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HYPOTHESES

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THE EFFECTS OF CREDIT FINANCE ON THE NIGERIAN AGRICULTURAL SECTOR'S PERFORMANCE**AKINSEYE OLOWU****LECTURER****DEPARTMENT OF ENTREPRENEURSHIP****JOSEPH AYO BABALOLA UNIVERSITY****IKEJI-ARAKEJI****DR. ONIMOLE SOLOMON****LECTURER****DEPARTMENT OF ENTREPRENEURSHIP****JOSEPH AYO BABALOLA UNIVERSITY****IKEJI-ARAKEJI****ABSTRACT**

Agricultural credit financing has a wide and deep history in Nigeria, owing to the fact that the Nigerian economy has huge potentials for growth especially from its agriculture sector which is the second largest contributor to GDP. Since the establishment of the Agricultural Credit Guarantee Scheme over 30 years ago, the total sum of 647,351 loans amounting to over N34 billion have been disbursed to farmers as at 2009. The result from this study shows that the guarantee scheme has been effective in providing agricultural financing as well as stimulating agricultural production in Nigeria. More specifically, the study found that, out of the five variables used in the models to determine agricultural performance, the credit finance provided under the ACGS and foreign exchange rates was found to be statistically significant to agricultural output. The credit provided under the ACGS has a significant effect on aggregate output; it was also found that the crop and the fishery subsectors are significantly affected by the credit finance provided under the ACGS, due to their short gestation period. However, the livestock and forestry subsectors do not have an immediate significant relationship with the credit finance due to their long gestation period; rather, they have a significant relationship with the depreciation of foreign exchange rates. A major policy implication from the study is that the government should continue to promote and support the operations of the ACGS to encourage farmers to invest their best efforts in agricultural production in Nigeria.

KEYWORDS

Agricultural financing, ACGS, Agriculture Performance, Credit guarantee, Finance.

INTRODUCTION

Finance for agricultural development has an increasing role in contemporary times. According to Nzotta and Okereke (2009), finance affects economic growth, stagnation or even decline in any economic system. However, a growing concern has developed over time regarding the need for effective access to credit facilities for farming purposes. The Nigerian government recognises that finance is an essential tool for promoting agricultural development because the agriculture sector is one of its main sources of sustainability. Access to finance for agriculture is an incentive for increasing the agricultural sector's performance; it stimulates productive growth, and supports the survival of small and new enterprises. Adams and Mortimore (1997) noted that access to finance increases the average inputs of labour and capital which has positive effects on production output.

According to Beck and Demirguc-Kunt (2006), specific financing tools can be useful in facilitating greater access to finance. The government of Nigeria, being fully aware of the need of progressive policies has introduced various initiatives and policies to attract finance to enhance agriculture productions dating back to the 1970s. Such policies have mainly been in the form of specialised agriculture lending, the supply of credit finance by the commercial banks in favour of the agriculture sector and through various programmes. While some of these efforts have failed, the operation of the remaining leaves one to wonder if they are actually achieving their intended objectives as rural poverty is on the increase and yet a large portion of the population is engaged in agricultural activities (Iheancho, Abdullahi & Ibrahim, 2006).

Despite the fact that access to finance is a problem that impedes on the development of agriculture, credit providers are reluctant to give out loans without a certainty of recovering the loan. However, the banks alike are not to be blamed as they are not charity organisations who disburse money without recourse to repayment; rather they are in business to make profit from their lending operations. The Nigerian government stands as a guarantor for agricultural loans in order to mitigate the risk involved in agricultural financing, hence, the creation of ACGS in 1978.

STATEMENT OF PROBLEM

Going by the operation of the ACGS in Nigeria since 1978, it is expected that the problem of access to finance for agricultural production would have been reduced to an insignificant minimum. However, if indeed the fund provided by the ACGS has been effectively utilised, it should reflect on the output of agricultural production. The question that arises is to what extent the ACGS has stimulated agricultural production in Nigeria. Rahji and Adeoti (2010) noted that Nigeria has a peculiar focus towards agricultural and rural development, these efforts help to foment the constraints to credit finance for farming and household purposes, which imposes high cost of agriculture development on the society. Credit finance is an important ingredient in agricultural production; farming and marketing of commodities, yet the problem of high-risk perception still persists on the part of financiers. Banks perceive agricultural credit as being very risky and they prefer to seek alternative less risky sectors to finance.

Notwithstanding the operations of the ACGS since 1978, Olomola (1989) notes that the agricultural sector has been severely disadvantaged in terms of its allocation of commercial bank loans as compared to other sectors of the economy. Indeed, there are a number of financial institutions in Nigeria that can adequately provide the financial needs of farmers. More so, the risk perception faced by banks to lend to farmers who cannot provide adequate security in form of collateral for such loans has been eliminated by the credit guarantees of ACGS. It is of concern that studies by Garba (1987), Olomola (1989), Oni, (1993), Ojo (1998), Manyong *et al.* (2005) and Olaitan (2006), still reveal that the major problem of the Nigerian agriculture still remains inadequate finance both by government and private financial institutions. According to the CBN (2007), about 65 percent of Nigeria's economically active population lacks access to formal financial services, hence the continuous efforts by government to address the issue.

OBJECTIVE OF THE STUDY

Following on from the research questions, this study will concentrate on only one aspect of the Nigerian government's agricultural lending programme, which is the Agricultural Credit Guarantee Scheme. The objective is to evaluate the impact of the Agricultural Credit Guarantee Scheme on the Nigerian agricultural production output.

Specifically the study intends to pursue the following objectives:

- To evaluate the effects of the finance provided under the ACGS on aggregate and sectoral agricultural production.

- To articulate the policy implication of the findings and to recommend possible intervention that could help to improve the effectiveness of the scheme.

REVIEW OF RELATED LITERATURE ON CREDIT FINANCE

There is a controversy that loans should be granted to borrowers based on their business viability, entrepreneurial intentions and economic prospect, rather than hammering on the stringent requirement of adequate collateral before loans can be granted in favour of small businesses. The response of most governments to financing small scale industry and agriculture in developing countries has been to set up special financing schemes on a concessionary basis (Anderson & Khambata, 1985). Credit guarantee schemes provide compensation to banks for the risk involved in lending to small enterprises should the borrower default in repayment (Levitsky, 1997). Ordinarily, credit guarantee schemes will not be necessary if all borrowers can afford to provide the requirements of bank loans. Credit guarantee schemes provide guarantees to borrowers that do not have access to credit by covering a share of the default risk of the loan (OECD, 2009). On the part of the borrower, the operations of credit guarantee scheme solve the problem of insufficient collateral through public, private, or mutual guaranteeing institutions (Szabó, 2005). Under a credit guarantee agreement, the guarantor pays compensation to the lender for the borrower's defaulted loan repayments. Guaranteed loans are tools used to expand the supply of finances to small enterprises (Seidman, 2005).

However, banks as lending institutions are profit making organisations and not charity organisations. As such, they have an obligation to protect their funds against mismanagement caused by their borrowers' unwillingness to pay back loans. It is also important to note that banks are only custodian of their customers deposited funds; they have a duty to account for the effective utilisation of such funds while they make profit from lending operations. According to Levitsky (1997), banks prefer to provide loans to individuals, organisations and businesses that they already have an established relationship with, for security reasons. Although this reduces the risk involved in giving out credit, it creates a problem of limited access to finance for potential investors, first time borrower, and new enterprises that are yet to establish a creditworthiness record. In regards to this, Seidman (2005) opined that to achieve the right balance between lenders and borrowers' relationship, the guarantee involved must be large enough to convince the providers of finance to lend to borrowers irrespective of their inherent risk.

The risk involved in credit disbursement is mitigated by adequate guarantees that safeguards banks' lending operations against default. Despite the inadequacy of borrowers to provide a surety for loans, Levitsky (1997) expressed the view that all guarantee schemes should obtain whatever collateral they can offer from borrowers, as a risk sharing measure. In order for a credit guarantee to be recognised as a valid risk mitigating scheme, the credit guarantee must display features of the capital adequacy accord Basel II criteria, i.e. direct, explicit, unconditional, irrevocable, explicitly documented and legally enforceable (Zavatta & Douette, 2010).

The World Bank (2001) identified the under development of financial systems as a reason why credit financing is low in developing countries. Financial institutions (banks) are faced with the problems of information asymmetry; transaction costs; and the inability of borrowers to provide adequate collateral. However, the risk perception of financing new and small enterprise is a general phenomenon in most developing countries (Green, 2003). OECD (2006) notes that credit guarantee schemes can be a mechanism of risk transfer and diversification. Although the importance of access to financial services has often been stressed, the role of policies in this regard is inevitable as it re-emphasises the need for credit innovations like the credit guarantee scheme (Honohan & Beck, 2007). According to Fleisig and de la Peña (2003), credit enhances the process of collateralised borrowing. Among many support measures by governments to aid access to finance, the credit guarantee system is seen as one of the most important instruments used to achieve national economic policy goals as well as economic growth (Kang & Heshmati, 2008).

Unfortunately, moral hazard poses a large threat to the success of credit guarantee schemes. Letiowsky (1997) opined that credit schemes encourage a carefree attitude because borrowers are rest assured that the guarantee fund will always reimburse the lending institution, hence their relaxed attitude towards loans repayment. Moral hazard weakens the will and commitment of the borrowers to repay loans. Despite the demerits caused by moral hazards, credit guarantees offer great potential to overcome market failures and expand the availability of finance to businesses (Seidman, 2005). Therefore, the provision of guarantee schemes by governments and other stakeholders creates an opportunity for a start-up credit scheme, leasing and equity facilitation (Szabó, 2005).

REVIEW OF RELATED LITERATURE

The role of agricultural credit in enhancing agricultural growth and development cannot be overemphasised. According to Olomola (1989), the agricultural credit guarantee system is often considered as an effective policy instrument for improving the production and distribution of agricultural commodities. Rahji (2010) affirms that credit finance is more than just another resource such as labour, land, equipment and raw materials. Under the ACGS, the government guarantees credit finance given to farmers from the commercial banks while it is supposed to achieve agricultural growth through increased production. According to Levitsky (1997), credit guarantee schemes assist banks to lend to small and medium enterprises while it cushions the banks from the risks involved.

Olaitan (2006) reiterated that the lack of access to finance restrains growth amongst farmers in Nigeria, stressing that they are endangered species, and calls for a transformative efforts to address the problem. As earlier mentioned, a large proportion of the rural population depends on agriculture for their main source of sustenance and livelihood, yet the supplies of finance still leave a wide gap of rural access to finance. Hence, the lack of access to finance constitutes a socio-economic problem for agricultural performance. Most commercial banks that have experienced losses from untimely repayment of agriculture loans given to farmers seek to minimise defaults by choosing carefully the distribution of credit across farmers (Anderson, 1990). According to Duong and Izumida (2002), the supply of agricultural credit plays a critical role in agricultural development.

PERFORMANCE OF THE AGRICULTURE SECTOR

In the 1960s, the agricultural sector was the most important in terms of its contributions to domestic production, employment and foreign exchange earnings. The situation remained almost the same three decades later with the exception that it is no longer the principal foreign exchange earner, a role now being played by crude oil. The sector was stagnant during the oil boom period of the 1970s, which accounted largely for the declining share of agriculture's contributions. The trend in the share of agriculture of GDP shows a substantial variation and long-term decline from 60 percent in the early 1960s through 48.8 percent in the 1970s, 22.2 percent in the 1980s and 26 percent in 2000. Unstable and often inappropriate economic policies (of pricing, trade and exchange rate), the relative neglect of the sector and the negative impact of the oil boom were also important factors responsible for the decline in its contributions. The leading cash crops are cocoa, citrus, cotton, groundnuts (peanuts), palm oil, palm kernel, benniseed, and rubber. As at 1984, the growth rate of the agriculture sector at constant basic prices had a negative figure of -5.20 percent yet the crop subsector which was the major source of food still accounted for about 30 percent of the Gross Domestic Products (GDP), livestock about five percent, forestry and wildlife about 1.3 percent and fisheries accounted 1.2 percent¹. In a bid to mitigate the negative growth effect of the agriculture, manufacturing and oil sectors, the government introduced Structural Adjustment Programme (SAP) in 1986. The policy introduced deregulation of interest rates, which enabled interest rates to be determined by financial market forces rather than being determined by government. As at 1990, the growth rate of the economy had grown from a negative figure to a positive figure of 4.30 percent and in year 2003, the growth rate was 6.50 percent (CBN, 2004). Although there were fluctuations of the interest rates in between the years, the ultimate effect of the government policy to deregulate the interest rate through SAP was effective in developing the agriculture sector in terms of output, productivity, trade, as well as share of GDP contributions.

According to the Central bank's policy document, the abundance of natural resources in the rural sector has remained the treasury of Nigeria. Agricultural production in Nigeria is determined by the functions of macroeconomic environment, other factors such as political instability, civil unrest and unfavourable policies have also been found to affect agricultural output (Eyo, 2008). The combined effects of all these factors either cause a fall or rise in commercial food production, exportation and food supplies. Morgan and Solarz (1994), opined that the major constraints to agriculture production include limited use of modern

¹ Source: www.ministryofagric.gov.ng

agricultural inputs, declining agricultural terms of trade and international debt, seasonal production bottlenecks, the risks of depending on market, lack of government financial support, government indifference and high levels of taxation, low food prices, poverty and lack of capital, land tenure systems, problems of competition with cheap food imports and food aid as well as the general world recession.

Over the years, in Nigeria, there have been occasional food supply shortfalls and high food prices in all or some parts of the country. This was often due to seasonal and cyclical food supply fluctuations, drought or poor rainfall in parts of the country. The level of dependence of a country on a particular food crop is a measure of the vitality of the food system and the vulnerability of the people to changes in production of the exporting countries and other external factors such as world prices. The price of nearly every agricultural commodity increased sharply by 55 percent between 2007 and 2008 (CBN, 2009). Nigeria imports raw materials for local food production, despite the adverse effect macroeconomic factors had on economic welfare over the years; there has been a rise of agricultural export, one that has brought numerous benefits to the country (Nwachukwu, Ehumadu, Mejeha, Nwaru, Agwu & Onwumere, 2008). However, in analysing the performance of the Nigerian agriculture, three issues will be considered, namely the trend of the GDP growth of the agriculture sector; the trend of the agriculture sector production relative to other sectors; and the trend in agricultural imports and exports in Nigeria, focusing on the period, 2000–2008.

2.1 TREND IN GDP GROWTH BY AGRICULTURE SUBSECTORS

Agricultural output, inflation, subsidy, exchange rate, food import and export influence the GDP of the agriculture sector at various degrees. During the period 2000 to 2008, the percentage growth of the agriculture sector increased by 4.57 percent. Although there was positive growth from the sector's contribution to the GDP over the years, much more financial effort is needed to enhance the production of livestock, forestry and fishery subsectors, as the bulk of the production of the sector comes from only crop production.

TABLE 2.1: GROWTH IN THE AGRICULTURE SECTOR'S CONTRIBUTION TO GDP IN PERCENTAGE (2000–2008)

Share of Total (%)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Crop Production	22.00	28.50	29.20	29.06	30.48	29.02	28.50	29.55	27.45
Livestock Production	2.60	3.30	3.40	2.04	2.14	2.15	2.04	2.10	2.02
Forestry Production	0.50	0.60	0.60	0.14	0.45	0.42	0.40	0.40	0.40
Fishery Production	1.20	1.60	1.70	1.09	1.14	1.17	1.06	1.09	1.00
Total/ Agriculture	26.30	34.00	34.90	32.60	34.21	32.76	32.00	33.15	30.87

Source: CBN Statistical bulletin (2009)

- Crops:** Food crops account for the bulk of the Nigerian agriculture, crop production comprises broadly of cereals i.e. sorghum, maize, millet, rice, wheat; tubers i.e. yam, cassava; legumes i.e. groundnut, cowpeas and other crops such as vegetable. The available data shows that there have been increases of crop production over the years. Between 2000 and 2008, the rate of crop production in Nigeria recorded an average increase of 5.45 percent annually as the total production also increased. Crop production contributes output to the GDP more than any other subsector in the Nigerian agriculture.

The best produced crops by the Nigerian agriculture in 2008 were, in this order, yam, cassava, groundnut, millet, citrus fruit, vegetables, sorghum, rice, paddy and maize. (see Table 2.2).

TABLE 2.2: TOP AGRICULTURAL PRODUCTION IN NIGERIA – 2008

Rank	Commodity	Production (Int \$1000)	Production (MT)
1	Yams	5652864	35017000
2	Cassava	3212578	44582000
3	Groundnut, with shell	1806834	3900000
4	Millet	1300298	9064000
5	Citrus fruits	1221280	3400000
6	Vegetables	1070543	5705000
7	Sorghum	947613	9318000
8	Rice	864799	4179000
9	Maize	688353	7525000

Source: FAOSTAT, 2010

- Livestock:** the livestock subsector is the second largest contributor of agriculture sector's GDP and consists mainly of poultry, cattle, sheep, and other livestock. Livestock production recorded a steady increase in 2001 and 2002 but since 2003 there has been noticeable decline and the situation did not improve as at 2008, as shown in Table 2.1. According to Aziakpono, (1994), there was a deterioration in the general performance of livestock production during the period 2000–2008, when modern cattle ranching and poultry on large scale boosted livestock production, especially during the period 1972–1981
- Forestry:** dating back from the 1970s and 1980s, forestry production has always been the smallest contributor of the agricultural sector to GDP. The reason is that the proportion of the rain forest suitable for trees to grow is rather small compared to the entire land mass of the country (Aziakpono, 1994). Forestry has always contributed less than one percent share of GDP of the agriculture sector. The highest contribution during the period was 0.60 percent in 2001; the average livestock production for the period 2000 to 2008 had a low percentage of 0.40 percent.
- Fishery:** fishery production recorded a steady increase in 2001 and 2002 from 1.60 percent to 1.70 percent; also, in 2003 there was a decline to 1.09 percent just as there was a decline in livestock production in that same year (see Table 2.1). According to Aziakpono (1994), the declining performance of fishery during the period, 1961 to the 1980s, was attributed to the massive importation of cheap fish, which threatened the competitiveness of local fish production.

2.2 TREND OF AGRICULTURE CONTRIBUTION TO GDP RELATIVE TO INDUSTRY, BUILDING, TRADE AND SERVICES SECTORS

Dating back from 1960, available data shows that the agriculture sector has been a major contributor to the GDP of Nigeria. From Table 2.3, showing selected year intervals between 1960 and 2008, evidence shows that at the time Nigeria gained independence in 1960, agriculture contributed the largest share of 63.5 percent to GDP at current prices and it was the major productive sector at the time. Apparently, the 63.5 percent in 1960 was the highest ever contribution made by one sector. Unfortunately, the intensity and the focus on performance were not maintained even before the advent of the oil boom in the 1970s. There has always been a steady decline in the agriculture sector; in 1965 the share of GDP was 54 percent and in 1970s, it declined to 48.8 percent.

TABLE 2.3: COMPARATIVE CONTRIBUTION OF AGRICULTURE, INDUSTRY, BUILDING, TRADE AND SERVICES TO GDP – 1960–2008 IN PERCENTAGE

YEAR	AGRICULTURE	INDUSTRY*	BUILDING & CONSTRUCTION	WHOLESALE & RETAIL TRADE	SERVICES	Total
1960	63.5	6.0	4.2	12.7	13.6	100
1965	54.4	11.5	5.7	13.1	15.3	100
1970	48.8	17.3	5.1	12.7	16.1	100
1975	27.3	27.2	8.5	20.2	16.8	100
1980	20.1	40.6	7.4	19.4	12.3	100
1985	39.2	26.8	2.3	13.5	18.2	100
1990	31.5	43.2	1.6	13.4	10.3	100
1995	32.1	45.2	0.7	14.2	7.8	100
2000	26.0	51.5	0.6	11.5	10.3	100
2005	32.8	41.8	1.5	12.8	11.1	100
2008	30.9	41.7	1.2	14.6	11.6	100

Source: Central Bank of Nigeria, 2008

*The industry sector comprises of crude oil, natural gas, solid minerals and manufacturing, with the crude oil having the largest contributor to the sector.

2.3 SUMMARY OF AGRICULTURAL FINANCE POLICIES IN NIGERIA

The Nigerian government has been making efforts since the 1970s to revitalise its agriculture sector to make the country food self-sufficient again. Nigeria's agricultural policy comprises of the framework and action plans of government designed to achieve overall agricultural growth and development. These policies aim at attainment of self-sustaining growth in all the subsectors of agriculture and the structural transformation necessary for the overall socio-economic development of the country as well as the improvement in the quality of life of Nigerians. The main objectives of agricultural financing policies in Nigeria are to establish an effective system of sustainable agricultural financing schemes; and programmes and institutions that could provide micro and macro credit facilities for the micro, small, medium and large scale producers, processors and marketers (CBN, 2007). These policies include schemes, banks, initiatives programmes and institutions. They are listed as follows:

- Sectoral allocation of credits (1970–1996)
- Nigerian Agricultural Co-operative and Rural Development Bank Ltd. (NACRDB) – formerly known as Nigerian Agricultural Co-operative Bank (1972 to date)
- Rural banking programme (1977–1991)
- Lending as a percentage of savings mobilised in rural areas to rural dwellers (1977–1996)
- Concessionary interest rate (1980–1987)
- Peoples Bank of Nigeria (1990–2002)
- Community Banks (CBs)/Microfinance Banks (MFBs) (1990 to date)
- Nigerian Agricultural Insurance Corporation (1996 to date)
- Family economic advancement programme (1997–2001)
- Small and medium enterprises equity investment scheme (2001–2008)
- Refinancing and rediscounting facility (2002 to date)
- Agricultural credit support scheme (2006 to date)
- Agricultural credit guarantee scheme (1977 to date)

The Agricultural credit guarantee scheme is the scheme under review in this study, it was established in 1977 and commenced operations from 1978 to date, it considers critical issues in diversifying appropriate development strategies capable of providing the required finance for farmers and small and medium enterprises. The ACGS provides credit finance to a large number of farmers in the rural areas, for sustainable growth and financial empowerment in the agriculture sector (Olaitan, 2006). The ACGS in Nigeria was established to provide some measure of risk coverage as well as to encourage commercial banks to increase their lending to agriculture (Olagunju & Ajiboye, 2010). It assists farmers on how to improve their productivity and ensure a good market for their product. The ACGS fund makes access to finance much easier, it guarantees credit facilities from the bank to farmers at 75 percent of total fund borrowed without any security, which contributes to improving the livelihoods of farmers and emerging entrepreneurs in the agriculture sector (Nwosu *et al.*, 2010). The Central Bank of Nigeria handles the operation of the scheme and stipulates the guidelines for the eligibility of farmers to access the funds. The ACGS is one of the very important schemes in terms of financing the activities of the agriculture sector in Nigeria.

3.0. EMPIRICAL ANALYSIS OF THE PERFORMANCE OF ACGS

This study takes a cue from the econometric tests used in Eyo (2008) which found that sustained growth in agricultural output is possible through capital accumulation, and the quantitative approach used in Okon and Nkang (2009) to deduce policy implications and recommend policy options for ACGS operations. The performance of the agricultural sector is envisaged to be affected by certain variables in an agricultural production model. The analysis will focus on the extent to which the ACGS fund has affected both aggregate and subsector output of the agriculture sector in Nigeria.

3.1 MODEL SPECIFICATION

According to Lee and Baker (1984), a number of macroeconomic variables are bound to affect agricultural production. In this study, specific focus will be on the effect of such variables on agricultural production output. The model postulates that agriculture production in Nigeria is a function of the amount of credit from the ACGS, foreign exchange rates, interest rates on loans, inflation rate and the amount of foreign private investment. It has been shown by previous studies that these explanatory variables considerably affect the agricultural performances in Nigeria (see Adegeye & Dittoh (1985), Adubi & Okunmadewa (1999), Iheancho *et al.* (2006), Eyo, (2008), Nwachukwu *et al.* (2008), Ajetomobi & Binuomote (2007), Okon & Nkang (2009) and Adofu *et al.* (2010)). The agricultural production model is estimated using an ordinary least square (OLS) method. This study estimates the following relationship:

$$Y = f(\text{ACGS, FOREX, IR, INF, FPI}) \dots \dots \dots (3.1)$$

The explicit forms of the models are represented in logarithm form are given as:

$$\text{LNY (Total)} = a + b_1 \text{LNACGS}^{\text{All}} + b_2 \text{LNFOREX} + b_3 \text{IR} + b_4 \text{INF} + b_5 \text{LNFPI} + \mu \dots \dots (3.2)$$

$$\text{LNY (Crop)} = a + b_1 \text{LNACGS}^{\text{C}} + b_2 \text{LNFOREX} + b_3 \text{IR} + b_4 \text{INF} + b_5 \text{LNFPI} + \mu \dots \dots (3.3)$$

$$\text{LNY (Livestock)} = a + b_1 \text{LNACGS}^{\text{L}} + b_2 \text{LNFOREX} + b_3 \text{IR} + b_4 \text{INF} + b_5 \text{LNFPI} + \mu \dots (3.4)$$

$$\text{LNY (Forestry)} = a + b_1 \text{LNACGS}^{\text{F}} + b_2 \text{LNFOREX} + b_3 \text{IR} + b_4 \text{INF} + b_5 \text{LNFPI} + \mu \dots (3.5)$$

$$\text{LNY (Fishery)} = a + b_1 \text{LNACGS}^{\text{FS}} + b_2 \text{LNFOREX} + b_3 \text{IR} + b_4 \text{INF} + b_5 \text{LNFPI} + \mu \dots (3.6)$$

where the following notation has been used:

LN_Y = natural log of agriculture output
 LNACGS = natural log of the amount of credit from the ACGS
 LNFOREX = natural log of foreign exchange
 IR = interest rates on loans
 INF = inflation rate
 LNFPFI = natural log of amount of foreign private investment (FPI)
 a = intercept
 b₁-b₅ = coefficients
 μ = error term
 C = crop L = livestock F = forestry FS = fishery

3.2 DEFINITION OF VARIABLES AND DATA SOURCES

The variables used in this study are specific variables that have been used in previous studies to measure agricultural performance. Data was obtained from the Central Bank of Nigeria for the period 1978 to 2009. The *a priori*² expectations of each variable listed earlier are presented in turn.

LN_Y: The natural logarithm of production output by the agriculture sector measured in millions of naira for aggregate sector output and the subsectors of crop, livestock, forestry and fishery.

LNACGS: The natural log of the amount of credit finance provided under the ACGS is defined as the value of loans guaranteed in favour of farmers for agricultural purposes. Since finance is important for production and the scheme was established to provide guarantee on loans granted by banks to farmers for agricultural production, an increase in this variable will enable farmers to afford the necessary equipment, skills, expertise, land and raw materials required for agricultural production. Consequently, a positive relationship between the LNACGS and output is expected.

LNFOREX: This variable represents the exchange value of the naira to 1 US dollars; it has a dual effect on the agriculture sector's performance. First, a decrease in this variable, indicating an appreciation of the naira, would make import of raw materials from abroad affordable. Farmers will be able to import more raw materials and farm equipment needed for production because the local currency is stronger and can purchase more goods from abroad thus will result in a positive effect. However, an appreciation of the naira could also lead to lower export, which could affect output negatively. On the other hand, an increase in this variable, indicating a depreciation of the naira, could lead to higher foreign demand for agricultural commodities, which could have a positive effect on production. Nevertheless, depreciation could also imply higher cost of imports of farm inputs, which would have a negative effect on production. Thus, the overall effect could be positive or negative depending on the circumstance.

IR: This variable represents the rates of interest charged on loans offered by the commercial banks. In other words, it is the cost of credit finance. High interest rates discourage farmers from borrowing as much funds as they would need for their farming activities because of the increase in the cost of loan. If the interest rate on the loan is reduced, farmers will be able to borrow enough funds for production. A low interest rate on farm credit is an incentive for loan borrowers; it encourages more investments in agricultural production. Hence, agricultural production will increase because the cost on finance is reduced. Thus, overall an inverse relationship between agricultural outputs and interest rate is expected.

INF: The rate of inflation in Nigeria. Inflation reduces the purchasing power of a currency; it creates a situation where too much money will be chasing few goods. Given that inflation lowers the purchasing power of farmers, the demand for agric inputs will fall when inflation is high. Therefore, a negative relationship is expected between agriculture production and inflation rate.

LNFPFI: The natural log of amount of foreign private investment. Foreign private investment is a source of finance from investors abroad. They come in form of equity or debt financing, and are mostly used to finance capital intensive expenditures like infrastructure, equipment and machineries required for agricultural production. An increase in this variable will reduce the problem of access to mechanised equipment needed for agricultural productions; hence, a positive relationship is expected.

3.3 EMPIRICAL RESULT

In interpreting the results, attention is first given to the overall performance of the models, followed by the effects of the ACGS on output and then the effects of the control variables on outputs. Table 3.1 presents the result of the variables using the R², adjusted R², F-statistics, standard error of regression (S.E) and the Durbin-Watson statistics, while Table 3.2 presents the coefficients, t-value and the p-value of the tests.

3.3.1 GENERAL PERFORMANCE OF THE MODELS

The results of the estimation as represented on Table 3.1 reveal the overall performance of the models specified for agricultural production outputs. The R² for Models 1, 2 and 5, i.e. 71.7, 71.3 and 72 respectively, indicate a high explanatory power of the production output used for aggregate, crop and fishing outputs. Likewise, the adjusted coefficient of determinations (adjusted R²) of the same models, are quite close to the R² at 66.2 percent, 65.8 percent and 66 percent respectively. Thus, our sample size is adequate for measuring the phenomenon being investigated. The models significantly explain a good proportion of the variation in those outputs, leaving a small portion unexplained. This suggests that the models are reasonable to a large extent. However, Models 3 and 4, the R² of 0.57 and 0.42 signify a weak performance of the models; it indicates that only about 57 percent and 42 percent of the variable in livestock and forestry output are explained by the variables included in the models.

TABLE 3.1: SUMMARY STATISTICS OF THE MODELS

Statistics	Model 1	Model 2	Model 3	Model 4	Model 5
R-Squared (R ²)	0.717	0.713	0.572	0.417	0.720
Adjusted R-Squared	0.662	0.658	0.490	0.305	0.666
F-Statistics (F)	13.166* (0.000)	12.933* (0.000)	6.963* (0.000)	3.715* (0.011)	13.382* (0.000)
S. E. of Regression	0.572	0.634	0.470	0.563	0.395
Durbin-Watson (DW)	0.732	0.725	0.560	0.787	1.030

* Represents significance at 1%. Figures in () represents the probability of F-statistics

The F-statistics of all the models are significant at one percent significance level, hence we are confident that the models fit the data generally well. It is also evident that the Standard Error of Estimates (S.E) of each of the models are particularly small compared to the means of the dependent variables. This assures us that the models are good enough for making accurate and meaningful conclusions. The Durbin-Watson statistics for Models 1 to 5 are 0.732, 0.725, 0.560, 0.787 and 1.030 respectively, and since they are all less than 2, there is an evident of autocorrelation as per the required condition. But, the coefficients of determination (R²) for Models 1, 2, 4 and 5 are less than the Durbin-Watson for each respective model. This signifies evidence of co-integration among the variables. We can therefore generally conclude that the models performed well.

3.3.2 EFFECTS OF ACGS ON AGRICULTURAL OUTPUT

Table 3.2 provides a summary of the effects of ACGS on agricultural output. Based on the parameters of the ACGS variable in general, there are evidences to infer that the ACGS is linearly related to output. The ACGS has significant effects in Models 1, 2 and 5 which measures the output of the aggregate, crop and livestock sectors. The positive response of those sectors to ACGS credit finance is logically acceptable, as it conforms to *a priori* expectation. The results agree with an earlier study by Nwoko (1980), which found that the funds provided by the ACGS are directed towards increasing the productive capacity of the agricultural sector. The study argued that the fund aims at re-organising the agricultural sector in favour of large-scale farms, and hence suggested that a village

² A preposition of possible outcome based on economic theory, which existed in the mind of the author before embarking on an analysis.

guarantee system be introduced for traditional farms and that loans granted under such a system should carry higher guarantees in order to enable an inclusive effort towards enhancing agricultural output. Since the scope of this study did not cover micro level analysis such as farmers' perception about the ACGS, the latter part of their argument cannot be confirmed.

TABLE 3.2: SUMMARY STATISTICS OF THE VARIABLE OF INTEREST

	Model 1	Model 2	Model 3	Model 4	Model 5
LNACGS	0.265 (1.962) [0.061] ***	0.307 (1.848) [0.076] ***	0.061 (0.875) [0.383]	0.115 (0.963) [0.345]	0.104 (2.387) [0.024] **

Notes: The table present the coefficients, t-values and p values. Figures in parenthesis are the t-values (), while figures in block are the P-value of the test []. *, ** and *** indicate significance of p- value at 1%, 5% and 10% respectively.

More specifically, for the effect of the variable of interest on agricultural output, first, we start with aggregate output, as shown in Model 1 on Table 3.2. The LNACGS has a positive coefficient and it is statistically significant to aggregate agricultural output. From the parameters of the log model, the coefficient of the variable translates thus; the elasticity of LNY with respect to LNACGS is about 0.27, suggesting that for every one percent increase in LNACGS, on average, agricultural output will increase by about 0.26 percent at aggregate level. The response of the dependent variable is inelastic, but is statistically significant at six percent significant level.

At sectoral levels, the credit provided by the ACGS to all the subsectors produces positive coefficients. However, only crop and fishery have statistically significant coefficients, while livestock and forestry output are not statistically significant. The result indicates that the fishery subsector was more significant at three percent levels of significance, followed by the aggregate output and then the crop subsector at six percent and eight percent levels of significance respectively.

The elasticity of crop output is slightly higher than the aggregate sector and fishery subsector outputs with credit provided by the ACGS. The result from Model 2 suggests that if there is a one percent increase in LNACGS^C, the output of crop sub-sector will increase at 0.30 percent. This response is so because crop is a common supply of food and its production creates market demand opportunities. Therefore farmers intensify their efforts in providing food, and hence the effect of the LNACGS^C is realised spontaneously. Crop farming consists of cereals, fruits, tubers etc. It is possible to harvest crop products on monthly, semi-annually or yearly bases. This explains why the effect of credit finance from the ACGS on crop output is significant. The primary purpose of the ACGS finance is to serve as a guarantee for loans granted for agricultural purposes in respect of the crop production.

From Model 5, LNACGS^{FS} is highly significant in the fishery output model at two percent significance level. The results of the fishery and crop output are seemingly alike. Fish farming is harvested fast because of its short gestation period, which is sometimes as quick as seven weeks. As far back as 1989, Amadi (1989) reiterated the need for more financial support for fishery production in order to increase the protein intake for the average Nigerian. At that time, the fishery subsector did not receive a fair share of credit from ACGS; thus the concern has raised an infusion of funds into the fishery subsector in order to enhance fishery output in contemporary times. The evidence suggests that such increased financial support through the ACGS is worthwhile.

As for the forestry sub-sector, the effect of LNACGS^F may not be significant because contemporaneous data was used in the analysis. Other possible explanations for the poor response of livestock output to ACGS could be because of the peculiar condition of forestry farming, i.e. forestry has a longer gestation period compared to the crop and fishery sub-sector. Hence the effect is not felt in the short run. For instance, most cocoa trees begin to bear fruit in their fifth year; it is not uncommon to find trees that are 30–40 years old³. For these reasons, the effect of the credit finance has not been felt on instantaneous basis, hence its insignificance to forestry output.

A similar explanation suffices for the livestock sub-sector, however, the elasticity of the livestock output to the LNACGS^L is the least compared to all other subsectors. The performance of the livestock output suggests that if LNACGS^L increases by one percent, on average, livestock output will be affected by a meagre increase of 0.06 percent. It goes further to show that as a policy measure, the livestock subsector should not be a priority subsector for the guaranteed loans.

Overall, there are indications that the ACGS has the potential to stimulate agricultural output as per our *a priori* expectations. These findings answer one of the questions raised in this study, namely asking to what extent the ACGS affects agricultural performance.

3.3.3 EFFECT OF THE CONTROL VARIABLES ON AGRICULTURAL OUTPUTS

From the result on Table 3.3, the effect of foreign exchange rates (LNFOREX) is positively related to output in all the sectors based on their positive coefficients. However, the variable is statistically significant to the output of the livestock and forestry subsectors at one percent and three percent level of significance respectively. For instance, for the livestock subsector in Model 3, the coefficient implies that for every one percent depreciation in the naira against the US dollar, the agriculture production output increases by 0.28 percent. The result suggests that the depreciation of the naira over the years has encouraged production of livestock output. Thus, a higher depreciation in the value of the naira tends to boost livestock and forestry productions in Nigeria. In order words, livestock output is export driven at times when the naira depreciates. However, for aggregate, crop and fishery output, the effects of LNFOREX were not as significant.

TABLE 3.3: SUMMARY STATISTICS OF THE CONTROL VARIABLES

	LNFOREX	IR	INF	LNFP1
Model 1	0.26	0.006	0.005	-0.154
	-1.507	-0.898	-0.789	(-0.651)
	[0.144]	[0.377]	[0.437]	[0.521]
Model 2	0.175	0.008	0.003	-0.091
	-0.727	-1.074	-0.552	(-0.339)
	[0.474]	[0.293]	[0.586]	[0.738]
Model 3	0.283	0.005	0.003	-0.154
	-2.597	-0.906	-0.667	(-0.799)
	[0.015] **	[0.373]	[0.511]	[0.432]
Model 4	0.277	0.003	0.005	-0.262
	-2.17	-0.512	-0.877	(-1.072)
	[0.039] **	[0.613]	[0.389]	[0.294]
Model 5	0.111	0.003	-0.003	0.059
	-0.956	-0.644	(-0.790)	-0.35
	[0.347]	[0.525]	[0.436]	[0.729]

Notes: The table present the coefficients, t-values and p values. Figures in parenthesis are the t-values (), while figures in block are the P-value of the test []. *, ** and *** indicate significance of p- value at 1%, 5% and 10% respectively.

Contrary to the empirical result of an assessment of the effects of the interest rate in enhancing agricultural productivity in Nigeria by Adofu *et al.* (2010), which showed that interest rate deregulation has a significant and positive impact on agricultural productivity, the finding of the study indicates that the interest rate on loans issued by commercial banks (IR) is not significant to agricultural output. The result shows that the interest rate and the inflation rate (INF) were positively related to the aggregate, crop, livestock, forestry and fishery outputs, but both variables were not statistically significant in any category of agricultural

³ <http://www.worldcocoaoundation.org/>

outputs. Also, the inflation rate (IR) was negatively related to the fishery output which could suggest that the increases in inflation rates have an adverse effect on fishery output.

The technical relationship between interest rate and inflation is explicitly explained in terms of the *fisher* effect, where the behaviour of interest rates is predetermined from a modern concept of rational expectations (Fisher & Molyneux, 1994). The effect proposes that the nominal interest rate and the inflation rate have to be adjusted on a one-for-one basis in order not to have an inverse relationship. However, the similarity link between the expectation of the effect of the interest rate and inflation is constant in the *fisher model*. The real rates of the two variables reflect the underlying patterns of productivity and it is relatively constant in the near term (Rose, 1985). Following from this, the effects of IF and INF in this study might be felt on long-term bases.

According to Sergio and Sundararajan (1990) and McKinnon (1989), the best effect of these two variables is more evident in economies that are characterised with the following prerequisite: existence of enough competition in the banking markets; sufficient sensitivity of borrower to interest rate changes; existence of monetary policy instruments capable of influencing marginal cost of funds to banks; prompt responsiveness to market interest rates to shifts in monetary policy; and in economies where banking supervision mechanism are sufficiently sound. In addition, the importance of these two variables emerges as a function of the supply and demand for finance by financial intermediaries, in this study, i.e. the lenders (banks) and the borrowers (farmers). However, Nigeria, being a developing country, has very much to achieve before the full effect of such theories can be felt.

Lastly, contrary to the *a priori* expectations, the foreign private investments did not enhance output on either aggregate or the subsectors output. Generally, the variable has an inverse relationship in all the subsectors. Could it be that the investments were not progressive? However, foreign private investment has not been effective on agricultural production based on its negative statistical performances in the models.

4.0 CONCLUSION

By and large, based on the result from the multiple regression analysis, ACGS has the most significant effect on production at both aggregate and subsector levels. ACGS has a significantly positive effect on aggregate agricultural output, crop and fishery subsector outputs. Nevertheless, the effects of the scheme on livestock and forestry were not significant due to long gestation of those subsectors. Thus, it is evident that the ACGS plays an important role in stimulating agricultural production in Nigeria.

However, from the following discussions some policy implication issues immerse in favour of the agriculture sector. The Nigerian economy has huge potential for growth especially from its agriculture sector's perspective. As a strategy to realise the optimal potentials of farmers in enhancing agricultural performance, it is recommended that the Nigerian government continues the use of the credit finance from the ACGS as an incentive to encourage farmers to invest their best efforts in chains of agricultural production. This will resuscitate their productive potentials, which will lead to ensuring food security in Nigeria.

For future investigations into the performance of the ACGS, we recommend a lag in the models used for the analysis in this study. According to Gujarati (2003:657), in economics, the dependence of a dependent variable on the explanatory variable is rarely instantaneous, hence they respond to each other with a lapse of time as it was observed in this study. In addition, a stepwise regression method is recommended to actually investigate the explicit effect of each variable on agricultural output. The method will test the relevance of each independent variable in the regression equations one at a time.

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