

# **BUDGETING FOR CLIMATE CHANGE IN AGRICULTURE**



**CENTRE FOR SOCIAL JUSTICE (CSJ)**

*(Mainstreaming Social Justice In Public Life)*

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By

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## ACRONYMS

AfDB	African Development Bank
APP	Agricultural Promotion Policy
CSA	Climate Smart Agriculture
EIA	Environmental Impact Assessment
FGN	Federal Government of Nigeria
FMARD	Federal Ministry of Agriculture and Rural Development
GDP	Gross Domestic Product
GHG	Green House Gases
IFAD	International Fund for Agricultural Development
INDCs	Intended Nationally Determined Contributions
LGA	Local Government Area
MDAs	Ministries, Departments and Agencies of Government
NARF	Nigeria Agriculture Resilience Framework
NASPA-CCN	National Adaptation Strategy and Plan of Action on Climate Change
NDC	Nationally Determined Contributions
NGOs	Non Governmental Organisations
UNFCCC	United Nations Framework Convention on Climate Change

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## EXECUTIVE SUMMARY

Nigeria has huge agricultural potential. It is blessed with over 84 million hectares of arable land, abundant and reliable rainfall, diverse resources for agricultural production, a large population of 180 million people and a large labor force who are predominantly of working age (AfDB, 2013). Naturally, agriculture is the mainstay of Nigeria's economy, employing approximately two-thirds of the country's total labor force and contributing about 23 percent to Nigeria's GDP (Financial Watch, 2016). In spite of Nigeria's huge agricultural potential, Nigeria is a food-deficit nation and depends on the importation of staple food such as grains, livestock products and fish to meet the demands of its teeming population (IFAD, 2012). The challenges affecting Nigeria's huge agricultural potentials can be grouped into environmental, political and socio-economic issues such as a lack of roads and other infrastructures, over-farmed land, deforestation, overgrazing, drought, erosion and flooding, etc.

Climate change is today considered as one of the most serious developmental and environmental challenge facing humanity. It affects agriculture in several ways, with direct consequences on food production and food security. Climate change which is attributable to the natural climate cycle and human activities has adversely affected agricultural productivity in Africa and tends to trap people in hunger and poverty (Ziervogel et al. 2006). It therefore contributes to lowering the standard of living and the quality of life. Available evidence shows that climate change is global, likewise its impacts; but the most adverse effects will be felt mainly by developing countries, especially those in Africa, due to their low level of coping capabilities (Nwafor 2007).

As the planet warms, rainfall patterns shift and extreme weather events such as droughts, floods and forest fires become more frequent (Zoellick 2009). This leads to poor and unpredictable yields, thereby making farmers more vulnerable, particularly in Africa (UNFCCC, 2007). Climate change is therefore a factor in determining the ability of a people and their government to respect, protect and fulfill the right to food and freedom from hunger<sup>1</sup>. Farmers constitute the bulk of the poor in Nigeria and face prospects of tragic crop failures, reduced agricultural productivity, increased hunger, malnutrition and diseases. According to Odjugo (2010), it is projected that without enhanced adaptive capacity and adaptation to climate change, crop yield in Nigeria may fall by 10-20% by 2050 or even up to 50% due to climate change, particularly because Nigerian agriculture is predominantly rain-fed with low technological usage and hence fundamentally dependent on the vagaries of weather. Agriculture contributes to climate

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<sup>1</sup> The right to food is guaranteed under international human rights law - see article 11 (1) of the International Covenant on Economic, Social and Cultural Rights. It is also linked to the right to life which is the fulcrum upon which other rights revolve. One of the easiest ways of depriving a person of his right to life is to deny the person of food and supporting nutrients to the point of abrogation.

change and is affected by climate change. Agriculture and food production, especially large scale mechanised farming leads to emission of greenhouse gases (GHGs).

In a broader context that links agriculture with energy use, especially the process of production, storage, packaging and transportation of agricultural produce releases GHGs into the atmosphere. Farming in particular releases significant amounts of methane and nitrous oxide (two powerful greenhouse gases). Methane is produced by livestock during digestion due to enteric fermentation and is released via belches. The agriculture sector faces complicated and intertwined challenges. It needs to ensure food security, adapt to the impacts of climate change and mitigate its contribution to GHGs emissions.

Nigeria's agriculture sector is undergoing reforms through the introduction of policies and programmes aimed at improving the sector and ensuring food security. The reforms include the Agricultural Promotion Policy (APP), agricultural financing and farm mechanization (AfDB, 2013). However, these gains can be eroded by climate change. This Study attempts to review the impact of climate change on Nigeria's agriculture sector and its implications to the country's aspiration of attaining food security. Because funding is important, the Study identified the trends of budgetary appropriation to the sector in the last four years to determine how allocations were deployed and utilised. The Study took a snap shot of the Federal Ministry's various plans and strategies and considered those that are climate related and further identified those it considered had climate co-benefits that enhanced climate adaptation or resilience.

An effective adaptation strategy would seek to boost resilience by preparing communities to deal with resource scarcity and extreme events through sustainable alternatives and resource use efficiency. Likewise, mitigation in agriculture would require improved efficiency in budgetary allocation so that climate change-induced stress, extreme events and their intensity can be attenuated. In that sense, both adaptation and mitigation have the same goal, seeking to achieve sustainability in agricultural consumption and production using a strong knowledge resource base.

The challenges are not insurmountable. Indeed, they are an opportunity for the government to prove its commitment to foster sustainable and inclusive growth. To better address the food security concerns that are central to economic and sustainable development, it is desirable to also address these aspects of climate change and agriculture through the following recommendations:

**(i)** Increased understanding by the National Assembly of the dynamics of climate change and how it affects all economic sectors including agriculture is critical. This will



lead to evidence based decision making in exercising the legislative power of appropriation.

**(ii)** An assessment of the cost of implementation of Nigeria's NDC is necessary to determine the level of financing required to implement sector specific programmes.

**(iii)** FGN should take concrete and targeted steps towards the full implementation and mainstreaming of the Nigerian Agricultural Resilience Framework (NARF) in the budgeting process.

**(iv)** Good and prudent use of the budget allocation for the agricultural sector; key government officials, farmers, private agriculture investors, research institutes, universities and colleges of agriculture should be well informed on agricultural adaptation and mitigation strategies.

**(v)** To reduce emissions from farming systems, several mechanisms are available. For example, in crop and feed production, the use of inorganic fertilizer can be minimised, or in some cases, replaced by organic fertilizers.

**(vi)** Agricultural extension workers are indispensable. FGN should encourage states and local governments to engage the services of numerous extension workers in the field to disseminate information and knowledge about CSA, sustainable farming, new technologies, etc. FGN should organize training of trainers and set up a co-ordination unit at the federal level that will continually transmit the outcome of agricultural research and development to rural farmers.

**(vii)** Extension workers should have adequate resources to provide first-hand information on climate-smart agriculture. Climate-smart agriculture refers to "agriculture that sustainably increases productivity, *resilience* (adaptation), reduces/removes greenhouse gases (mitigation) and enhances achievement of national food security and development goals".

**(viii)** There is the need for the FMARD to update the database of farmers in Nigeria with a view to reaching them with relevant climate smart information and knowledge at the appropriate time.

**(ix)** Collaboration between the FMARD and the Meteorological agency should be tailored to provide adequate information to farmers on weather conditions to enable them gain first-hand information on the planting and harvesting calendar and the use of good and fit agricultural practices will be adapted to our local conditions.

**(x)** Weather forecasting stations are scantily and ill-equipped; they should be properly equipped with appropriate equipment and infrastructure by FGN to ensure timely

availability of weather information. With this, accurate weather forecast and predictions will be possible and this will help to prevent weather-related disasters through early warning and effective response/adaptation system.

**(xi)** Inadequate storage facilities and dilapidating agricultural infrastructure affects agriculture productivity in Nigeria. In addition, major portions of the national grain storage system are not properly managed and the entire network is far from being completed. The shortage of storage facilities poses serious threats to farmers in food preservation, most especially during harvest periods. As a result, most crop farmers are often in a rush to send farm produce to market immediately after harvest, not minding the associated low prices. This could act as a disincentive to investment in agriculture and hence portend serious threats to agricultural adaptation to climate change.

**(xii)** There is the need for emphasis on “anticipatory adaptation”, that is the proactive rather than reactive management of climate change risk. This can only be feasible if the potential problems/challenges to adaptation are preemptively analyzed. Most studies on climate change and agriculture in Africa have tended to concentrate on actual and projected impacts as well as farmers’ coping/adaptation strategies. There has been little or no work in the area of challenges of anticipatory adaptation.

**(xiii)** Staple Crops Processing Zones and other agricultural facilities where feasible and possible should be powered by renewable energy as this will save costs in the long run and reduce the carbon footprints.

**(xiv)** In the 2016 budget, there are also ongoing projects listed under the fisheries and aquaculture value chains. It is recommended that aquaculture infrastructure be strategically located to minimize climate change risks. The Sahel savannah region of Nigeria is not as conducive as the southern part of the country for such infrastructures.

**(xv)** There should be an explicit national agricultural research policy framework to provide a conducive environment for continuity and effectiveness in agricultural programmes/projects.

**(xvi)** Migration from reliance on rain-fed food production through efficient and effective utilization of irrigation; Adequate provision of irrigation and drainage infrastructure is regarded as crucial for climate change adaptation.

**(xvii)** Agriculture needs to become professionalised with educational training incentives and development of human capital in the direction of crop and livestock production. Heavy reliance on subsistence agricultural practices with rudimentary farm implements should be discouraged.

**(xviii)** With the increasing rate of erratic rainfall patterns, drought and desertification, drought resistant and short duration high yielding crops should be developed through research efforts and made available to farmers.

**(xix)** Investment on improved agricultural technology by government and other stakeholders is very necessary for agriculture to be able to cope with climate change.

**(xx)** The high climate variability that characterizes the African continent presupposes that people have developed successful indigenous adaptation strategies. It is therefore advocated that indigenous knowledge and practices should be integrated into formal climate change mitigation and adaptation strategies.

**(xxi)** There is need for effective capacity building to strengthen the most vulnerable group(s) in agricultural production with requisite knowledge and information necessary for climate change mitigation and adaptation. Such capacity building should focus inter alia on women and the youths.

**(xxi)** FGN should make concerted efforts to reduce deforestation and step up reforestation. Legislation, policies, incentives, education and sensitization holds the key.

**(xxii)** Increased public-private partnerships in the agricultural sector and FMARD to partner with state governments, civil society and NGOs within the agricultural sector.

**(xxiv)** The FMARD and the Federal Ministry of Environment should collaborate extensively especially on issues relating to abattoirs, forests and agroforestry and the impact of the climate in agriculture.

**(xxv)** NDC in agriculture should be mainstreamed into the budgets of the 36 states of Federation and LGAs.

**(xxvi)** Government should promote ranching. This will give farmers greater control over methane emission within the animal husbandry subsector. Already existing ranches should be reactivated and new ones built. Legislation should also be considered to incentivize ranching. The Federal Government should use policy frameworks to incentivise states and local governments in this direction.

**(xxvii)** Comprehensive soil analysis should be done that will show deficiencies/abundance of nutrients in a particular soil so that fertilizer distribution and application will be soil-specific. Also, fertilizers rich in particular nutrients will be used on soils deficient in that particular nutrient.

**(xxviii)** Owners of agricultural farms of 50 hectares and above should be compelled to do Environmental Impact Assessment (EIA) before establishing the farms.

## 1. AGRICULTURE IN NIGERIA AND CLIMATE CHANGE

Climate change is today considered as one of the most serious developmental and environmental challenge facing humanity. It affects agriculture in several ways, with direct consequences on food production and food security. Climate change which is attributable to the natural climate cycle and human activities has adversely affected agricultural productivity in Africa and tends to trap people in hunger and poverty (Ziervogel et al. 2006). It therefore contributes to lowering the standard of living and the quality of life. Available evidence shows that climate change is global, likewise its impacts; but the most adverse effects will be felt mainly by developing countries, especially those in Africa, due to their low level of coping capabilities (Nwafor 2007).

As the planet warms, rainfall patterns shift and extreme weather events such as droughts, floods and forest fires become more frequent (Zoellick 2009). This leads to poor and unpredictable yields, thereby making farmers more vulnerable, particularly in Africa (UNFCCC, 2007). Climate change is therefore a factor in determining the ability of a people and their government to respect, protect and fulfill the right to food and freedom from hunger<sup>2</sup>. Farmers constitute the bulk of the poor in Nigeria and face prospects of tragic crop failures, reduced agricultural productivity, increased hunger, malnutrition and diseases. According to Odjugo (2010), it is projected that without enhanced adaptive capacity and adaptation to climate change, crop yield in Nigeria may fall by 10-20% by 2050 or even up to 50% due to climate change, particularly because Nigerian agriculture is predominantly rain-fed with low technological usage and hence fundamentally dependent on the vagaries of weather. Agriculture contributes to climate change and is affected by climate change. Agriculture and food production, especially large scale mechanised farming leads to emission of greenhouse gases (GHGs).

In a broader context that links agriculture with energy use, especially the process of production, storage, packaging and transportation of agricultural produce releases GHGs into the atmosphere. Farming in particular releases significant amounts of methane and nitrous oxide (two powerful greenhouse gases). Methane is produced by livestock during digestion due to enteric fermentation and is released via belches. The agriculture sector faces complicated and intertwined challenges. It needs to ensure food security, adapt to the impacts of climate change and mitigate its contribution to GHGs emissions.

Essentially, the key impacts of climate change on agriculture include the following in Box 1.

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<sup>2</sup> The right to food is guaranteed under international human rights law - see article 11 (1) of the International Covenant on Economic, Social and Cultural Rights. It is also linked to the right to life which is the fulcrum upon which other rights revolve. One of the easiest ways of depriving a person of his right to life is to deny the person of food and supporting nutrients to the point of abrogation.

*Box 1: Key Impacts of Climate Change*

**Higher Temperatures Result In:**

1. Decreased agricultural productivity and production in all parts of Nigeria.
2. High evaporation rate and reduced soil moisture, lowering of the groundwater table and shrinking of surface water, especially in the North.
3. Lower crop yields and poor livestock production due to increased heat in the Sahel and Savanna.
4. Heat stress which reduces human labour use on farms.
5. Rapid deterioration and wastage of farm produce.

**Rainfall**

1. Changes in the amount of rain, increased rainfall intensity and changes in rainfall patterns lead to decreased agricultural productivity and production in all parts of Nigeria (crops and livestock).
2. Lower rainfall in the Sahel and Sudan savanna leads to lack of water for livestock, less fodder, reduced ability to house livestock and drought.
3. Increased rainfall intensity in the coastal region can lead to flooding, erosion of farmland, inundation, leaching, decreased soil fertility and lower agricultural productivity.
4. Changing and erratic rainfall patterns make it difficult for farmers to plan their operations, may reduce the cropping season and can lead to low germination, reduced yield and crop failure.
5. Erratic weather interferes with processing of produce (e.g. sun-drying crops and smoking fish).

**Extreme Weather Events**

Major storms cause damage to farm land, crops and livestock. Major storms can also cause road wash outs, which make it difficult to access farms and to market products.

**Sea-Level Rise**

Sea level rise affects coastal zones through flooding, inundation, salinization of soils and coastal erosion, which affects the livelihood of households.

*Source: National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN)*

Climate Smart Agriculture (CSA) has been introduced by the Food and Agriculture Organisation of the United Nations as a methodology and process that entails sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change and reducing or removing GHGs where possible<sup>3</sup>. It therefore adapts to and mitigates the negative impacts of climate change on agriculture.

As the people of Nigeria strive to surmount poverty and achieve economic growth, climate change threatens to deepen vulnerabilities, erode hard-won gains and seriously undermines prospects for development through the agricultural sector of Nigeria's economy. Wisner et al (2004) reports that the vulnerability of agriculture is not per se determined by the nature and magnitude of environmental stress like climate change, but by the combination of the societal capacity to cope with and or recover from environmental change. While the coping capacity (adaptation) and degree of exposure

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<sup>3</sup> Climate Smart Agriculture is a component of the Agriculture Promotion Policy and Strategic Document (2016-2020) of the Federal Ministry of Agriculture and Rural Development.

(vulnerability) are related to environmental changes, they are both also related to changes in societal aspects such as land use and cultural practices.

## **2. NATIONAL PLANS AND STRATEGIES RELEVANT TO CLIMATE CHANGE**

The development of dynamic farming systems, capable of adapting to the challenges of climate change requires a conducive and stable policy environment from the Federal Ministry of Agriculture and Rural Development (FMARD) and other Ministries, Departments and Agencies of Government (MDAs). FMARD is expected to introduce major reforms to boost the agricultural sector in Nigeria and to address the twin challenges of climate change and food security. The vision of the FMARD is to grow Nigeria's agricultural sector. Specifically, it aims to achieve a hunger-free Nigeria through an agricultural sector that drives income growth, accelerates achievement of food and nutritional security, generates employment and transforms Nigeria into a leading player in global food markets to grow wealth for millions of farmers. The FMARD has introduced several programmes and policies that drive its vision under the Agricultural Promotion Policy (APP) which addresses the full value chain of agriculture including financing farm mechanization. Furthermore, agriculture and land-use is one of the mitigation measures identified in Nigeria's Intended Nationally Determined Contributions (INDC) specifically through climate smart agriculture.

CSA seeks to address the combined challenges of food security and climate change. Effective implementation of CSA will lead to a sustainable increase in agricultural productivity, equitable increases in farm incomes, enhancing food security and development. CSA also helps the agricultural sector to adapt to and build resilience of agricultural and food security systems to climate change, thus, reducing GHGs from crops, livestock and fisheries. Furthermore, it encourages farmers to adopt agro-ecological measures that increase the resilience of the farming systems, as opposed to such measures that promote high external input farming - industrial meat production and large-scale industrial agriculture, which contributes to climate change.

The APP has identified the following constraints to CSA.

Constraints:

- Limited awareness of climate issues and therefore key changes required to protect agriculture.
- Poor management of land, water, soil nutrients and genetic resources.
- Inconsistency of the governance regimes, policies, legislation and financial mechanisms with the requirements for climate friendly agricultural practices.
- Inefficient and unsustainable management of agriculture and natural resources e.g. soil, water, etc.
- Lack of awareness of soil management practices.

- Limited availability of drought resistant varieties of crops.
- Lack of research into climate smart agriculture.
- Lack of cooperation and synergy among the key MDAs and other stakeholders.
- Absence of comprehensive soil map for Nigeria.
- Lack of awareness on climate change and its effects on agricultural practices.
- Lack of access to alternative energy use.
- Poor infrastructure to support climate smart agriculture.

To counter these constraints, the APP puts forward the following policy thrusts:

- Boosting public awareness through advertising of the importance of CSA and broad public and stakeholder awareness on Climate Smart Agriculture will be created.
- The management of land, water, soil and other natural resources will be improved.
- Institutional linkages and partnerships will be strengthened for ensuring climate smart agricultural governance, policies, legislation and financial mechanisms.
- Environmental impact assessment will be carried out on major agricultural projects.
- The use of renewable energy will be promoted with the involvement of private sector.
- Government will facilitate soil map to improve land use and management practices and; Government will increase the adoption of global best practices on climate change, including the aspects of adaptation, mitigation and carbon credit.

The Nigeria Agriculture Resilience Framework (NARF) seeks to create the ecosystem for Nigerian agriculture to be resilient. NARF extensively deals inter alia with changing climate - impact, risks and adaptation; enhancing the natural resources for agriculture resilience; and mainstreaming climate change adaptation into agricultural planning and development. Other issues include agriculture research and technology development for CSA; extension services; policies; innovative financing and monitoring and evaluation. Resilience is defined by NARF as follows:

*“..the ability of a system to cope, absorb stresses or shocks, and “bounce back” or recover. A stress is defined as a regular, sometimes continuous, relatively small, and predictable disturbance (e.g., the effect of growing soil salinity or indebtedness). A shock, by contrast, is an irregular, infrequent, relatively large and unpredictable disturbance, such as is caused by a rare drought, flood, or a new pest (Conway, 2012). The distinction is important because they are different phenomena (even though they sometimes grade into one another), have different effects on agricultural production and require different response and adaptations. In a recent report, The Montpellier Panel identified seven steps that need to be taken to build resilience (Montpellier Panel, 2012). These include the **anticipation** of the likelihood and*

location of a stress or shock via a **survey** (or agro-climatic monitoring in the case of the extreme weather event). The next steps – **prevention and tolerance, recovery and restoration** – involve defining objectives, identifying the various options and appraising them in terms of their outcomes and the relevant costs and benefits. Situations do arise when damage is unavoidable and the only response is to **restore** the basis for growth. Lastly, building resilience is about **learning** from past experience”.

Box 2 shows some excerpts from NARF.

*Box 2: Some Key NARF Principles*

**The National Agricultural Resilience Framework (NARF 2014)** is based on the principles of adaptive management and participatory engagement as the central tenets of the overall implementation strategy. The NARF articulates policy options, opportunities and required interventions to achieve the following strategic objectives:

- Strengthening the overall policy/institutional framework for improved resilience and adaptation to climate variability and change in the agricultural sector, including planning and implementation, systems for resource mobilization, and effective project monitoring and evaluation.
- Evaluation and introduction of risk transfer and risk management strategies (e.g., improved seasonal and real time weather forecasts, insurance based risk mitigation options etc.) into the agricultural sector and widespread deployment of same through communication technologies, including mobile phones.
- Improving productivity through training community and grass root farmers on land and water management strategies (e.g., irrigation farming, water harvesting, soil fertility enhancement and erosion control, etc.), improved farming practices and using policy instruments such as economic incentives, regulations and communication.
- Reinforcing existing social safety nets through support systems that reduce vulnerability and improve livelihood conditions for the vulnerable, especially women and children.
- Improving farming systems research capacity within the National Agricultural Research System (NARS) to enable and support the implementation of climate friendly agriculture in Nigeria.
- Revamping extension services, including building new capacity for evidence-based assessment and management of climate risk for resilience in the agriculture sector.



### 3. TREND OF BUDGET ALLOCATION TO FEDERAL MINISTRY OF AGRICULTURE FROM 2013-2016

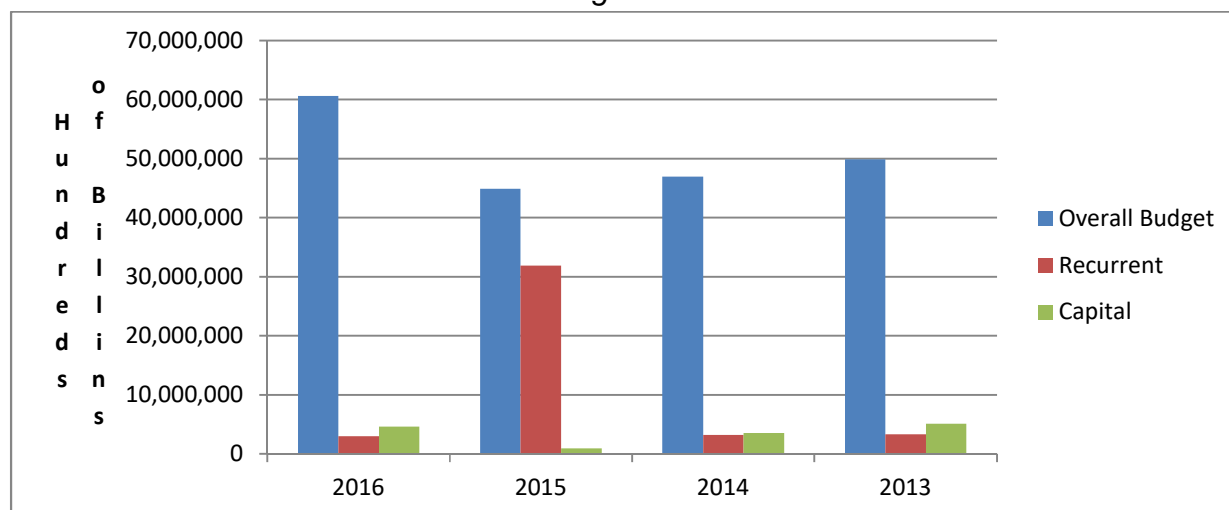
The trend of budgetary allocation to the FMARD over the four year period as shown in Table 1 and Chart 1 below indicates that budgetary allocations have been fluctuating with 2015 having the least allocation while 2013 had the largest allocation. The second highest allocation was in 2016. Though in the 2013 budget, a bigger share was allocated to the agriculture sector, yet the sector was under-funded. The 2016 allocation in real terms, taking into consideration the value of naira cannot support the needs of the sector.

*Table 1: Federal Allocations to Agriculture 2013-2016*

Year	Overall Budget	Allocation to Agriculture	Recurrent Vote	Percentage of Recurrent Vote	Capital Vote	Percentage of Capital Vote
2016	6,060,677,358,227	75,806,548,274	29,632,584,416	39.53	46,173,963,859	60.47
2015	4,493,363,957,158	40,659,020,717	31,869,020,717	78.38	8,790,000,000	21.62
2014	4,695,190,000,000	66,644,675,939	31,493,503,356	47.25	35,551,172,583	52.75
2013	4,987,220,425,601	83,762,937,710	33,115,066,282	39.53	50,647,871,428	60.47

Source: Budget Office of the Federation (2013-2016)

*Chart 1: Trend of Budget Allocation: 2013-2016*



Source: Budget Office of the Federation

In 2016, the recurrent expenditure got 39.53 percent while the capital expenditure got 60.47 percent. In 2014, agriculture was allocated N66.64 billion, which represented 20.44 percent decrease from the previous allocation in 2013. Also, the percentage of the 2014 capital expenditure reduced when compared with the immediate previous year of 2013. Recurrent expenditure got 47.25 percent while the capital expenditure got 52.74 percent as against 39.53 percent and 60.47 percent for recurrent and capital expenditure respectively in the previous year. Sadly, in 2015, the year Nigeria submitted its INDCs to UNFCCC, the percentage distribution of budget allocation between recurrent and capital adversely altered with 78.38 percent going to recurrent and 21.62 percent to capital respectively.

### 3.1 POSITIVE IMPACT OF BUDGET ALLOCATIONS ON CLIMATE CHANGE AND PROGRAMMES AND PROJECTS THAT SHOULD BE CONTINUED

The budget of FMARD over a four year period (2013-2016) shows there are programmes that have the potential to impact positively on climate change. Some of these programmes are shown in Table 2 below.

*Table 2: Positive Impact of Budget Allocations on Climate Change*

YEAR	PROJECT	ALLOCATION (N)
2016	Research and Development	1,377,033,464
	Organic Fertilizer (Biostimulant-Maxicrop )	219,170,984
2015	• Climate Adaptation	7,680,000
	• Agricultural Resilience for Climate Change Ongoing	28,400,000
	• Research and Development	81,048,000
	• Erosion and Flood Control	11,520,000
	• Inputs (Carbon Free Jute Bags & Solo Pumps)	4,800,000
	• Organic Fertilizer	98,045,600
2014	• Research and Development	700,000,000
	• Climate Adaptation	40,000,000
	• Agricultural Resilience for Climate Change	140,000,000
	• Organic Fertilizers	455,612,500
2013	• Research & Development	188,000,000

	<ul style="list-style-type: none"> <li>• Climate change Adaptation</li> </ul>	60,000,000
	<ul style="list-style-type: none"> <li>• Jute bags</li> </ul>	314,325,000
2016	<ul style="list-style-type: none"> <li>• Land and Climate Change Management New</li> </ul>	1,150,000,000
	<ul style="list-style-type: none"> <li>• Research and Development</li> </ul>	32,876,127,108

Source: Budget Office of the Federation (2013-2016)

From Table 2 above, climate change adaptation and agricultural resilience for climate change have received allocations in the four years under study. This shows positive impact of the budget on climate change. Also, though not limited to only climate change, research and development has been identified as a key player in solving national climate crises including its effect on the agriculture sector. Thus, research and development should be channeled towards CSA because the APP identified lack of research into CSA as one of the constraints to agricultural productivity<sup>4</sup>. One of the challenges of agricultural research in Nigeria is that it is not demand driven and as such, the products of research institutes have hardly been diffused, popularized and commercialized to solve existential challenges such as the negative impacts of climate change<sup>5</sup>. If research and development is not properly targeted and contextualized, it can turn from being positive for CSA and the economy to being a drain on federal resources in the absence of value for money.

Erosion and flood control is a key climate change mitigation strategy but received allocation in 2015 only. However, it is imperative to note that erosion and flood control programmes are found in the votes of several MDAs including works, housing, urban development and environment. Collaboration is needed across these MDAs to solve the erosion and flood control challenge. As a result of these findings, these identified line items should be continued. Also, if necessary, allocation of funds for jute bags, which received allocation only in 2013 and 2015 budget allocations should be continued. The jutes are fabrics made of jute fibers and they are *carbon*-dioxide neutral. There should also be continued budget allocation to erosion and flood control in subsequent budgets.

The 2013 budget provided for seeds, improved seeds, seedlings and cuttings. However, there is no indication whether they are of the type that adapt to the changing climate such as drought resistant and early maturing seeds. Insufficient access to

<sup>4</sup> APP at page 30 under Climate Smart Agriculture.

<sup>5</sup> APP at page 31 under Research and Innovation.

improved seed varieties still persist. A 300,000MT gap persists between demand and supply of seeds<sup>6</sup>.

The use of organic fertilisers has been empirically proven to be very effective as a climate mitigation measure. However, the allocation to it in 2014 and 2015 only is an indication of low attention to the application of organic fertiliser in agricultural practices. But in 2013, huge sums were allocated to fertiliser without indicating whether it is organic or inorganic fertiliser.

### 3.2 NEGATIVE IMPACT OF BUDGET ALLOCATIONS ON CLIMATE CHANGE AND PROGRAMMES AND PROJECTS THAT SHOULD BE DISCONTINUED

The budget of FMARD over a four year period (2013-2016) shows that there are programmes that have the potential to impact negatively on the climate. Some of these programmes are shown in Table 3 below.

*Table 3: Negative Impact of Budget Allocations on the Climate*

YEAR	PROJECT	ALLOCATION
2016	Maintenance of Plants/Generators	3,541,545
	Plant/Generator fuel cost	4,047,480
	Inorganic fertilizer(NPK)	270,127,555
2015	Provision of motorised boreholes for rural communities	116,102,978
	National Grazing Reserves Development	13,882,026
	Inorganic Fertilizer	240,301,216
	Chemicals	224,103,936
2014	Inorganic Fertilizer	1,281,048,750
	Chemicals	1,522,777,500
2013	National Grazing Reserves Development	100,582,000
	Chemicals	3,271,100,000
	Fertilizer	6,648,749,080

Source: Budget Office of the Federation (2013-2016)

From Table 3 above, line items in the budgetary allocation such as chemicals including herbicides, pesticides, agro chemicals, fungicides, Dithane M45 and ultracides do not promote CSA. The processes and usage of these chemicals emit GHGs into the atmosphere. Though agricultural practices require these chemicals for control of pest

<sup>6</sup> APP at page 8.

and disease, their minimal usage will help mitigate the effect of climate change. The use of inorganic fertilisers for agricultural practices contributes in emitting GHG such as methane. Since agriculture requires fertilisers, organic fertilisers should be promoted and excessive use of inorganic fertilisers curtailed. Again, there is no information whether the fertilisers are soil and crop specific.

Also, the inability of the FMARD to link up agricultural productivity, mitigation and adaptation strategies with the use of renewable energy is a clog in the implementation of CSA. Farming, to a great extent should draw upon renewables to satisfy its energy needs. The National Grazing Reserve programme will have a negative impact on the climate as this practice will provoke crises between animal herders and the farm owners where the animals are taken for grazing. Animals should be kept in ranches. Therefore, making ranches for animals will substitute for grazing reserves and will reduce the impact of destruction of farms leading to the overuse of land for farming and grazing at the same time.

### **3.3 AFFORDABLE LOW HANGING FRUITS TO IMPLEMENT MITIGATION AND ADAPTATION IN AGRICULTURE SECTOR**

The following should be considered in policy making and implementation.

- First, while it may not be politically feasible to take a mitigation-first approach, the government can plan a development-first strategy for agriculture with clear adaptation and mitigation co-benefits. The climate-smart agriculture could cut sector emissions by a quarter, based on conservative estimates, while increasing productivity and climate resilience. Considering agriculture's contribution to GDP at 23 percent and its value chain share of the labour force at 70 percent, it provides an opportunity to reach a majority of the population with climate change compliant knowledge and improve productivity over the long term.
- For CSA to be effective, interventions must be evidence and knowledge driven, soil mapping and testing and the production of a comprehensive soil map for Nigeria is imperative to drive CSA. This will improve land use and management practices.
- Livestock is a major contributor to Nigeria's food basket and accounts for 40 percent of agricultural emissions. Productivity in the livestock subsector is highly vulnerable to temperature rises and the impacts of extreme weather events. However, simple interventions like feed quality improvement and health and reproduction management, achievable through improved extension services,

have the potential to increase productivity, improve resilience and reduce emissions.

- Water is critical for agricultural development. Available irrigation water is inadequate and susceptible to climatic change, while prevailing irrigation patterns are highly inefficient and energy intensive. For example, according to Garba, (2006), due to excessive low precipitation in the Northern part of Nigeria, improving the management of irrigation water would help in sustaining agricultural practices in the region. Substantial cuts in water demand could be achieved by adopting efficient irrigation technologies such as the drip and sprinkler and much of the remaining demand could be met by extending and enhancing the surface irrigation network. Sustained rainwater harvesting and groundwater recharge initiatives, combined with better irrigation pump efficiency, will also contribute to CSA. These initiatives will raise resilience to looming water scarcity without compromising productivity, with co-benefits that include reduced energy consumption and lower methane emissions from flood irrigation.
- Modernization is crucial for development, yet some traditional practices are more efficient. Land leveling, mulching and crop diversification are all traditional practices that reduce the need for input resources like water and fertilizer. Farmers often neglect them, partly to avoid the extra labor and partly because they don't understand the benefits. Yet, these inexpensive practices reduce the need for inputs and also help prevent erosion, preserve soil nutrients, suppress weeds and increase fertility. Crop residues that are mostly burnt in the field, contributing to emissions and local air pollution can be used productively as mulch.
- Similarly, agroforestry as a farming practice has tremendous benefits for productivity, resource efficiency, adaptation, and carbon sequestration. More modern practices like soil fertigation (the injection of fertilizers, soil amendments, and other water-soluble products into an irrigation system) and systemic rice intensification can further improve resource use efficiency and productivity.
- Mitigation potentials at zero or even negative costs should be realised by removing institutional and social barriers. This includes educational efforts, making information and technology available in the right places and developing appropriate legal frameworks.
- Use already available print, electronic, digital and social media facilities to disseminate CSA knowledge and information.

- There are potential mitigation options that will provide per-hectare net returns far above those from traditional practices, such as high-yielding agroforestry systems.

#### **4. BUDGET AND POLICY RECOMMENDATIONS**

Due to negligence of agriculture in Nigeria as a result of more attention paid to the oil sector, a major climate threat to agriculture is increased stress on already low resource allocation and raised vulnerability of agriculture dependent communities. An effective adaptation strategy would seek to boost resilience by preparing communities to deal with resource scarcity and extreme events through sustainable alternatives and resource use efficiency. Likewise, mitigation in agriculture would require improved efficiency in budgetary allocation so that climate change-induced stress, extreme events and their intensity can be attenuated. In that sense, both adaptation and mitigation have the same goal, seeking to achieve sustainability in agricultural consumption and production using a strong knowledge resource base.

The challenges are not insurmountable. Indeed, they are an opportunity for the government to prove its commitment to foster sustainable and inclusive growth. To better address the food security concerns that are central to economic and sustainable development, it is desirable to also address these aspects of climate change and agriculture through the following recommendations:

**(i)** Increased understanding by the National Assembly of the dynamics of climate change and how it affects all economic sectors including agriculture is critical. This will lead to evidence based decision making in exercising the legislative power of appropriation.

**(ii)** An assessment of the cost of implementation of Nigeria's NDC is necessary to determine the level of financing required to implement sector specific programmes.

**(iii)** FGN should take concrete and targeted steps towards the full implementation and mainstreaming of the Nigerian Agricultural Resilience Framework (NARF) in the budgeting process.

**(iv)** Good and prudent use of the budget allocation for the agricultural sector; key government officials, farmers, private agriculture investors, research institutes, universities and colleges of agriculture should be well informed on agricultural adaptation and mitigation strategies.

**(v)** To reduce emissions from farming systems, several mechanisms are available. For example, in crop and feed production, the use of inorganic fertilizer can be minimised, or in some cases, replaced by organic fertilizers.

**(vi)** Agricultural extension workers are indispensable. FGN should encourage states and local governments to engage the services of numerous extension workers in the field to disseminate information and knowledge about CSA, sustainable farming, new technologies, etc. FGN should organize training of trainers and set up a co-ordination unit at the federal level that will continually transmit the outcome of agricultural research and development to rural farmers.

**(vii)** Extension workers should have adequate resources to provide first-hand information on climate-smart agriculture. Climate-smart agriculture refers to “agriculture that sustainably increases productivity, *resilience* (adaptation), reduces/removes greenhouse gases (mitigation) and enhances achievement of national food security and development goals”.

**(viii)** There is the need for the FMARD to update the database of farmers in Nigeria with a view to reaching them with relevant climate smart information and knowledge at the appropriate time.

**(ix)** Collaboration between the FMARD and the Meteorological agency should be tailored to provide adequate information to farmers on weather conditions to enable them gain first-hand information on the planting and harvesting calendar and the use of good and fit agricultural practices will be adapted to our local conditions.

**(x)** Weather forecasting stations are scantily and ill-equipped; they should be properly equipped with appropriate equipment and infrastructure by FGN to ensure timely availability of weather information. With this, accurate weather forecast and predictions will be possible and this will help to prevent weather-related disasters through early warning and effective response/adaptation system.

**(xi)** Inadequate storage facilities and dilapidating agricultural infrastructure affects agriculture productivity in Nigeria. In addition, major portions of the national grain storage system are not properly managed and the entire network is far from being completed. The shortage of storage facilities poses serious threats to farmers in food preservation, most especially during harvest periods. As a result, most crop farmers are often in a rush to send farm produce to market immediately after harvest, not minding the associated low prices. This could act as a disincentive to investment in agriculture and hence portend serious threats to agricultural adaptation to climate change.



**(xii)** There is the need for emphasis on “anticipatory adaptation”, that is the proactive rather than reactive management of climate change risk. This can only be feasible if the potential problems/challenges to adaptation are preemptively analyzed. Most studies on climate change and agriculture in Africa have tended to concentrate on actual and projected impacts as well as farmers’ coping/adaptation strategies. There has been little or no work in the area of challenges of anticipatory adaptation.

**(xiii)** Staple Crops Processing Zones and other agricultural facilities where feasible and possible should be powered by renewable energy as this will save costs in the long run and reduce the carbon footprints.

**(xiv)** In the 2016 budget, there are also ongoing projects listed under the fisheries and aquaculture value chains. It is recommended that aquaculture infrastructure be strategically located to minimize climate change risks. The Sahel savannah region of Nigeria is not as conducive as the southern part of the country for such infrastructures.

**(xv)** There should be an explicit national agricultural research policy framework to provide a conducive environment for continuity and effectiveness in agricultural programmes/projects.

**(xvi)** Migration from reliance on rain-fed food production through efficient and effective utilization of irrigation; Adequate provision of irrigation and drainage infrastructure is regarded as crucial for climate change adaptation.

**(xvii)** Agriculture needs to become professionalised with educational training incentives and development of human capital in the direction of crop and livestock production. Heavy reliance on subsistence agricultural practices with rudimentary farm implements should be discouraged.

**(xviii)** With the increasing rate of erratic rainfall patterns, drought and desertification, drought resistant and short duration high yielding crops should be developed through research efforts and made available to farmers.

**(xix)** Investment on improved agricultural technology by government and other stakeholders is very necessary for agriculture to be able to cope with climate change.

**(xx)** The high climate variability that characterizes the African continent presupposes that people have developed successful indigenous adaptation strategies. It is therefore advocated that indigenous knowledge and practices should be integrated into formal climate change mitigation and adaptation strategies.

**(xxi)** There is need for effective capacity building to strengthen the most vulnerable group(s) in agricultural production with requisite knowledge and information necessary

for climate change mitigation and adaptation. Such capacity building should focus inter alia on women and the youths.

**(xxi)** FGN should make concerted efforts to reduce deforestation and step up reforestation. Legislation, policies, incentives, education and sensitization holds the key.

**(xxii)** Increased public-private partnerships in the agricultural sector and FMARD to partner with state governments, civil society and NGOs within the agricultural sector.

**(xxiv)** The FMARD and the Federal Ministry of Environment should collaborate extensively especially on issues relating to abattoirs, forests and agroforestry and the impact of the climate in agriculture.

**(xxv)** NDC in agriculture should be mainstreamed into the budgets of the 36 states of Federation and LGAs.

**(xxvi)** Government should promote ranching. This will give farmers greater control over methane emission within the animal husbandry subsector. Already existing ranches should be reactivated and new ones built. Legislation should also be considered to incentivize ranching. The Federal Government should use policy frameworks to incentivise states and local governments in this direction.

**(xxvii)** Comprehensive soil analysis should be done that will show deficiencies/abundance of nutrients in a particular soil so that fertilizer distribution and application will be soil-specific. Also, fertilizers rich in particular nutrients will be used on soils deficient in that particular nutrient.

**(xxviii)** Owners of agricultural farms of 50 hectares and above should be compelled to do Environmental Impact Assessment (EIA) before establishing the farms.

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