SACRIFICING CEREALS FOR CRUDE: HAS OIL DISCOVERY SLOWED AGRICULTURE GROWTH IN GHANA?

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Abstract

This study applies the quadratic hill climbing model, stepwise regression, and a dynamic generalized method of moments to investigate the relationship between oil rents and agriculture growth in Ghana. Agriculture, once considered the backbone of Ghana's economy recorded a reduction of its contribution to GDP from 45% in 1992 to 22% in 2013 and a growth rate of 0.04 in 2015. The results from all models confirm an inverse relationship between oil rents and agriculture output. Further, availability of agriculture land is a major driver of agriculture output. Since oil resources are exhaustible and oil revenues are volatile, the study recommends a sustainable investment plan that emphasis on diversification, private investment in the agriculture value chain, and productive land use, and encourages higher percentage of revenues into agriculture.

Oil revenues, Agriculture, Ghana, Oil Production

1.0 Background

Sustainable development has been a global policy issue since the UN established the Brundtland Commission in 1987. According to the World Commission on Environment and Development (1987), "sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the limitations imposed on the environment's ability to meet present and future needs. Based on this definition, Beckner (2009) identifies three tenets of sustainable development. First is the intergenerational equity which describes just sharing of natural resource benefits between the present and future generations. The second is the intra-generational equity which defines equitable distribution of natural resource wealth among the present generation. Third is the physiocentric ethics which describes the need to take nature into consideration when harnessing natural resources.

The purpose of sustainable development is therefore to satisfy the needs of the today whilst taking into consideration the needs of future generation and the environment. In order to achieve this goal, Baumgartner and Quaas, (2009) recommends that natural resources should be used in three ways. To begin with, scarce and non-renewable natural resources can be used in alternative ways to achieve any of the goals. For instance, instead of exploring for only oil, a little of oil and non-oil natural resources such as agriculture can be explored to enhance sustainability. This calls for diversification of the source of natural resource. Secondly, scarce resources can be used to achieve alternative goals. Lastly, scarce resources can be used to achieve some of the goals and other legitimate societal goals.

At the heart of sustainable development is the concept of diversification. Instead of investing in capital resources, it appears developing economies usually spend resource rents on subsidizing current consumption. According to Limi (2006), investment in man-made capital, human capital, transparency, and good governance are some of the channels through which resource rents are translated into economic development.

According to World Bank (2009), agriculture can function in tandem with other sectors to produce faster growth, reduce poverty, and sustain the environment and thus contributing to sustainable development. The agricultural sector contribution to development can be achieved through three (3) main ways; as an economic activity; as a livelihood, and as a provider of environmental services. Agriculture can be a source of growth for the national economy, an opportunity for investment by the private sector and a prime driver of agriculture-related industries and the rural nonfarm economy. It can also boost the income and standard of living of the rural folks particularly in developing countries who depend primarily on agriculture for their livelihood. Agricultural sector growth and productivity play a crucial role in accomplishing the goals of sustainable growth and substantial poverty reduction in developing countries.

Ghana's Agricultural sector is made up of food crops, livestock, fisheries, cocoa and forestry subsectors. The main aim of this sector is to ensure food security and facilitate the production of agricultural raw materials for industry and agricultural commodities for export. Agriculture in Ghana is largely practiced on a smallholder basis on family-operated farms using basic equipment to produce about 80% of the total output and predominantly rain-fed. The agricultural sector employs over 40% of the population and until recently used to be the backbone of Ghana's economy. For example, between 2000 and 2008 the agricultural sector on average contributed 39% to GDP compared to 31% and 26% contribution by the services and industrial sector

respectively according to the Ghana Statistical Service (2010). Whilst the rainfall pattern has been mostly blamed for the decline in agriculture growth, this study contributes to the literature on the resource curse by investigating the role of both economic (oil rents) and geographic factors (rainfall) on agriculture output in Ghana.

1.1 Agriculture Growth and Oil Revenues

The exploitation of newly-discovered natural resources such as oil can provide substantial resources to Governments and to factors of production employed in the booming sectors. However, how these resource booms are spent can create substantial macroeconomic upheavals, including the so-called Dutch Disease whereby existing successful sectors are harmed because of a loss of international competitiveness (Dessus et al., 2009). The judicious allocation and use of natural resource revenues can help a country diversify its economy away from the natural resource sector and hence safeguard against Dutch disease as evidenced in other countries. For instance, Botswana, a resource rich country depends on minerals for 40% of its GDP, but has been growing at an average of 7.8% annually since the 1980's (Limi, 2006).

Figure 2.0 shows the contribution of agriculture to GDP and oilrent. Agriculture contributed 45% of Ghana's GDP in 1992. This decreased to 40% in 2002 and 22% in 2012.

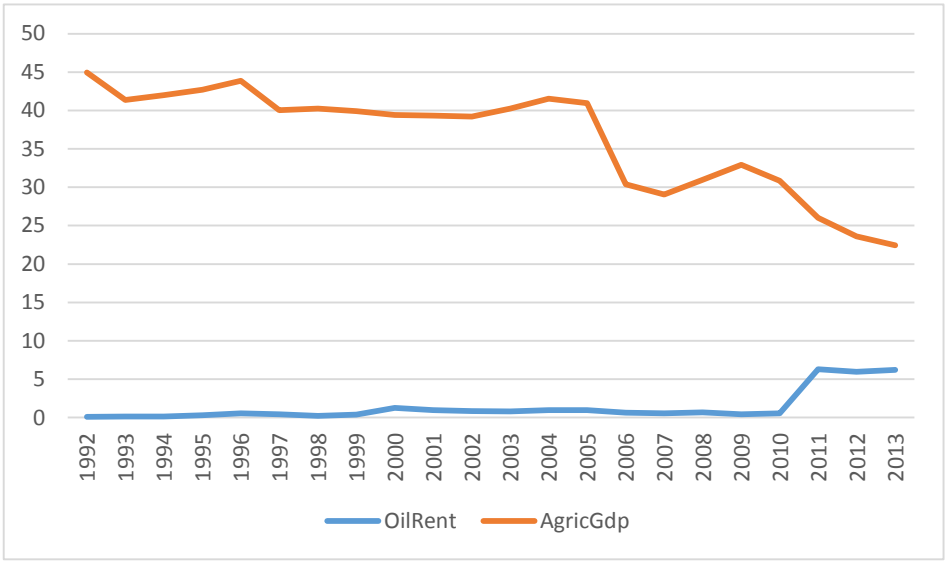

Figure 1: Trend in oil rent and Agricultural sector contribution to GDP

In Figure 2, the growth rate of agriculture sector is shown. For instance, the growth rate of the agriculture sector was 5.3% in 2010. This is projected to be reduced to 0.04% in 2015

The crop subsector was severely affected as it experienced a negative growth rate in 2015 (MOFEP, 2016). These statistics have consequences on Ghana's food sufficiency and has contributed to the huge import bill. It also has consequences for the many rural poor who depend solely on the agricultural as a source of their livelihood. The Agriculture sector contribution to GDP has also been on the decline. As can be seen from Figure1, the sector's contribution to GDP in 2010 was 29.8% and declined to 22.4% in 2013.

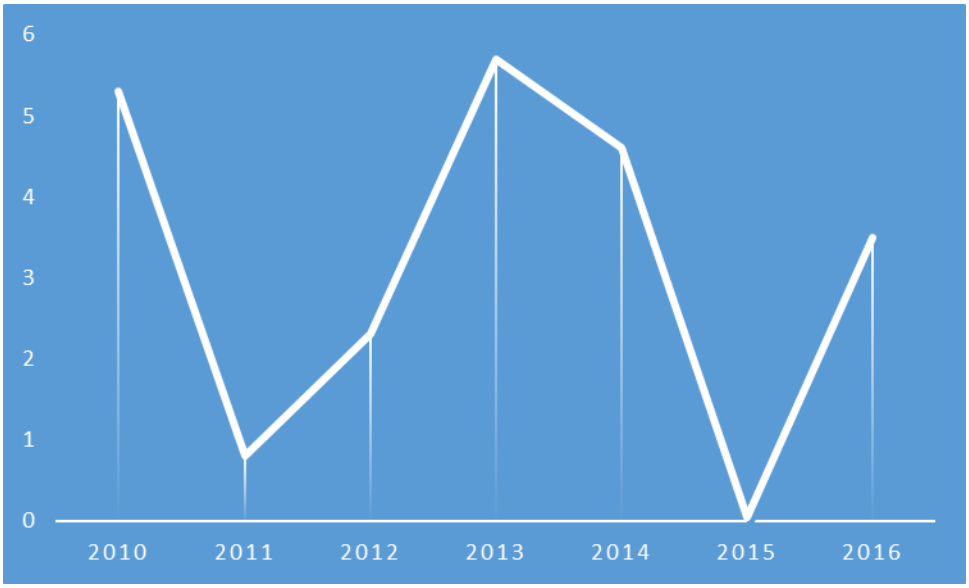

Figure 2: Trend in the Agriculture sector growth rate

This trend supports the call by the Africa Centre for Energy for the Ministry of Finance to narrow the ABFA allocation to agriculture modernization and education to boost output, reduce the wage bill, enhance food sufficiency, reduce rural-urban migration, and support poverty reduction. This goal is in tandem with the objectives of the ABFA in Ghana's Petroleum Revenue Management Act (PRMA). According to Section 21(2) of the PRMA, the objectives of the ABFA is *to maximize the rate of economic development; equality of economic opportunity and to undertake even and balanced development of the regions*.

Since attaining lower middle income status in 2011, development assistance to Ghana has been dwindling. In 2015, grant disbursement from development partners for the first three-quarters of 2015 was GH¢1,507.9 million, 16.4 percent lower than the budget target of GH¢1,694.1 million (MOFEP, 2016). The statistics call for diversification and prudent management of oil revenues.

1.2 Oil Revenue Framework in Ghana

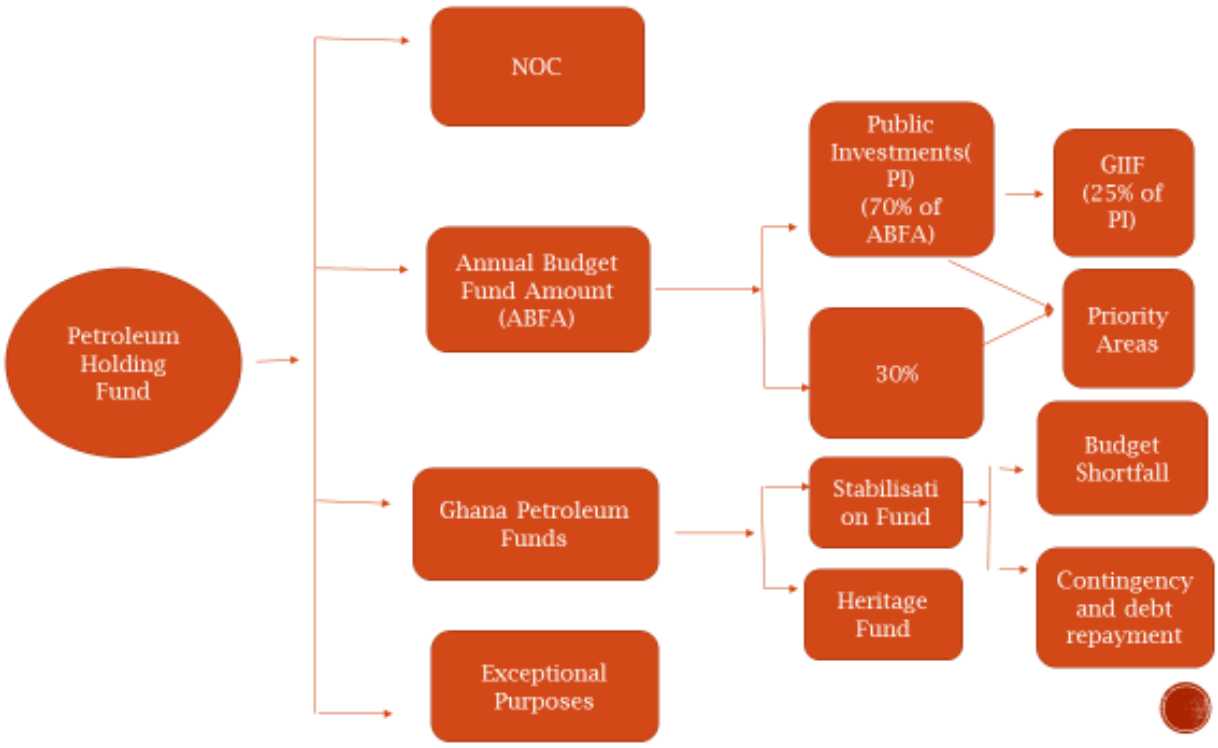

Figure 3: Ghana's Petroleum Revenue Management Framework

The Ghana Petroleum Revenue Management Act (PRMA) 2011 (Act 815) provides a framework for the collection, allocation and management of petroleum revenue in a responsible, transparent, accountable and sustainable manner. From the framework oil revenue management framework shown in Figure 3, two types of spending from the petroleum revenues are prescribed by the law; spending by the National Oil Company (NOC) in this case Ghana National Petroleum Corporation (GNPC) and spending by the Central Government (Annual Budgeting Funding Amount). The size of the NOCs spending is determined by the size of its equity financing requirement in producing blocks plus a proportion not exceeding 55% of the net carried and participating interest. The law stipulates that a maximum of 70% of annual petroleum revenues less the equity financing cost of the national oil company (referred to as "benchmark revenues"),

shall be transferred to the budget i.e. Annual Budget Funding Amount (ABFA). The remaining 30% according to the law shall be saved in the Petroleum Funds made up of the Stabilization Fund (SF) and the Heritage Fund (HF). This is however applicable during the period of oil production. However, after oil depletion, the ABFA shall be equal to the real returns on financial assets of the Petroleum Fund. The SF is used to cushion the budget on the use of petroleum revenues against revenue shortfalls arising from price and production volatilities. The HF on the other hand is an endowment fund used only when the oil and gas resources are depleted i.e. an instrument to achieve intergenerational equity.

2.0 Literature Review

Matsuyama (1992) derives a formal model of what is called the "linkages approach" to the analysis of the role of natural resources for growth. He investigates the role of agriculture in a model in which manufacturing is characterized by learning-by-doing. He concludes that forces that push the labor force away from manufacturing and toward agriculture lower the growth rate of the economy by reducing the learning-induced growth of manufacturing. Because the learning effects are external to the firm, market equilibrium is not efficient. Yet, as Sachs and Warner (1999, p. 15) observe, "such a framework is less relevant for a natural resource sector such as oil production, which uses very little labor and therefore does not directly draw employment from manufacturing." Grossman and Helpman (1991) as well as Feenstra (1996) have worked out models in which a country that is lagging technologically can be driven by trade to specialize in traditional goods and thereby experience a reduction in its long-run growth rate. Such models formalize old arguments about infant industries and the need for temporary protection to catch up with more advanced countries (Rodriguez and Rodrik, 2000).

Sachs and Warner (1995) find significant evidence that there is a negative relation between resource and per capita growth. Davis (1995) presents evidence that the resource curse is not a general problem.

In considering the role of natural resource in economic development (Jannson, 1994) suggests that there is a need to assess the ecologically sustainability of the resource, the equitable distribution of the resource benefits between the current and the future generations, and the consideration of the environment and species. Again, Auty (1994) believes that the role of natural resources in development can be positive or negative due to policies, level of development and the type of resources.

However, this has not been the case in most oil producing countries especially in Africa. Sachs and Warner (1995) propound a paradoxical hypothesis that seems to imply that oil abundance is a limit to economic growth. The hypothesis stipulates that resource endowed countries perform poorly than the less endowed ones (Tiago et al., 2010). Oil resource is therefore a curse instead of blessing. Atkinson (2003) posits that the inability of resource rich countries to translate resource wealth into development may be the source of the curse. According to the literature on natural resource economics, there are four channels through which natural resources become a curse. First is the Dutch disease (Corden and Neary, 1982). The second is rent seeking (Collier and Hoeffler, 2004), institutional failures (Mehlum et al, 2006) and the type of natural resource (Boschini et al 2007). This literature informs that resource scarce economies often outperform their resource rich counterparts with higher growth rates, thus, natural resource abundance inhibits growth. This paradoxical hypothesis suggests a shift from the classical conception of the growth enhancing effect of rich natural resource endowments to a growth inhibiting effect termed as the ‘Resource Curse’.

Often times, policy makers seem to partly attribute their inability to translate resource rents to growth to the peculiar qualities of such rents. For instance, Barnett and Ossowski, (2002) suggest that oil revenues are volatile, exhaustible, and uncertain and largely come from abroad. Countries that depend heavily on natural resources experience fluctuations in income since the price of most of these resources are determined on a volatile international market (Murshed, 2004). Due to this, it becomes challenging to have long term development plans especially if the country relies heavily on resource revenues. This means issues of intergenerational and intragenerational development should be central in policy design in oil producing countries to achieve sustainable development.

Mellor (1995) showed that growth of agriculture in countries that have natural resources is more retard than growth consequent of industry in countries without natural resources. Ogbonna *et al.*,(2013) examined the impact of crude oil discovery, exploitation and exportation on the agricultural commodity export in Nigeria. The study sought to evaluate how the discovery and exportation of crude oil has impacted on the production and export of agricultural output by employing annual time series covering the period 1970-2011.The results of the study revealed that in the long run oil exports tend to weaken Agricultural output. Specifically, a 1% increase in oil exports led to the reduction in agricultural commodity export by 16%. The study therefore revealed as Nigeria produces more oil, the lower the output and less competitive the agricultural sector becomes.

Sekumade (2009) contributed the effect of crude oil production in Nigeria by analysing the impact of quantity of oil produced and value of oil exports on five major agricultural export commodities(cocoa, cotton, palm kernel, palm-oil and groundnut) in Nigeria. The study made use of annual data covering the period 1970 to 2003 and was obtained from the Central Bank of

Nigeria and the Federal Office of Statistics' annual abstract of statistics. The author quantity of crude oil production and the value of crude oil exports lagged by 2 years had a negative effect on cocoa and cotton production. The quantity of palm oil and groundnut produced was negatively affected by the quantity of crude oil produced. The result suggests that as Nigeria produces more crude oil, the quantity of cocoa, cotton and palm oil produced tends to decrease. The study also revealed that a sustained increase in production and exportation of crude petroleum will lead to a decrease in the production of palm kernel. That notwithstanding the study further revealed that a sustained increase in importation of crude oil will result in high production of palm kernel.

In Iran, Mehdi and Reza (2011) also investigated the relationship between oil exports and agricultural value addition. The data were collected from 1961 to 2006 and the method of data analysis was based on the Auto Regressive Distributed Lag (ARDL) and Error Correction model. The key assumption underlying the study was that the total production in the economy is divided into two sections: production for inside and production for exports. The authors showed a significant long run relationship between oil export and agricultural value added. In the long run, a 1% increase in oil export rate led to a 13% decrease in agricultural value added. Therefore oil exports have negative effects on agricultural value added and is regarded as an important factor in Iran's agricultural value added.

3.0 Data and Methodology

This chapter investigates the factors influencing agricultural output in Ghana. The study specifically seeks to ascertain whether oil production is contributing to the declining agricultural production in Ghana. The study therefore applies the stepwise regression, a dynamic generalized

method of moments and a quadratic hill climbing model to study the relationship between oil rents and agriculture growth in Ghana whiles controlling for other factors.

$$AV_t = f(\mathrm{AL}_t, \mathrm{RF}_t, \mathrm{OR}_t, \mathrm{Y}_t) \quad (1)$$

Where AV is agricultural value added, AL is Agricultural Land, OR is oil rent K and Y is Gross Domestic Product. All the data were obtained from World Bank Development Indicators. The estimated period for the study is 1992 to 2013.

$$av_t = \alpha_0 v_{t-T} + \alpha_1 or_t + \alpha_2 al_t + \alpha_3 y_t + \alpha_4 rf_t + \varepsilon_t \quad (2)$$

4.0 Results and Discussions

We begin the analysis by following standard econometric procedures in considering the relationship between oil revenues and agriculture output. Firstly the ADF Fisher unit root test proposed by (Maddala and Wu, 1999) is applied. This is followed by 3 regression methods, Step-Wise, dynamic generalized method of moments, and the Quadratic Hill Climbing. Table 1 repots the results of the regression analysis.

Table 1 results of the regression analysis.

Variable	**Step-Wise Regression**	**Dynamic GMM**	**Quadratic Hill Climbing**
AL	**0.47**	**2.27***	**1.88***

	(0.474051)	**(0.746406)**	**(0.958469)**
RF	**0.24** **(0.474051)**	**3.26** **(1.106208)**	**0.37*** **(0.557364)**
OR	**-0.44*** **(0.023968)**	**-0.03*** **(0.049933)**	**-0.005*** **(0.048894)**
Y	**0.92*** **(0.060109)**	**0.32*** **(604887)**	**0.86*** **(0.073830)**
AV(-1)	**-**	**0.86*** **(0.073742)**	**0.85*** **(0.851448)**
R	**0.99**	**0.93**	**-**
DW	**1.5**	**1.6**	**-**

Where * is significant

Analysis of three models indicate an inverse and significant relationship between oil rents and agriculture output in Ghana. The Stepwise model reveals that any 1% increase in oil rents reduces agriculture output by 0.44%. The dynamic GMM and the Quadratic Hill Climbing All these models also showed an inverse relationship between oil rents and agriculture outputs.

factors put together could likely contribute to the abysmal performance of the agricultural sector. Further, the availability of agriculture land has positive relationship with agriculture output. This finding brings to the fore two important policy issues affecting agriculture lands. That is the issue of small scale mining and real estate development. In both the Southern and Northern parts of Ghana, agricultural lands are being sacrificed for unsustainable mining. If not checked, this can worsen Ghana's food imports. On average, any 1% increase in agriculture land increase agriculture output by 2.08%.

Also, all the three models indicate that GDP have a positive relationship with agricultural output. The implication of this result is that as the economy grows, people's income increases they tend to purchase agricultural commodities to meet their food needs which leads to higher producer (farmer) income. This increased income makes it possible for farmers to expand their farm size and patronize other yield enhancing inputs such as fertilizers in order to produce more agricultural goods.

4B. Increased Oil Revenues and Declining Agriculture Output

Three main factors may have accounted for the inverse relations between oil revenues and agriculture output. These are discussed as follows:

4Bi. Inconsistencies of oil revenues investment in agriculture

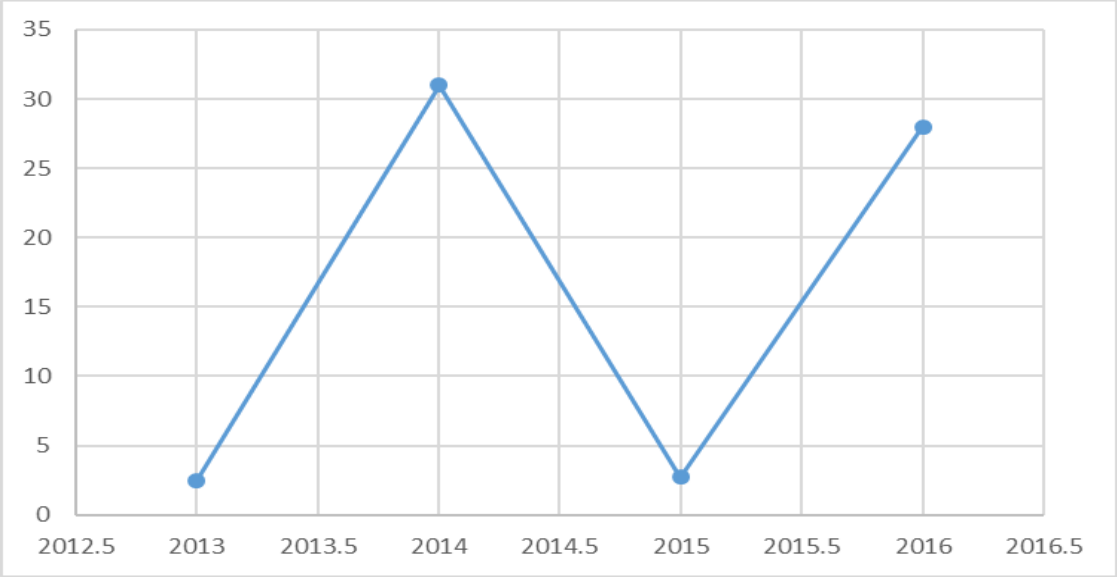

Figure 4: Allocation to agriculture as percentage of total oil revenue allocation to agriculture

In the 2016 budget, ₵284, 450, 130 representing 28% of the ABFA was allocated to agriculture in 2016. In 2013, the total allocation to the agriculture sector was 2.5%, and 31% to agriculture in 2014 and 2.7% of ABFA was allocated to agriculture in 2015. This trend suggests that allocation to the agriculture sector has been intermittent and can affect sustainable investment.

4Bii.Missapplication of agriculture receipts to other sectors

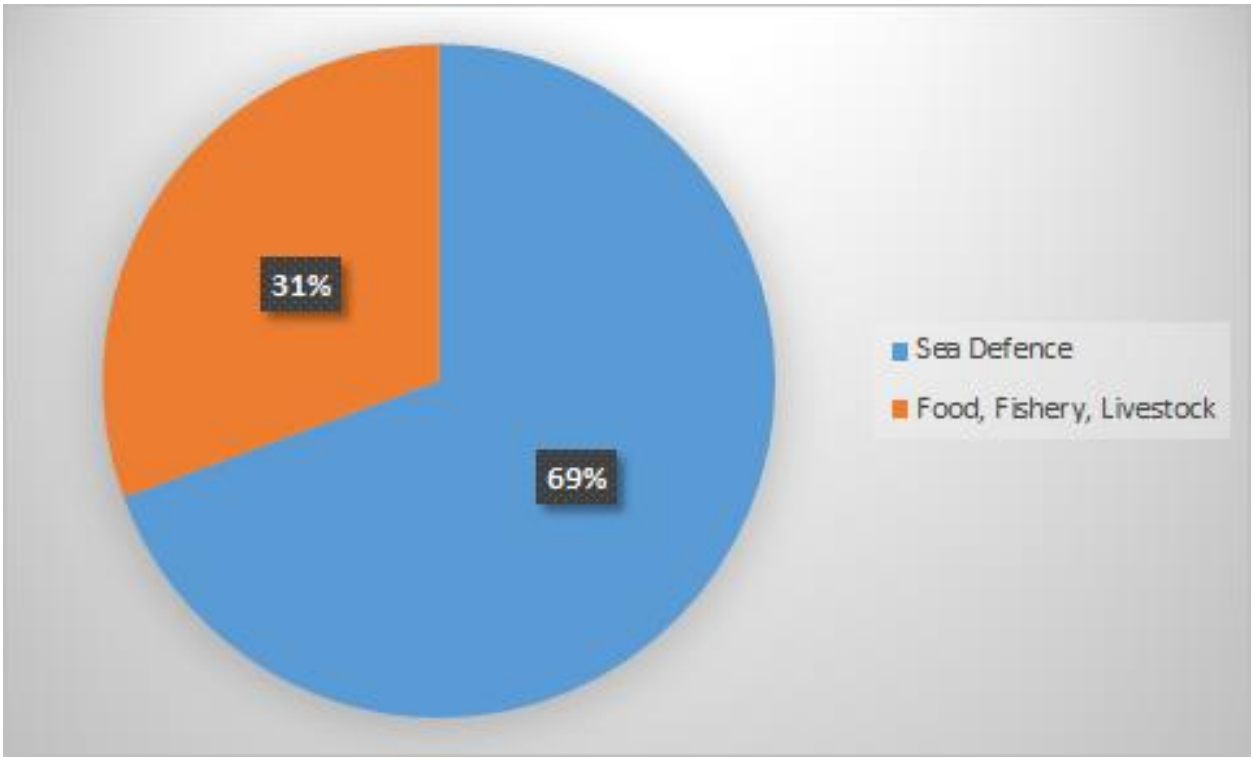

Figure 5.0 Allocation of Oil Revenues to Agriculture in 2014

There is the lack of an agricultural investment plan that would serve as a guide to how petroleum revenues and other revenues allocated to the sector are utilized. It is therefore not surprising that revenues allocated to the sector are spent anyhow and therefore does not have the required impact on the agricultural sector. For example, in 2014, the total oil revenues allocated to the agriculture sector in ₡170,624,179.60. Out of this, food, fishery and livestock received 31% whilst a sea defence project received 69%. As to how this huge proportion spent on building sea defence wall enhances agricultural productivity is unknown.

4Ciii. Oil Revenues as Substitutes instead of complement

Instead of oil revenues used to shore up expenditure deficit in the agricultural sector, it is being used as a supplement. For instance in 2010, actual expenditure on the agricultural sector amounted to ₵94,158,243 whiles that of 2015 was ₵ 91,539,769.58.

5. Conclusion and Recommendations

Agriculture has long been the backbone of Ghana's economy. In addition, due to its direct interface with rural communities and the poor, it is very important channel to reduce poverty. The funding of Ghana's agriculture sector has been donor-driven. Given the fact that Ghana is now a lower middle income country, donor supports have been diminishing. Revenues from petroleum production therefore provide Ghana the opportunity to shore up the funding deficit in the agricultural. Since the commencement of oil production in Ghana, the growth in the Agricultural sector has been on the decline. Experience other countries show that the competitiveness of agriculture is often undermined by natural resource discovery. Ghana needs to learn from the failures of other resource rich countries by allocating petroleum revenues judiciously towards the modernization of the agricultural sector given its enormous potential in diversifying the economy away the petroleum sector and its critical role in poverty reduction.

In view of this, the following recommendations are proffered;

- Projects selected to be funded from oil revenues in the agriculture sector should be based on research and guided by financial plan with clear timelines and growth targets that guides oil allocation to the sector to manage the volatility

- In order to enhance the quality of investment in the agriculture sector, there should be timely allocation of project funds, fertilizers, seeds and effective monitoring.

- In order to minimize the exposure of the sector to volatility, oil revenues should supplement traditional government allocation to agriculture and not as a substitute

- Section 21(5) of the Petroleum Revenue Management Act 2011 (ACT 815) requires the Government to prioritize not more than four (4) areas for the use of ABFA. This implies that government could limit its priorities to one or two areas. Agriculture and another important sector especially with the advent of GIIF

- There should be enough incentives to encourage private investments in the agriculture value especially in storage, irrigation, transportation and food and meat processing.

- Annual Petroleum Reports or the Reconciliation Report should highlight the status of all projects funded with oil revenues.

- To encourage effective monitoring, local authority and citizens should know oil funded projects and should be empowered to monitor and report progress of projects funded with oil revenues.

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