# Can Boosting Agricultural Sector Output Reduce Unemployment Rate in Nigeria?

**Imoisi, Anthony Ilegbinosa**
Department of Entrepreneurship,
Faculty of Arts, Management and
Social Sciences,
University of Agriculture and
Environmental Sciences, Umuagwo,
Imo State, Nigeria
Email: mcanthonyby@yahoo.co.uk
**Tel: +2348034525743**

**Abstract**
This research examine the relationship between agricultural sector output and the unemployment rate in Nigeria from 1990-2021. To achieve the aim of the study, data on agriculture sector's contribution to GDP, agricultural output, government's expenditure on agriculture and unemployment rate were obtained from the CBN, NBS, ILO, Ministry of Agriculture and the World Bank. The unit root test, integration and error correction model were employed in analyzing the relationship among the variables used in this study. Our results revealed that agriculture sector's contribution to GDP, agricultural output and government's expenditure on agriculture have important impact on the unemployment rate in Nigeria for the period under review. Thus, the paper recommends that additional finance be allocated to the agriculture sector at the federal, state and local levels with flexible credit conditions and additional agricultural and rural employment opportunities should be created to absorb the increasing labour force in the nation.

**Keywords:** Agriculture, Unemployment Rate, Agricultural Sector Output, Agricultural Development, Economic Growth,

**JEL Classification Code:** E20, E24, J20, J43

## 1. Introduction

Agriculture was the earliest source of livelihood for humankind and it is as old as man himself is. It involves tilling the soil for harvest as well as raising livestock. Despite the advancement of present-day civilization, it continues to be a vital sector of any nation in the world (Anthony-Orji, Orji, Ogbuabor, and Ezealigo, 2020). Globally, the advancement of a squirming economy relies to a great degree on the growth of its agriculture sector (Ogbalubi and Wokocha, 2013). This sector is regarded as a catalyst for the general development of any country, and Nigeria is not an exemption. According to a World Bank Report in 2016, agriculture is a key sector in the Nigerian economy that propels economic growth and industrial development owing to its significance in creating employment opportunities, particularly in the rural areas, providing food for the teeming population, generating foreign exchange earnings for the nation, supplying raw materials to the emergent industries as well as offering markets for manufactured goods of the industrial sector. Nigeria as a nation is blessed with an enormous spread of arable land as well as favourable climatic conditions for agricultural activities. Consequently, this enables the turning out of extensive agricultural products, for example, crops, livestock, fisheries as well as forestry (Ewetan, Fakile, Urhie, and Oduntan 2017). Higher output in Nigeria's agriculture sector is essential in advancing the growth, development, and sustainability of the economy. This inevitably will have an apparent influence on economic growth via several outlets, for instance, employment generation, higher exports, investment potential, and financial impacts (Kareem, Bakare, Ademoyewa, Ologunla, and Arije, 2015). During 1960s, agriculture was a foremost contributor in Nigeria; it contributed approximately 60% to the country's GDP and was the most significant sector in foreign exchange earnings and job creation (NBS 2014; CBN 2016).

The 1970s witnessed the advent of the crude oil industry in Nigeria and this sector became the key propeller of economic growth; thus, making it the principal provider of the nation is GDP. Subsequently, output from agriculture has been fluctuating concerning its annual contribution to the nation's GDP as indicated in fig 1 below.

**\*Corresponding author:**
**Imoisi, Anthony Ilegbinosa**
Department of Entrepreneurship,
Faculty of Arts, Management and
Social Sciences,

**Fig 1. Agriculture value added (%GDP) in Nigeria**
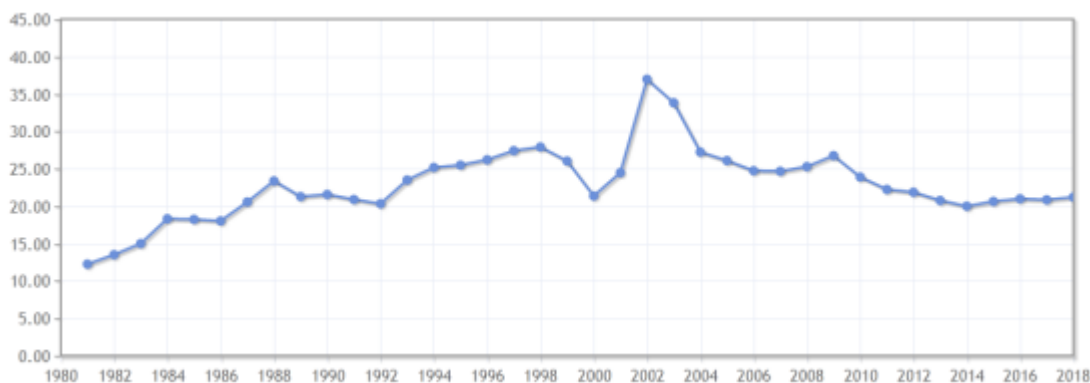


*Source: World Bank National Accounts Data, and OECD National Account Files (2020)*

Fig 1 reveals that agriculture's contribution to Nigeria's GDP has been inconsistent. It increased from 12.2% in 1981 to 23.4% in 1988, and fell to 20.3% in 1992. It increased to 27.9% in 1998 and decreased to 21.4% in 2000. By 2002, it rose to 37% and dropped to 24.7% in 2007. In 2009, it increased to 26.7% and fell to 21.2% in 2018. The over-dependence of the Nigerian economy on crude oil resulted in the dereliction of agriculture by the government and this has taken its toll on employment generation in the nation as shown in Fig 2 below.

**Fig 2. Employment in the Agricultural Sector (% of total employment)**
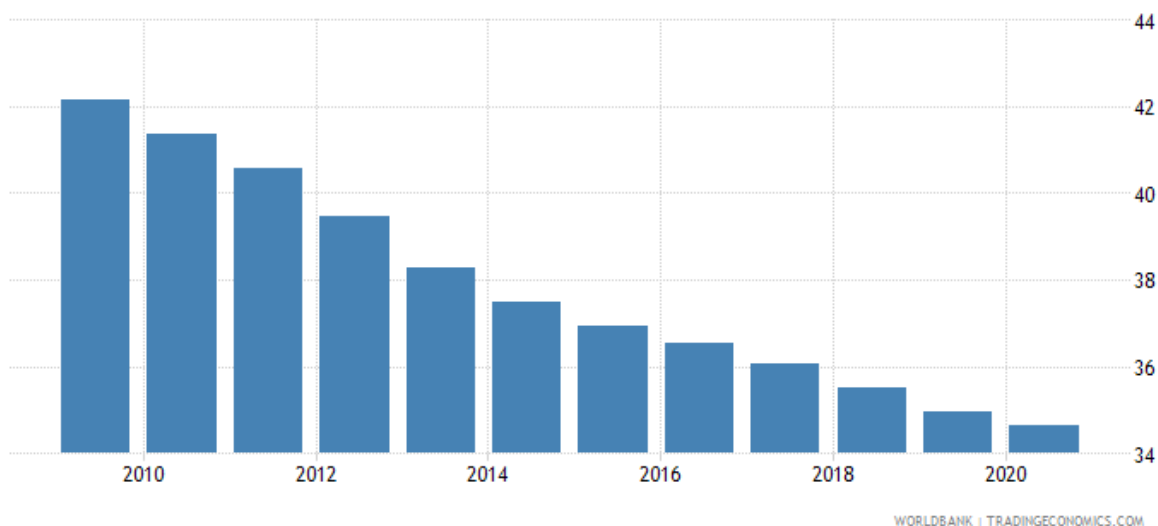


*Source: World Bank National Accounts Data, and OECD National Account Files (2020)*

As observed from fig 2, the employment in the agriculture sector (% of total employment) has been on a persistent decline; reduced from 41.36% in 2010 to 38.27% in 2013; it fell further to 36.55% in 2016 and dropped in 2020 to 34.66%. This incessant reduction in employment opportunities in this sector has added to the chronic unemployment experienced in Nigeria.

Over the past decades, the unemployment situation in the Nigerian economy has demonstrated to be a lingering macroeconomic ill befuddling any development endeavours by successive governments in the country. The upward surge in the rate of unemployment signifies a clear-cut divergence between the probable results of the modelled macroeconomic development strategies of the three tiers of government and actuality. According to Adegboyega, (2021), one out of every three Nigerians that have the capacity and readiness to be gainfully employed could not be employed in the fourth quarter of 2020. In addition, there has been a continuous increase in the annual change of unemployment from 2016 to 2019 as indicated in fig 3 below.

**Fig 3. Unemployment Rate (%) and its Annual Change in Nigeria**



Source: World Bank: *https://www.macrotrends.net/countries/NGA/nigeria/unemployment-rate*
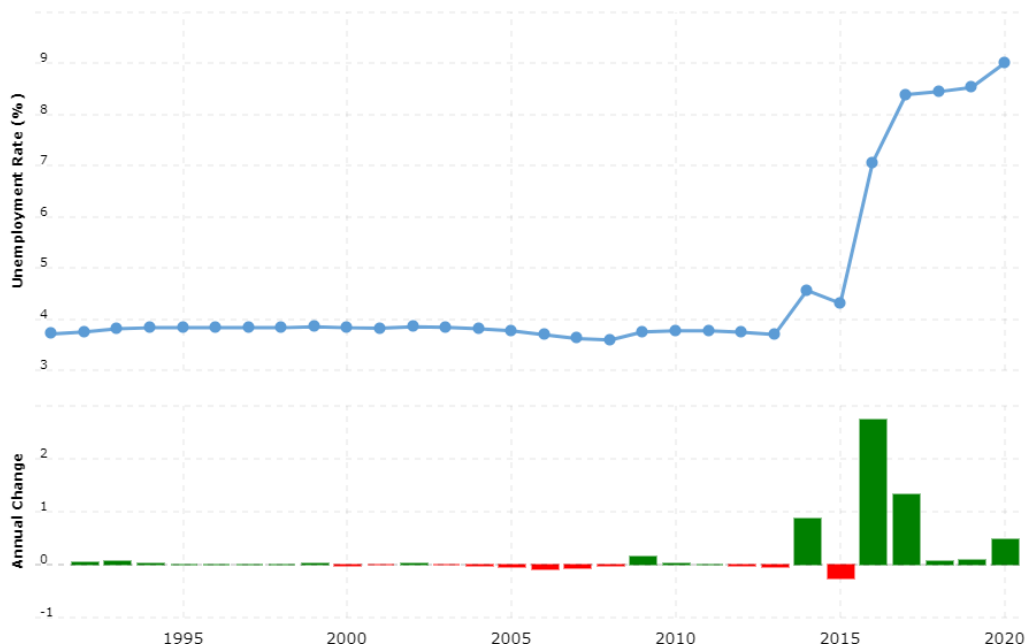
From fig. 3 above, in 2017, the unemployment rate in Nigeria was 8.39%, a 1.33% rise from 2016. In 2018, it was 8.45%, a 0.06% surge from 2017; in 2019, it was 8.53%, a 0.08% increase from 2018 and in 2020, it was 9.01%, a 0.48% upsurge from 2019 (World Bank, n.d.). In the third quarter of 2017, Nigeria's unemployment rate rose from 18.8% to 23.1% in the third quarter of 2018. It increased further from 27.1% in the second quarter of 2020 to 33% in 2021, converting to approximately 23.2 million persons, the grandest in at least thirteen years and the second-highest rate globally after Namibia whose unemployment rate is 33.4% (Adegboyega, 2021).

Although different governments, previous and current have made some notable exertions by formulating agricultural policies and establishing agricultural intervention programmes with the optimism of resolving the unemployment situation in the economy, it is quite arduous to determine those policies or programmes that have produced the coveted results in tackling Nigeria's high unemployment rate. However, just like the series of other non-agricultural programmes, the effect of these agricultural policies and intervention programmes are yet to be felt, as they have been unsuccessful in tackling the unemployment predicament in Nigeria.

In the 1960s, the agricultural sector was the most dominant in Nigeria, such that the growth and development of the economy were dependent on the sector. Agriculture constituted approximately two-thirds of the country's GDP and is a major sector in the employment of labour. Despite this, through the years, the sector has experienced a rapid deterioration in its influence, involvement, and role in development nationwide (Ogbalubi & Wokocha, 2013). Agriculture has been neglected for the quest and pursuit of crude oil and this worrisome situation began with the oil boom that led to the swift failure of this sector and has been described as the most severe impairment done to Nigeria's agricultural sector (Ogbanga, 2018). As a result, Nigeria turned into a key importer of agricultural goods against its former status as a principal exporter. This caused a drastic reduction in the economically active population engaged in agriculture and increased the unemployment rate in the economy. Economists and policymakers have attributed the chronic unemployment situation in the country to the poor performance and inadequate output of the agricultural sector.

Over the years, the failure of agricultural output to reduce the unemployment rate in Nigeria has been attributed to inadequate agricultural infrastructure and social amenities; insufficient credit facilities and funds to farmers; lack of modernized and mechanized agricultural technology; non-implementation of farming policies; absence of modern storage and processing facilities; insecurity of Nigerian farmers etc. In addition, other studies on agricultural output and reduction of unemployment rate in Nigeria have not examined why previous agricultural policies by the Nigerian government have not successfully addressed the unemployment rate in the country. The reasons for the failure of these agricultural policies in reducing unemployment rate in Nigeria might be as a result of: incompatibility of regional policies with the national

policies; short duration of agricultural policies; inefficient monitoring and evaluation of policies; inadequate technical advisory and extension services; role conflict between various policies; non interaction between and among stakeholders in the agriculture sector;  delay, embezzlement, misappropriation and insufficient funds to pursue certain policies to achieve a required outcome. The government has to effectively address these pertinent issues for agriculture to influence unemployment reduction in the nation. The germane question repeatedly asked is why the Nigerian economy is still experiencing chronic unemployment, particularly the youth (those between the ages of 15 – 35 years) regardless of the potentials of the agricultural sector in increasing output. It is because of this, that this research is undertaken.

## 2.      Literature Review

### 2.1.      Concept of Agricultural Output

The quintessence of participating in any economic pastime is to produce a specific good, product or output. Similarly, it is for this purpose that individuals are engaged in agricultural activities. Agricultural output refers to the product obtained from agricultural activities and these activities comprises of forestry, crop production, fishing and livestock (CBN, 2012.) Generally, agricultural output refers to output or product individuals gain after series of agricultural activities in which they are engaged. Over the years, the Nigerian agricultural sector has produced a huge quantity of output, which has been helpful to both the country and the international scene. According to the CBN (2012), there are four types of agricultural output namely:

- Crop Production – This is the ploughing of floras both on land and in riverine areas. These are planted, tendered (weeding, fertilizer application, trimming etc.) and harvested when due. Crops typically planted in Nigeria among others include rubber, beans, rice, cocoa, citrus crops, guinea corn, maize, wheat, cassava, palm, yam, kola, tomatoes etc. They are mostly categorized into roots and tuber, pulses and kernels, fruits and sugars, vegetables and spices and forest crops. The varieties in temperatures, rainfall, solar radiation and topography of the soil make it possible for these crops to be cultivated all through the country. Mixed root crops and cereals dominate the middle-belt zone, while the northern zone predominantly produces grains and pulses.
- Forestry – Nigeria has approximately 2.5% of its GDP provided by forest resources in 2010. The majority of the products of the forest is low land rain-wood. The forest products or output are commercially harvested for the generation of income.
- Fishing – This represents the water products gotten from the involvement in fishing activities. Nigeria has enormous fisheries resources.
- Livestock: It involves the rearing of animals for both commercial and consumption purposes.

The enviable status of agricultural output was transient owing to the civil war (1967 – 1970) and 1972, 1973 and 1983 drought decreased agricultural output (Oloruntoba, 1984). The discovery of crude oil, unfortunately, shifted interest away from agricultural production. By 1975, Nigeria has lost all its key export crops except cocoa thus giving in to importation. There was a mass exodus of people from the farms into the urban areas. To change this state of affairs, all governments, which have led the country since the 1970s, have put in place numerous programmes, policies and schemes which are all geared towards improving and increasing agricultural output which will restore agriculture to its former position as the prominent sector and to set up the coveted linkage with other sectors in the economy.

### 2.2.      Theoretical Literature

The following are models used in explaining agricultural development. These include:

### i.      Frontier Model or Resource Exploitation Model

For centuries, increase and expansion of regions farmed, cropped or grazed represented the major means of raising agricultural production. For instance, the opening as well as unlocking of new continents such as Australia during the 18th and 19th centuries (Ruttan, 1977). These newfangled continents progressively turned into vital food purveyors, raw materials, and market for the urbanite states of Western Europe.

Previously, analogous practices had progressed, although at reduce swiftness, in bucolic African, Asian and European economies. An increase of land utilization in prevailing hamlets and communities, clearing of forests were sequence of consecutive alterations from fallow to shifting cultivation on grassland ploughed initially by fallow systems. Regarding the above, where the state of the soil was satisfactory, the new hamlets slowly increase their cultivation methods. Whereas if soil conditions were unsuitable, for example, in most hill and upland areas, these were susceptible to shifting cultivation. Due to rapid population growth, this model was ephemeral. In terms of output per unit of seed, crop yields depleted. Output per hectare deteriorated – apart from South Asia, and Egypt (Ruttan, 1977). The 1960s witnessed the collapse of this model in most areas of Africa, South East Asia and Latin America (Udemezue and Osegbue, 2018).

## ii.    The Conservative Model

This model drew attention to the progression of progressively intricate exhaustive land and labour system of planting, manufacture along with utilizing organic composts as well as exhaustive labour capital formation in the shape of material facilities for further efficient usage of land as well as water resources. The only method for an increase of agricultural production that was accessible to most farmers worldwide was this model.

Furthermore, this model was proficient in numerous locales globally in maintaining the growth rates of agriculture products at approximately one percent per annum over lengthy periods. This is not similar to current growth rates for agricultural productivity that normally falls between three to five percent in less developed nations.

## iii.    The Location Model

At first, this model was put together to elucidate topographical disparities in the location and concentration of agricultural production in an industrializing economy. This model was built under the main assumption that urbanization ascertains the location of manufacture of agricultural products and affects the techniques as well as the concentration of cultivation. The specific assumptions include the following: economic growth and development takes place in a particular location milieu. These location milieus are mostly industrial-urban in arrangement. The prevailing economic organization operates effectively at or close to, the center of a specific milieu of economic growth and development and it performs efficiently in those areas of agriculture that are positioned positively in relation to such center.

The model propose that: greater commodity prices, land worth and levels of land utilization typify agricultural locations positioned nearer to urban locales. Furthermore, access to urban-industrial hubs is connected with equipment investment per staff and per hectare but has insignificant impact on other resources or factors. This use of the location model is restricted in poverty-stricken nations where: a key setback is to commence and increase economic growth at an adequate level to engage the rising labour force instead of the topographical allocation of economic activity. The degree of technical knowledge required for swift agricultural growth is unobtainable. The uncontrolled urban hubs growth due to the influx of population from rural areas is administering the requirements of non-farm employees. Nevertheless, despite the restrictions of this model, it has much important consequence for agricultural development where there are some issues in industrial location.

## iv.    The Diffusion Model

This model proposes that a key source of agricultural productivity is the diffusion of improved methods of husbandry, livestock and crop varieties. It is the opinion of this model that the path to agricultural development is via efficient distribution of technological expertise, and a contraction in output amongst specific farmers and among zones. Each smart farmer is an alchemist and does not require an experimentation station, essentially built to conduct scientific research. This is because the experimentation station cannot affect most of the critical difficulties of agriculture.

In addition, the diffusion model has offered key logical basis for majority of the research and expansion endeavours in farm management as well as production economics since the start of the 19th century. This model perceives agricultural economics as a distinct sub-discipline connecting agricultural sciences and economics. However, this model was unsuccessful in creating a swift transformation of outmoded farms and rapid increase in agricultural products.

## v.    The High Payoff Input Model

There are two parts in which this model concentrates on. Firstly, how to invent and supply to farmers the novel higher-payoff technology exemplified in capital equipment as well as other factors. Secondly, how to raise labour productivity. The model proposes that in a poverty-stricken nation, economic growth from the agricultural sector relies mainly on the obtainability and prices of cutting-edge high pay off factors. If there is success in creating as well as allocating these non-traditional inputs, agricultural inputs such as higher yielding seedlings, fertilizers, etc. becomes less expensive and investment in agriculture becomes lucrative. Furthermore, the solution to transforming an old-fashioned agricultural sector into a fecund source of economic growth in poor nations is investment, which will cause state of the art high pay off factors to be obtainable to farmers.

According to Ruttan (1977), there are three classes of higher productivity investment namely:

- Agricultural test stations to create newfangled knowledge in technology
- Industrial sector to manufacture, develop, sell as well as promote novel technological factors

- Ability of farmers to utilize cutting-edge agricultural inputs efficiently

This model has effectively influenced endeavours to develop high yielding state of the art type of grains that are appropriate for the tropics, for example, Mexico in the 1950s and Philippines during the 1960s as well as the swift dispersion of latest varieties amongst farmers in numerous nations in Latin America, Africa and Asia. Strategies, which are created by this model, seem able to produce an appropriate high agricultural growth rate to offer the foundation for complete economic growth and development corresponding to current population and income prerequisites. However, the model is inadequate and the means by which inputs are shared among research, education, private and public economic activities is not fully completely built into the model.

## 2.3.    Empirical Literature

Over the years, the debate on the effect of agricultural output on unemployment reduction has received considerable attention from scholars and economic policymakers. For instance, Zhang, Fan, Zhang, and Huang (2004) examined local governance and its influence on the delivery of public goods in rustic China. They discovered that government investments in the construction of roads in bucolic China to connect farmsteads with markets across the boards have alleviated poverty and increased off-farm employment. Guido (2005) studied the influence of trade liberalization in agriculture globally on job creation, unemployment as well as wages in Argentina. His findings revealed that a rise in agriculture exports prices would bring about a surge in the likelihood of Argentine employment opportunities, equaled by a reduction in unemployment possibilities and an upsurge in labour market involvement. In addition, anticipated wages would rise, an influence predominantly determined by greater employment possibilities. This signifies that majority of effects of trade reforms begin with household retorts accompanied with modification costs and that the inability to explain them might bring about substantial predispositions in the welfare assessment of trade policy. Aliber, Baipheti, and Jacobs (2007) looked at the agricultural employment scenarios in South Africa and forecasted that taking up labour-intensive technologies such as animal traction instead of utilizing machines will probably increase the employment of labour in their agricultural sector. Ayinde (2008) investigated agricultural growth and the unemployment rate in Nigeria and analyzed the connection and proportion of agricultural growth and unemployment rates. He utilized time-series data, t-test, Granger causality test and regression analysis. His findings revealed that the Nigeria's agriculture growth rate has a negative correlation with unemployment. Furthermore, a rise in the growth rate of agriculture reduces the unemployment rate and therefore can alleviate poverty. Thus, proposing policies to alleviate poverty ought to concentrate on enhancing growth of agriculture. Diao, Hazell, and Thurlow (2009) analyzed agriculture's role in African development and stated that it is the only sector that can offer utmost employment for the indigent as approximately 70% of the poverty-stricken populace reside in rural areas. Research carried out by the South Africa's division of agriculture, fisheries and forestry in 2010 examined trends in employment in the country's agriculture sector from 2000 - 2010. Its discoveries exposed that investment in agriculture does not automatically turn into a rise in employment.

According to Chandararot and Liv (2013), in Cambodia, agriculture is the key supplier of jobs for the rustic populace with majority of families participating in rice production. Lyatuu, Nie, and Fang, (2015) studied the impact of agriculture on economic growth and poverty reduction in Tanzania. According to them, most Tanzanians reside in rural areas and obtain ample amount of their incomes from agriculture. Their results showed that ventures in agriculture would enlarge engagement in farming, improve living standards of individuals as well as reduce rural-urban migration among the youths in search of job opportunities. Behera (2016) opined that though the Indian agricultural sector employs the majority of the workforce, employment generation is a gradual process. He observed that although investment in this sector has brought about additional growth and progression, it has done insignificantly regarding job creation. Ayinde, Aina and Babarinde (2017) examined agricultural growth's influence on unemployment and poverty in Nigeria from 1980 to 2012 employing a cointegration approach. Data sourced from the CBN, NBS, as well as the UN were utilized for their study and Granger causality and co-integration models were employed in their analysis. Their result revealed the following: (i) a unidirectional causation from poverty to changes in agricultural growth. (ii) a unidirectional causation from poverty to unemployment changes. (iii) a unidirectional causation from changes in agricultural growth to unemployment rate. Adekanbi (2018) studied the correlation between agriculture and employment generation in Nigeria, and discovered that agriculture has an effect on the nation's economic development. However, he noticed that despite the government's increased support to this sector, its impact is quite insignificant. Osabohien, Matthew, Gershon, Ogunbiyi, and Nwosu, (2019) assessed the relationship between agricultural development, job creation and reduction of poverty in West Africa utilizing panel data from 2000 - 2016. They employed the Generalized Method of Moments econometric technique and discovered that poverty-stricken persons in West Africa rely on agriculture to get additional incomes and alleviate poverty. Aderemi, Abalaba, Adeniran, and Amadi (2020) looked at the agricultural sector in Nigeria and employment generation in the post-Structural Adjustment Programme (SAP) era. They discovered from their result that the agricultural sector did not have a substantial effect on

job creation in Nigeria during the post-SAP era. Furthermore, they asserted that expenditure on agriculture and employment generation have an inverse relationship

## 3.  Methodology

The aim of this paper is to examine the influence of agricultural sector output on reduction of unemployment rate in Nigeria. To realize this aim, the research via extensive review of relevant literature and the vital role agriculture plays in enhancing employment, agricultural sector output, government expenditure on agriculture, and agriculture sector percentage to Nigeria's GDP as likely factors that could reduce unemployment in Nigeria.

### 3.1. Model Specification

The variables utilized by the researcher for the model were obtain from several works of literature reviewed. Thus, the model followed the contention of Bernard and Adenuga (2017); Oluwafemi, Saidi and Onyeka (2019).  This study overtly evaluated Nigeria's unemployment rate and agricultural sector output. Based on the foregoing, the functional relationship between the variables was specify as thus:

UNEM = f (AO, GEXA, A%GDP)                                                                 3.1

Stating equation 3.1 in linear form, it becomes

UNEM = $\beta_0 + \beta_1 AO + \beta_2 GEXA + \beta_3 A\%GDP + \mu$                              3.2

Where UNEM = Unemployment Rate; AO = Agriculture Sector Output; GEXA = Government Expenditure on Agriculture; A%GDP = Agriculture Sector Percentage to Nigeria's GDP; $\beta_0, \beta_1, \beta_2, \beta_3,$ = Parameters and $\mu$ = Error term.

### 3.1.1. Definition of Variables in the Model

**Unemployment Rate (UNEM)** - It refers to the percentage of individuals in the labour force who are unemployed. Thus, measuring it involves recognising who is in the labour force. The labour force comprises of individuals who are either employed or unemployed.

**Agriculture Sector Output (AO)** - This refers to output or product individuals obtain after series of agricultural activities in which they are actively engaged in.

**Government Expenditure on Agriculture (GEXA)** – This is the total expenses or spending incurred by the government (Federal, State or Local) on the agricultural sector

**Agriculture Sector Percentage to Nigeria's GDP (A%GDP)** – This refers to the contribution of the agriculture sector to Nigeria's Gross Domestic Product

### 3.2. Estimation Technique

Given that the variables were all stationary at their first difference I(1), the cointegration and error correction mechanism (ECM) were applied on the time series data with significant thought on its supposition and principles. The cointegration test was employed to test the correlation between two or more non-stationary time series in the long run or for a specified period; while the error correction mechanism links the long-run equilibrium relationship between two time series inferred by cointegration with the short-run dynamic adjustment mechanism.. The descriptive statistics was utilized for the analysis of the variables recognized in this research in addition to graphs for trend analysis. This research studied the time series properties of the data by employing the Augmented Dickey-Fuller (ADF) test. Later, it will advance to the long-run relationship since the variables were all stationary at order one.

### 3.3. Conitegration and Error Correction Model

Once the variables to be assessed are non-stationary in a regression model we might obtain errorneous results. Thus, if $Y_t$ and $X_t$ are both I(1), and we carry out a regression analysis:

$Y_t = \Phi_1 + \Phi_2 X_t + \mu_t$                                                                 3.3

Realizing an acceptable estimates of $\Phi_1$ and $\Phi_2$ might be difficult. One means of resolving this is to difference the data to guarantee stationarity of our variables. Afterwards,

$Y_t \sim I(0)$ and $X_t \sim I(0)$                                                              3.4

The regression equation becomes:

$\Delta Y_t = \Phi_1 + \Phi_2 \Delta X_t + \Delta_i \mu_t$                                            3.5

From equation 3.5, the regression equation is likely to provide dependable estimates of $\Phi_1$ and $\Phi_2$ parameters and the errorneous regression problem will be resolved. Nonetheless, what happens in equation 3.5 is only the short-run relationship between the two variables. Recollect that the long-run relationship equation:

$Y^*_t = \Phi_1 + \Phi_2 X_t$                                                                      3.6

Thus, $Y_t$ is certain to offer us no information about the long-run behaviour of our model. Remember that economists are concerned more in long-run relationships, this brings about a severe problem, and the idea of cointegration and the ECM are extremely important in resolving this problem.

As indicated earlier that when $Y_t$ and $X_t$ are both I(1) signifying that there is a linear combination of $Y_t$ and $X_t$ then $Y_t$ and $X_t$ are cointegrated. Therefore, if this is the scenario, the regression of equation 3.3 is no longer errorneous, and it in addition offers with the linear combination. Thus, equation 3.7 below links $Y_t$ and $X_t$ in the long run:

$$U^*_t = Y_t - \Phi^*_1 - {}^*\Phi^*_2 X_t \qquad\qquad 3.7$$

If $Y_t$ and $X_t$ are cointegrated, implying $U^*_t \sim I(0)$. Thus, we can express the connexion between $Y_t$ and $X_t$ with an ECM as:

$$\Delta Y_t = \Phi_0 + \Phi_1 \Delta X_t - \mathcal{X} u^*_{t-1} + U_t \qquad\qquad 3.8$$

Equation 3.8 has the capacity of accomodating the short-run and long-run parameters as well as variables. In this equation, $\Phi_1$ is the control multiplier (the short-run impact) that evaluates the direct effect a variation in $X_t$ will have on a change in $Y_t$. While $\mathcal{X}$ is the adjustment effect and it reveals the degree the disequilibrium is being corrected. In other words, the degree to which any disequilibrium in earlier period influence any change in $Y_t$. Nevertheless, $U^*_{t-1} = Y_{t-1} - \Phi^*_1 - {}^*\Phi^*_2 X_{t-1}$, hence from this equation $\Phi_2$ is also the long-run response

## 4.0. Results and Discussion

The descriptions of the data and the summary of the descriptive statistics for the macroeconomic variables are presented in table 1. The results exposed an indication of discrepancy in the trends of the macroeconomic variables utilized over the sample period. This is substatiated in the variation between the maximum and minimum values of the series as well as the standard deviation. This signifies a very high level of variabilities or unpredictability in the macroeconomic variables under study over the period.

**Fig 4. Trends of Unemployment Rate, Agriculture Sector Output, Government Expenditure on Agriculture, Agriculture Sector Percentage to Nigeria's GDP from 1990 – 2021**
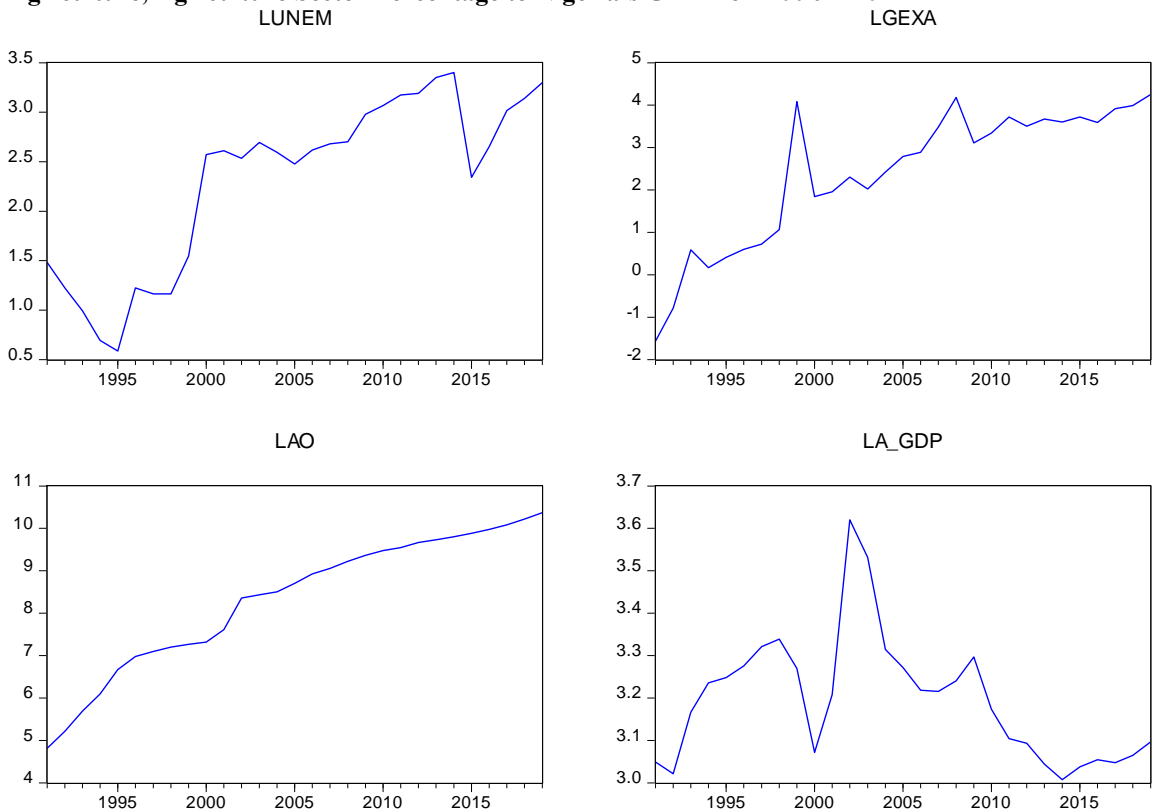


The line graphs above represent the data for unemployment rate, government expenditure on agriculture, agriculture sector output and agriculture sector percentage to Nigeria's GDP from 1990 - 2021. From the graphs above, Nigeria's unemployment rate fluctuated from 1990 to 2015, while it steadily increased afterwards to 2021. For instance, Nigeria's unemployment rate in 1992 was 4.09%, a -0.03% decrease from 1991; in 1993, it was 4.10%, a 0.01% increase from 1992; in 1994, it was 4.09%, a -0.02% decrease from 1993. In 2002, it was 3.88%, a -0.05% decrease from 2001; it increased to 3.90% in 2003, a 0.02% increase from 2002; it fell again to 3.88% in 2004, a -0.02% from 2003. In 2018, it was 8.46%, a 0.07% increase from 2017; it was 8.53% in 2019, a 0.07% increase from 2018; in 2020, it was 9.71%, a 1.18% increase from 2019; in 2021, it was 9.79%, a 0.07% increase from 2020.

The trend of government expenditure on agriculture in Nigeria has been inconsistent and fluctuating for the period under review. From 1990 to 2011, the federal government capital expenditure on agriculture were less than 10% excluding 2001, 2002, 2004, 2005, 2007, 2008 and 2009 because these years concurs with or the year after different government agricultural development programmes such as the Rural Agro-Industrial Development Scheme in 2001 and Economic Empowerment Development Strategy of 2003. The federal government recurrent expenditure on agriculture as a ratio of the total federal government recurrent expenditure was highest in 2008 (3.4) (CBN, 2022). Capital expenditure to the agricultural sector in Nigeria rose from 60.3 billion naira in 2005 to 138.9 billion naira in 2009 and then declined to 56.4 billion naira in 2013(CBN, 2022). In 2014, capital expenditure to the agricultural sector rose to 60.9 billion naira and then reduced to 55.93 billion naira and 50.12 billion naira in 2017 and 2018 respectively (CBN, 2022). The recurrent expenditure of the federal government on the agricultural sector was 17.9 billion naira in 2006, which then rose to 22.4 billion naira and 39.4 billion naira in 2009 and 2013 respectively. There was a fall to 38.67 billion naira in 2014 followed by an increase to 40.79 billion naira, and 41.04 billion naira in 2017 and 2018 respectively (CBN, 2022).

Agriculture output in Nigeria has witnessed an upward trend for the period under review. For instance, agricultural output increased from N123.24 billion in 1991 to N1, 508.41 billion in 2000. It increased further from N2, 015.42 billion in 2001 to N13, 048.89 billion in 2010. By 2011, agricultural output in Nigeria was N14, 037.83 billion and this further increased to N31, 904.14 billion in 2019 (CBN, 2022).

Agriculture sector percentage to Nigeria's GDP has been fluctuating for the period under review. For instance, it was 21.6% in 1990 and fell to 20.3% in 1992. It later rose to 27.9% in 1998 and fell to 21.4% in 2000. Agriculture sector percentage to Nigeria's GDP was highest in 2002 at 37%, and lowest in 2014 at 20%. By 2020, it was 24.1% and later reduced to 23.4% in 2021.

**Table 1. Descriptive Statistics**

|  | LUNEM | LGEXA | LAO | LA%GDP |
|---|---|---|---|---|
| Mean | 2.316340 | 2.399718 | 8.319591 | 3.194473 |
| Median | 2.610070 | 2.885864 | 8.704889 | 3.207979 |
| Maximum | 3.401197 | 4.252410 | 10.37049 | 3.620268 |
| Minimum | 0.587787 | -1.566857 | 4.814098 | 3.007449 |
| Std. Dev. | 0.876775 | 1.614698 | 1.599405 | 0.148610 |
| Skewness | -0.642666 | -0.816033 | -0.630915 | 1.001290 |
| Kurtosis | 2.006484 | 2.621366 | 2.291314 | 3.960708 |
| Jarque-Bera | 3.188977 | 3.391798 | 2.530792 | 5.961057 |
| Probability | 0.203012 | 0.183434 | 0.282127 | 0.050766 |
| Sum | 67.17386 | 69.59184 | 241.2681 | 92.63971 |
| Sum Sq. Dev. | 21.52455 | 73.00295 | 71.62673 | 0.618378 |
| Observations | 29 | 29 | 29 | 29 |

**Source**: *Researchers' computation using E-views12*

In Table 1, the descriptive statistics of the variables revealed that the average value of unemployment rate is 2.316340; average value of government expenditure on agriculture is 2.399718, average value of agriculture sector output is 8.319591 and average value of agriculture sector percentage to Nigeria's GDP is 3.194473 between 1990 – 2021. Additional analyses implied that apart from agriculture sector percentage to Nigeria's GDP which is positively skewed denoting that it has a long right tail, unemployment rate, government expenditure on agriculture and agriculture sector output are negatively skewed meaning they have long left tails; apart from agriculture sector percentage to Nigeria's GDP which is leptokurtic, unemployment rate, government expenditure on agriculture and agriculture sector output are platykurtic. Government expenditure on agriculture was the most volatile with a standard deviation value of 1.614698 while agriculture sector percentage to Nigeria's GDP was the least volatile with a standard deviation value of 0.148610. In addition, the Jarque-Bera tests shows that the null hypothesis is rejected for unemployment rate, government expenditure on agriculture, agriculture sector output and agriculture sector percentage to Nigeria's GDP. Based on these analyses, it indicates that the variables have unit root. Thus, evaluating these variables at this level might not give the right result, so there is a need to carry a unit root test to see if the variables were stationary or not.

**Table 2. Unit Root Test Result**

| Variables | ADF – statistics | Critical values | | Order of Integration |
|-----------|------------------|-----------------|----------------|----------------------|
| LA%GDP | -3.777941 | 1% level | -3.737853 | I(1) |
| | | 5% level | -2.991878 | |
| | | 10% level | -2.635542 | |
| LAO | -3.256172 | 1% level | -3.699871 | I(1) |
| | | 5% level | -2.976263 | |
| | | 10% level | -2.627420 | |
| LGEXA | -6.098670 | 1% level | -3.711457 | I(1) |
| | | 5% level | -2.981038 | |
| | | 10% level | -2.629906 | |
| LUNEM | -4.808069 | 1% level | -3.699871 | I(1) |
| | | 5% level | -2.976263 | |
| | | 10% level | -2.627420 | |

*Source: Researchers' computation using E-views12*

The Augmented Dickey Fuller (ADF) test for stationary was carried out on all the macroeconomic variables as shown in table 2. The results revealed that no macroeconomic variables were stationary at level. This signifies that unemployment rate and all the macroeconomic variables explaining it for this study were not stable without differencing. Subjecting the macroeconomic variables to first differencing brought about their stability, hence all the macroeconomic variables (dependent and independent) were stationary at I(1). The attainment of stationarity is an essential requirement for performing cointegration test as illustrated in table 3 below

**Table 3. Johansen Co-integration Test Results**
Date: 06/16/23   Time: 18:28
Included observations: 28 after adjustments
Trend assumption: Linear deterministic trend
Series: LUNEM LGEXA LAO LA_GDP
Lags interval (in first differences): No lags

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value |
|---------------------------|------------|-----------------|---------------------|
| None * | 0.674045 | 60.65069 | 47.85613 |
| At most 1 | 0.458459 | 29.26283 | 29.79707 |
| At most 2 | 0.262492 | 12.08943 | 15.49471 |
| At most 3 | 0.119519 | 3.564046 | 3.841466 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value |
|---------------------------|------------|---------------------|---------------------|
| None * | 0.674045 | 31.38786 | 27.58434 |
| At most 1 | 0.458459 | 17.17340 | 21.13162 |
| At most 2 | 0.262492 | 8.525385 | 14.26460 |
| At most 3 | 0.119519 | 3.564046 | 3.841466 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
*Source: Researchers' computation using E-views12*

Table 3 shows the cointegration test result using the Johansen procedure. We observed that there was at least one cointegrating equation in the trace and Max Eigen value test. The presence of at least one cointegrating equation is a validation of a long run relationship and a fundamental prerequisite for fitting the error correction model (ECM). The result of the ECM is depicted in table 4 below.

**Table 4. Parsimonious Error Correction Model Result**

| Variable | Coefficient | T-statistic | Probability |
|---|---|---|---|
| Constant | -0.104022 | 0.112380 | 0.3652 |
| D(LUNEM(-1)) | 0.079976 | 4.408421 | 0.0003 |
| D(LA%GDP(-1)) | -0.974069 | 2.166471 | 0.0001 |
| D(LAO(-1)) | -0.922657 | -3.512567 | 0.0003 |
| D(LGEXA(-1)) | -0.039270 | 2.741553 | 0.0002 |
| ECM(-1) | -0.764271 | -3.846066 | 0.0001 |
| $R^2 = 0.67$; Adjusted $R^2 = 0.45$; F-statistic = 14.95; DW statistic = 2.1 | | | |

*Source: Researchers' computation using E-views12*

The Error Correction Model (ECM) result as shown in table 4 reveals that agriculture sector contribution to GDP, agriculture sector output and government's expenditure on agriculture have similar effects on unemployment rate in Nigeria for the period under review. For instance, at lag 1, agriculture sector's contribution to GDP, agricultural output and government's expenditure on agriculture all have negative relationship with unemployment rate in Nigeria and were statistically significant at 5 level, which implies that they have important impact on unemployment rate in the country for the period under study.

The ECM value of -0.76 signifies that agriculture sector's contribution to GDP, agricultural output and government's expenditure on agriculture adjust quickly to long run changes in unemployment rate in Nigeria. The negative and statistically significant coefficient of the ECM suggest that approximately 76% of the disequilibrium in the previous years is corrected within one year. The $R^2$ value of 0.67 indicates that 67% change in unemployment rate in Nigeria is explained by agriculture sector's contribution to GDP, agricultural output and government's expenditure on agriculture, while the other 33% is accounted for by variables not included in the model. The F-statistic of 14.95 shows that the entire regression model is statistically significant.

**Table 5: Model Diagnostic Test Results**

| Test | F-statistic | Probability | Decision |
|---|---|---|---|
| Breusch-Godfrey Serial Correlation | 0.109 | 0.91 | Accept $H_0$ |
| Heteroscedasticity test (ARCH) | 1.97 | 0.12 | Accept $H_0$ |
| Normality Test | 0.59 | 0.76 | Accept $H_0$ |
| Ramsey RESET Test | 1.05 | 0.33 | Accept $H_0$ |

*Source: Researchers' computation using E-views12*

The model diagnostic tests results is illustrated in table 5. We employed the Breusch-Godfrey test or Langrage Multiplier (LM) in testing the serial correlation of the residuals. Our probability value of 0.91 was greater than the 5 percent level of significance value; hence, the null hypothesis of no serial correlation was accepted. The Ramsey Regression Equation Specification Error Test (RESET) was carried out to check if the model was specified correctly. Our probability value of 0.33 was greater than the 5 percent level of significance value; consequently, the null hypothesis that the model was specified correctly was accepted. Thus, there was no likelihood of our model being incorrectly specified which might bring about the exclusion of some variables. Moreover, the model possess no wrong functional form. Under the normality test, a probability value of 0.76 was greater than the 5 percent level of significance value and this implies that the errors were normally distributed and hence, we upheld the null hypothesis. Finally, the probability value of 0.11 from our ARCH test revealed the absence of heteroscedasticity. This indicates that the error terms were homoscedastic and independent of the explanatory variables. Thus, our model has a good fit and can be utilized for analysis of policy.

### 4.1 Discussion

Agriculture sector's contribution to GDP has a negative and significant relationship with unemployment rate. This implies that an increase in agriculture sector's contribution to GDP reduces unemployment rate. Our results conforms to economic theory and it revealed that at lag 1, a unit rise in agriculture sector's contribution to GDP reduces unemployment rate by 0.974069. Olowu, Olasehinde-Williams., & Bein (2019) in their study titled does financial and agriculture sector development reduce unemployment rates? Evidence from Southern African countries supports this negative relationship between agriculture sector's contribution to

GDP and unemployment rate. They discovered that agricultural value added is negatively associated with unemployment in both the short and long run.

Agricultural output has a negative and significant relationship with unemployment rate and conforms to economic theory. This denotes that an increase in agricultural output reduces unemployment rate. We found out that at lag 1, a unit rise in agricultural output reduces unemployment rate by 0.922657. This negative association between agricultural output and unemployment concurs with the findings of Enilolobo, Mustapha & Onyeka (2019). In their study of the nexus between agriculture and unemployment, they discovered that changes in agriculture output in the present period is negative and significant related to present unemployment level in Nigeria.

Government's expenditure on agriculture has a negative and significant relationship with unemployment rate and conforms to economic theory. This signifies that an increase in government's expenditure on agriculture reduces unemployment rate. At lag 1, a unit rise in government's expenditure on agriculture reduces unemployment rate by 0.039270. The study by Chitekwere (2021) backs this negative connection between government's expenditure on agriculture and unemployment. In his study, titled public spending on agriculture and its effects on unemployment in sub-Saharan Africa, he discovered that public spending reduces unemployment in Sub-Saharan Africa, though the effect is higher in agricultural-based economies than non-agricultural based economies.

The federal government of Nigeria after years of neglect of the agricultural sector began to reform the sector by implementing new strategies and policies such as the Agricultural Transformation Agenda (ATA) and the Agriculture Promotion Policy (2016 – 2020). These strategies have played a key role in increasing agriculture sector's share to GDP, agricultural output and government's expenditure to the agricultural sector. Thus, with the implementation of these policies, employment generation in the country's agriculture sector have slightly increased particularly in the rural areas.

## 5.0 Conclusion and Recommendations

The paper examines the effectiveness of agricultural sector output in reducing unemployment rate in Nigeria from 1990 – 2021 utilizing the cointegration and error correction model. Our results and findings of the study revealed that agriculture sector's contribution to GDP, agricultural output and government's expenditure on agriculture have important impact on the unemployment rate in Nigeria for the period under review. This is demonstrated in the negative and significant relationship between agriculture sector's contribution to GDP, agricultural output, government's expenditure on agriculture and unemployment rate in Nigeria. Based on these findings, the paper recommends that additional finance be allocated to the agriculture sector at the federal, state and local levels with flexible credit conditions. Self-sufficiency in basic food items mainly those which take sizeable shares of Nigeria's foreign exchange and for which the nation has comparative advantage in local production. Increase exports of agriculture product with a view to increasing their foreign exchange earning capacity. Modernize agricultural production, processing, storage and distribution via the infusion of improved technologies and management. Generate additional agricultural and rural employment opportunities to absorb the increasing labour force in the nation. Guard and improve agricultural land resources for sustainable agricultural production. Set up suitable institutions to facilitate the integrated development and fulfilment of the nation's agricultural potentials.

## References

Adegboyega, A. (2021, March 16). Nigeria's unemployment rate rises to 33.3% — the highest in over 13 years. Premium Times Nigeria. https://www.premiumtimesng.com/news/headlines/449150-Nigeria-unemployment-rate-rises-to-33-3-highest-in-over-13-years.html

Adekanbi, O. (2018). The Role of Agriculture in Job Creation for National Development in Nigeria. *International Research Journal of Engineering and Technology (IRJET)*, 5(9), 226-227.

Aderemi, T. A., Abalaba, B. P. Adeniran, A. A. & Amadi, C. E. (2020). Agricultural Sector and Employment Generation in Post Sap Era Nigeria: An Empirical Perspective. International *Journal of New Economics and Social Sciences,* 11(1), pp. 185-196.

Aliber, M., Baipheti, M., and Jacobs, P. (2007). *Agricultural Employment Scenarios: Human Science Research Council*. Pretoria.

Anthony-Orji, O. I., Orji, A., Ogbuabor, J. E. and Ezealigo, P. (2020). Empirical Analysis of Agricultural and Non-Agricultural Exports' Impact on Infrastructural Investment in Nigeria. *Ekonomika APK*, 5, 87–96. DOI: 10.32317/2221- 1055.202005087

Ayinde, O. E. (2008). Empirical Analysis of Agricultural Growth and Unemployment in Nigeria. *African Journal of Agricultural Research,* 3(7), 20-25.

Ayinde, O. E., Aina, I. V. and Babarinde, S. O. (2017). Effect of Agricultural Growth on Unemployment and Poverty in Nigeria (1980-2012): A co-integration approach. *Article in Tropical Agriculture*, 94(4), p. 442

Behera, D. K. (2016). *Employment potential in Indian agriculture: An econometric investigation.* https://www.researchgate.net/publication/312061923.

Bernard, O.A, and Adenuga, O. (2017). Agricultural Sector Development as a Panacea for Employment Generation in Nigeria. *International Journal of Economics, Business and Management Research*, 1 (2), 251-257.

Chitekwere, B. (2021). *Public Spending on Agriculture and its Effects on Unemployment in Sub- Saharan Africa*. A dissertation submitted in fulfilment of the requirements for the degree of Master of Science in Agricultural Economics

Central Bank of Nigeria (2012). *Economic Report: Fourth Quarter, 2012*. Retrieved from https://www.cbn.gov.ng/out/2013/ccd/cbn%20economic%20report%20for%20the%20fourth%20quarter%20of%202012.pdf

Central Bank of Nigeria (2016). *Annual Reports*. Lagos: Nigeria

Central Bank of Nigeria (2022). *Statistical Bulletin*. Abuja: Nigeria

Chandararot, K. and Liv, D. (2013). Rural development and employment opportunities in Cambodia: How can a national employment policy contribute towards realization of decent work in rural areas? *ILO Asia-Pacific Working Paper Series*. International Labour Organisation.

Department: Agriculture, Fisheries and Forestry (2010). *Estimate of the Contribution of the Agricultural Sector to Employment in the South African Economy*

Diao X., Hazell, P. and Thurlow, J. (2009). The Role of Agriculture in African Development. *World Development,* 38(10), 1375-1383.

Enilolobo, O. S., Mustapha, S. A., and Ikechukwu, O. P. (2019). Nexus between Agriculture and Unemployment in Nigeria. *Journal of Economics, Management and Trade*, 22(5), 1–13. https://doi.org/10.9734/jemt/2019/v22i530103

Ewetan, O., Fakile, A., Urhie, E. and Oduntan, E. (2017). Agricultural Output and Economic Growth in Nigeria. *Journal of African Research in Business and Technology*. DOI: 10.5171/2017.516093.

Guido, G. P. (2005). Agro-Manufactured Export Prices, Wages, and Unemployment. *Development Research Group the World Bank*.

Kareem, R. O., Bakare, H. A., Ademoyewa, G. R., Ologunla, S. E., and Arije A. R. (2015). Nexus Between Federal Government Spending on Agriculture, Agricultural Output Response and Economic Growth of Nigeria (1979-2013). *American Journal of Business, Economics and Management*; 3(6): 359 – 366

Lyatuu, E. T., Nie, F. and Fang, C. (2015). The Role of Agriculture in the Economic Growth and Poverty Reduction in Tanzania. *Journal of Economics and Sustainable Development*, l6 (14), pp. 163-164.

Narayan, P. K., & Smyth, R. (2005). The Residential Demand for Electricity in Australia: An Application of the Bounds Testing Approach to Co-integration. *Energy Policy*. 33(4), 467–474.

National Bureau of Statistics (2014). *Agriculture.* Retrieved from https://www.nigerianstat.gov.ng/

National Bureau of Statistics (n.d.) Retrieved from https://www.nigerianstat.gov.ng/

Nwachukwu, I. (2008). Planning and Evaluation of Agricultural and Rural Development Project. Lamb house publishers. p. 1-6.

Ogbalubi, L. N. and Wokocha, C. C. (2013). Agricultural Development and Employment Generation: The Nigeria Experience. *IOSR Journal of Agriculture and Veterinary Science*, 2 (2), 60–69. DOI: 10.9790/2380-0226069

Ogbanga, A. (2018). Agricultural Development and Employment Generation in Nigeria. *International Journal of Advanced Studies in Ecology, Development and Sustainability*, 5      (1), 1-22

Oloruntoba, B. S. (1984). *Towards Self Sufficiency in Food Production in Nigeria*. A Public       Service Lecture Delivered at the Institute of International Affairs, Lagos 3rd July, 1984.

Olowu G., Olasehinde-Williams G., and Bein M. (2019): Does Financial and Agriculture Sector Development Reduce Unemployment Rates? Evidence from Southern African Countries. *Agricultural Economics* – Czech, 65: 223–231.

Oluwafemi, S. E., Saidi, A. M. and Onyeka, P. I. (2019). Impact of Agriculture Sector Growth on Unemployment Level in Nigeria. *Journal of Economics, Management and Trade*. 22(5),   1- 13.

Osabohien, R., Matthew, O., Gershon, O., Ogunbiyi, T. and Nwosu, E. (2019). Agriculture Development, Employment Generation and Poverty Reduction in West Africa. *The Open       Agricultural   Journal,* 13, pp. 84-85.

Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of    Level Relationships. *Journal of Applied Econometrics*, 16 (3), 289–326. DOI:            doi.org/10.1002/jae.616

Ruttan, V. W. and Hayami, Y. (1984). Toward a Theory of Induced Institutional Innovation.        *Journal of Development Studies*, 20, 203-223.        http://dx.doi.org/10.1080/00220388408421914

Ruttan, Vernon W., 1984. Integrated rural development programmes: A historical perspective.       *World Development*, 12 (4), 393-401.

Ruttan, V. W. (1977). Induced Innovation and Agricultural Development. *Food Policy* 2(3): 196-  202

Udemezue, J. C. and Osegbue, E. G. (2018). Theories and Models of Agricultural Development.    *Annals of Reviews and Research,* 1 (5), 134-137

World      Bank      (2016).    *Human      Development      Report*.    Retrieved      from http://www.worldbank.org/en/country/nigeria

World Bank (n.d.) Retrieved from   https://www.macrotrends.net/countries/NGA/nigeria/unemployment-rate

Zhang, X., Fan, S., Zhang, L. and Huang, J. (2004). Local Governance and Public Goods Provision in Rural China. *Journal of Public Economics*, 88, pp. 2857–71.            doi.org/10.1016/j.jpubeco.2003.07.004.