A New Framework for Building Resilience in Nigeria's Agriculture Value-Chains through Climate Smart Policies, Adaptation Programs and Actions

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Abstract: It is now widely understood and accepted that climate change poses significant serious threats to sustained economic growth and agricultural development, poverty reduction, food security and political stability globally. Nowhere are these challenges more marked than in Africa where two-thirds of all available land is classified as deserts or drylands and which the Intergovernmental Panel on Climate Change (IPPC) categorizes as the most vulnerable continent to climate change and climate variability. This situation is further aggravated by the interaction of multiple stresses occurring at various levels, compounded by low adaptive capacity. In Nigeria, climate change threatens food production systems and therefore the livelihoods and food security of millions of people who depend on agriculture. More than 70% of the economically active population and their dependents - almost 100 million people - rely on agriculture for their livelihoods and agriculture still contributes nearly 40 percent of the country's GDP (FGN, 2012). Agriculture is the sector most vulnerable to climate change due to its high dependence on climate and weather and because people involved in agriculture tend to be the rural poor. The year 2012 was one of the most challenging for Nigeria in recent history with the unprecedented flood that ravaged several states of the country, affected over seven million people, displaced 2.3 million people, killed over 363 persons and destroyed or damaged hundreds of thousands of houses. Total value of losses across all sectors of the national economy was estimated at US$16.9 billion by the Federal Emergency Management Authority (FEMA). In this presentation, we describe a new multi-disciplinary effort to develop an agricultural resilience national program in Nigeria to support the Agricultural Transformation Agenda (ATA). The core of the program comprises policy options and strategies for achieving the following strategic objectives: (i) strengthening the overall policy/institutional framework for climate change adaptation planning and implementation**,** including resource mobilization and information management; (ii) evaluation and introduction of risk transfer and risk management options into the agricultural sector and rapid (and widespread) deployment of same through communication technologies, including mobile phones; and (iii) building capacity within Federal Ministry of Agriculture and Rural Development (FMARD) for evidence-based assessments and management of climate risks and the maintenance of robust extension services to the agricultural communities and industry.

Key words: Climate Change; Agricultural Resilience; Risk Management; Nigeria

1.1 Why Agricultural Resilience?

It is now widely understood and accepted that climate change poses significant serious threats to sustained economic growth and agricultural development, poverty reduction, food security and political stability globally. These threats are compounded by repeated food price spikes that have created high food prices, a growing food crisis in many parts of the world, high fossil fuel and fertilizer prices, and increasing environmental degradation and competition for food and water (The Montpellier Panel, 2012). Nowhere are these challenges more marked than in Africa where two-thirds of all available land is classified as deserts or drylands and which the Intergovernmental Panel on Climate Change (IPCC) classifies as the most vulnerable continent to climate change and climate variability. The International Food Policy Research Institute (IFPRI) estimates that by 2050 the combined effect of increasing temperatures, declining rainfall, floods and droughts could result in average rice, wheat, and maize yields declining by up to 14%, 22%, and 5%, respectively, and food availability in Sub-Saharan Africa will average 500 calories less per person, a 21% decline (IFPRI, 2009).

Agriculture in Africa is especially vulnerable to climate variability and change due to its high dependence on seasonal rainfall. In Nigeria, Africa's most populous country and second largest economy, more than 70% of the economically active population and their dependents - over 100 million people - rely on agriculture for their livelihoods and agriculture still contributes nearly 40 percent of the country's GDP. Country specific observations from studies conducted in recent decades show that various parts of the country have experienced impacts ranging from accentuated droughts, severe floods, increased occurrence and intensity of storm surges with concomitant flooding and coastline erosion, including progressive salinization of fresh water aquifers and unpredictable variability in the availability of fisheries resources (Adefolalu, 1986; Ibe, 1990; Ibe and Ojo, 1994; Oladipo,1993; NFNC, 2003; Adegoke et al., 2010). Projections of future climate suggest that global warming may further aggravate these environmental problems in the coming decades (Abiodun et al. 2012, 2013; Cervigni et al., eds. 2013a).

The impact of current environmental and anticipated climate-related changes on the national economy will be colossal if adequate response plans and mitigation strategies are not urgently put in place. The recently completed National Climate Change Adaptation Strategy and Action Plan for Climate Change in Nigeria – NASPA-CCN (BNRCC, 2011), indicates that climate change is already having significant impacts in Nigeria, and these impacts are expected to increase in the future. Recent estimates suggest that, in the absence of adaptation, climate change could result in a loss of between 2% and 11% of Nigeria's GDP by 2020, rising to between 6% and 30% by the year 2050. This loss is equivalent to between N15 trillion (US$100 billion) and N69 trillion (US$460 billion). This large projected cost is the result of a wide range of climate change impacts affecting all sectors in Nigeria with agriculture being the most vulnerable.

NASPA-CCN (BNRCC, 2011) articulates key adaptation recommendations and action points necessary to minimize risks; improve local and national adaptive capacity and resilience; leverage new opportunities; and facilitate collaboration with the global community, all with a view to reducing Nigeria's vulnerability to the

negative impacts of climate change. Specific recommendations germane to the agricultural sector are highlighted in Box 1.1:

Box 1.1 NASPA-CCN Recommendations on Building National Adaptive Capacity & Resilience in the Agricultural Sector

1. **Review national agricultural and related policies and programs:** The Federal Government should review all national agricultural and related policies and programs to determine modifications required in view of expected climate change. This would include policies and programs in the following areas:

- Nigerian Agricultural Policy
- Policies and programs relating to agricultural research, livestock, fisheries, seeds, crops, markets, and food security
- Other policies and programs relating to water harvesting, erosion and flood control, soil conservation practices, drought and desertification, and related matters.

2. **Federal leadership role:** The Federal Government should play a leadership and catalytic role by encouraging and supporting new program initiatives in the following areas:

- *Agricultural Extension Services for Resilience in Agriculture:* Support a State-led extension program addressing climate change adaptation (State and Local Governments Recommendation #1 below). Key areas of Federal Government support could include programs focused on Training of Trainers in priority adaptation areas, and involvement/engagement of the National Youth Service.
- *Community-based Climate Change Adaptation Support Program:* Collaborate with State Governments and civil society organizations to establish a country-wide community-based climate change adaptation support program.
- *Climate Change and Agriculture Research Program:* Working through the Agricultural Research Council of Nigeria, stimulate and support a new national research initiative addressing climate change impacts and adaptation in the agricultural sector in Nigeria.
- *Promotion of Micro-insurance and Micro-credit:* Stimulate and support CSO and private sector involvement in the provision of insurance and access to finance for small scale farmers vulnerable to climate change, to enable them to adapt their farming practices.
- *Promotion of poverty reduction through integration of adaptation with mitigation*: Providing incentives to encourage enhanced income generation through intercropping with biofuel crops, especially in the low carbon density tracts of the country (income can be enhanced directly and through participation in carbon markets).

3. **Early warning systems:** The Federal Government should review current policies and programs for early warning, and based on this should develop and roll out a program to improve availability and

farmer access to short and long range weather forecasts.

4. **Irrigation and water supply:** In view of projected rainfall changes, particularly in the northern ecozones, the Federal Government should increase efforts to identify environmentally sound and sustainable opportunities to improve and extend irrigation for crops and water supply for livestock.

5. **Green Growth Technology Solutions:** The Federal Government should identify productive avenues for interventions and investment to promote innovation in low-carbon based technologies for green growth, including opportunities for transfer of appropriate technology from international sources.

6. **Gender:** Climate change risk and vulnerability factors are exacerbated by the gender-differentiated needs and roles of the society. The Federal Ministry of Agriculture and Rural Development (FMARD) should encourage community participation and active roles by women in all livelihood development initiatives across its areas of mandate.

7. **International funding:** The Federal Government of Nigeria should work to facilitate access to international climate change adaptation funding to support various climate-smart agricultural development initiatives at the national, state and local government levels.

Source: NASPA-CCN 2012

These recommendations are supported by other studies and reports, including two recent country specific studies by the World Bank - *Toward Climate Resilient Development in Nigeria* and *Low Carbon Development: Opportunities for Nigeria* (Cervigni et al., eds. 2013a,b; Ibe 2011). The reports identified several key components of new and innovative adaptation measures to climate change in the agriculture sector, including:

- Changes in agricultural practices to improve soil fertility and enhance carbon sequestration
- Changes in agricultural water management for more efficient water use
- Improving spatial targeting of investments
- Agricultural diversification toward enhanced climate resilience;
- Reducing greenhouse gas (GHG) emissions from agriculture and increasing the value of sustainable farming practices through the valuation of carbon and other forms of agricultural ecosystem services such as water purification and biodiversity,
- Agricultural science and technology development, agricultural advisory services, and information systems; and
- Risk management and crop/livestock insurance.

1.2 Building Agricultural Resilience

The National Policy on Climate Change (FGN, 2012), recently adopted by the Federal Executive Council, provides *inter alia* for an integrated agricultural intervention plan to reduce the sector's vulnerability to climate change and strengthen agricultural resilience so as to achieve the dual goals of food security and poverty reduction.

Vulnerability is susceptibility to harm or damage potential. Resilience, on the other hand, implies the ability of a system to cope or absorb stresses or shocks and to "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 then 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.

1.3 National Context: The Agricultural Transformation Agenda of the Federal Government of Nigeria

The agricultural sector in Nigeria has been undergoing phenomenal change under the Agricultural Transformational Agenda (ATA) of His Excellency, the President and Commander in Chief of the Armed Forces of Nigeria, Dr. Goodluck Ebele Jonathan (GCFR). The ATA is underpinned by a vision to unlock the full potential of agriculture in Nigeria by making Nigeria an agriculturally industrialized economy in scale and magnitude of the agricultural market revolutions of Brazil, China and India over the past two decades (*Excerpt from speech delivered by Dr. Akinwumi Adesina (CON) Honourable Minister of Agriculture and Rural Development at the Inaugural Meeting of the Nigeria Agribusiness Group, March 2013*). In pursuit of this vision, the Federal Ministry of Agriculture and Rural Development (FMARD) guided by Dr. Akin Adesina (CON), Honourable Minister of Agriculture, set ambitious goals in 2012 that include adding 20 million metric tons of food to the national supply by 2015 and 3.5 million new jobs in the agricultural sector.

To support the national ATA program and strengthen national capacity to respond effectively to the challenges of climate change, the FMARD, under the leadership of the Honourable Minister of Agriculture and Rural Development, Dr. Akinwumi Adesina (CON), launched an initiative to develop a National Agricultural Resilience Framework (NARF) on climate-smart agriculture that will include a robust implementation plan that incorporates innovative agricultural production strategies and risk management mechanisms to promote

resilience in the agriculture sector. The Honourable Minister invited leading experts on climate impacts, agricultural systems, and global food security from within and outside Nigeria to constitute the Advisory Committee on Agricultural Resilience in Nigeria (ACARN). This Committee was officially inaugurated by the Honourable Minister on September 17, 2013 at the World Bank Country Office in Abuja, Nigeria with a mandate to develop the National Agricultural Resilience Framework (NARF) and advise the Honourable Minister on the policies required to successfully implement a national climate smart agricultural programme. The goal of the programme is to strengthen the capacity of small and large-scale agricultural producers to increase productivity, grow wealth and thrive in the face of growing challenges from multiple social and environmental stressors, including changing climate. This national agricultural resilience initiative is the first attempt at developing a sector specific climate adaptation and risk mitigation programme in Nigeria.

1.4 The National Agricultural Resilience Framework (NARF) Report: Aims, Approach & Methods

The natural world, with its biodiversity, landscapes and ecosystems, is in a perpetual state of change, but the increasing pace of climate change will place unprecedented pressures on access to and use of our natural resources. It is important therefore, that, in pursuit of the intensification of agricultural production for economic growth and national food security, every effort must be made to build into agricultural reforms, the imperative for preservation of the natural world. It will be necessary to develop integrated approaches to land management e.g., sustainable land management (SLM) practices such as agro-forestry and conservation agriculture that can significantly increase yields while delivering better environmental outcomes. These technologies would also enhance farmers' resilience to climate variability and change.

The National Agricultural Resilience Framework (NARF) is based on principles of adaptive management and participatory engagement as the central tenets of the overall implementation strategy. Adaptive management acknowledges uncertainty as a context of decision making and builds flexibility into policy and decision-making to manage risk and it allows for new knowledge input. The NARF Report articulates policy options, opportunities and required interventions for achieving the strategic objectives highlighted below:

Box 1.2 NARF Strategic Objectives

1. 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.
2. 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.
3. 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.

4. Reinforcing existing social safety nets through support systems that reduce vulnerability and improve livelihood conditions for the vulnerable, especially women and children.
5. Improving farming systems research capacity within the National Agricultural Research System (NARS) to enable and support the implementation of climate friendly agriculture in Nigeria
6. Revamping extension services, including building new capacity for evidence-based assessment and management of climate risk for resilience in the agriculture sector.

Earlier on in the process of developing this report, we decided to focus our attention primarily on small-scale rural farmers and agricultural communities who, in fact, are the largest private sector producers. The report articulates a vision that speaks to and directly supports the Agricultural Transformation Agenda (ATA) of the FMARD. Its broadly stated strategic objectives are aligned to the NASPA-CCN (2011) and the National Policy on Climate Change (FGN, 2012). These goals are addressed in separate chapters that describe specific programs and interventions along with the strategic actions needed to successfully implement the recommended programs. The strategic actions are the programmatic building blocks that are needed to achieve the goals and we have highlighted them throughout the report. Many of the core chapters in the report include a summary section in table form that identifies principal parties responsible for implementation and the target beneficiaries. During the three month planning process, ACARN hosted several stakeholder engagement sessions at all the six-geopolitical zones of the country to consult with a broad spectrum of stakeholders. We received both oral and written submissions from across the country that were both instructive and helpful in the formulation of several of the recommendations included in this report. Some of the submissions included examples of successful models of adaptation or ongoing resilience-promoting activity. We captured some of these as case studies and highlighted them in separate boxes in the relevant sections of the report. Additional case studies were also included from other developing countries where we felt that the lessons are relevant to Nigeria and potentially transferable.

In total, the NARF report comprises ten chapters, including the introduction and conclusion. This paper, which provides a brief overview of the background and context of agricultural resilience in Nigeria, summarizes the essential elements of chapter one of the report.

Chapter two deals with the methodological approaches and results of the modeling of various scenarios of vulnerabilities to the impacts of climate change within the agriculture sector in Nigeria by various researchers, both within and outside. It tests the validity of assumptions that served as inputs into the modeling process and concludes that, despite the lack of refinement in certain of the studies, there is every reason for the emphasis and urgency on building agricultural resilience. It submits that this is better done within the ambit of a low carbon economy.

Chapter three describes how a safe and flourishing natural environment is a *sine qua non* to successful and productive agriculture. Agriculture, unlike other productive sectors of the economy is a renewable resource deeply anchored on the ability of ecosystems to continue to provide their known goods and services. The chapter considers the status of the natural resource base and recommends what should be done to enhance it in support of resilient agriculture in Nigeria. It insists that agricultural practice takes account of the role of the natural environment and develop solutions that are in harmony with nature.

Chapter four dwells on the necessity to mainstream climate change adaptation into agricultural policy and practice and discusses the most cost efficient and effective methods of achieving this process with a view to climate proofing agriculture. It describes the adaptation-mitigation nexus and argues that the best approach to adaptation is via those technologies and strategies that produce maximal mitigation benefits. It ends with a

discussion of viable governance models that will entrench an Adaptation culture and promote the preference for climate smart agriculture.

Chapter five explains how investment in Agricultural research and adoption of results can provide the quantum leap in productivity and concomitant economic growth achieved during the green revolution of the late 1950s and 1960's that kick started the economies of the Asian Tigers and placed them on a solid path to sustainable human development. It harps on the necessity to transform the research management structure in Nigeria after the Brazil EMBRAPA model in which research is both demand and profit driven. The imperative to re-engineer the Agricultural Research Council of Nigeria (ARCN) from a coordinating to a managerial Council and a corresponding overhaul of its present structures is stressed

Successful adaptation requires a dissection of climate impacts to understand the risks they generate, and the degree of certainty with which predictions are made as well as assessing the various dimensions of vulnerability and the appropriateness, including costs and benefits , of a range of potential options for action. It also compels the availability of critical agricultural inputs including insurance and credit to farmers to enable farmers make and implement the right choices. All these fall within the purview of Agricultural Extension Services which receive considerable attention in Chapter six. It is not an exaggeration to say that accelerated growth in agricultural output cannot be maintained without adequate investments in rural infrastructure and in agricultural research and extension.

Chapter seven explores and recommends those policy options that will underpin the successful implementation of the recommendations of this Report and make for the general well- being of the agriculture sector. They include important ongoing FMARD development initiatives which need to be reinforced to reduce vulnerability to climate change, including promoting agricultural markets, minimizing or eliminating distortions in agricultural policies that will exacerbate climate change impacts, enhancing social protection and microfinance, preparing for disasters, insurance and, critically, mainstreaming climate change in agricultural policies and practice. It incorporates a gamut of additional development issues critical to agricultural production, processing, storage, marketing and trade. It stresses the value chain approach as the only viable option for a lofty lift of the agriculture sector as well as for its sustainability.

Financing for climate smart agriculture is a core issue in the drive for agricultural resilience to the impacts of the changing climate. Globally, the costs of Adaptation (and Resilience) are colossal. Still it is recognized that there are no alternatives to tackling the problem head on. While this may be challenging to developed countries, it is a herculean task for developing countries like Nigeria because of low adaptive capacities including a weak economic base. Chapter eight explores innovative financing options for building agricultural resilience to the changing climate in Nigeria and concludes that they are "doable" given the right enabling environment and commitment.

Without effective Monitoring and Evaluation (M&E), there can be no systematic pathway to assessing the development and impact of social learning, behavioural change in the adoption of climate smart agricultural practices and methodologies. Mainstreaming this good practice within the Nigerian agricultural landscape will further entrench the gains of Climate Resilient Agriculture in the Agricultural value-chain in the country. Chapter nine makes recommendations of preferred approaches to successful M&E, that include participatory methods of data collection which engenders new insights into people's needs for project planning and implementation.

Many stresses and shocks are interlinked, for example, energy and input price volatility, extreme weather events and climate change, growing scarcity of natural resources and poverty, inequality, and unsustainable population growth. Policies must factor these competing challenges. Also important is the necessity for clear role assignments and cohesion among the various Ministries, Departments and Agencies of government, the

Private Sector, Development Partners, NGOs/CBOs and agricultural communities. In the concluding Chapter, we stress the need for harmonization or restructuring of the architecture for planning, programme formulation and implementation support across institutions with mandates relating to the many dimensions of food security, poverty eradication, sustainable development and climate change.

Note: This paper was originally developed as the introductory chapter of the National Agricultural Resilience Framework (NARF) reportcommissioned by the Federal Ministry of Agriculture and Rural Development (FMARD), Nigeria. The complete ten-chapter NARF report can be obtained from the FMARD.

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