Nigeria’s Agriculture and Food Security Challenges

“Today’s problems cannot be solved at the same level of consciousness that created them.”
Albert Einstein

by Professor Chinedum Nwajiuba

Imagine... Kaduna, Abuja and Onitsha are mega cities like Lagos with populations over 12 million people. They are supplied with food made-in-Nigeria, some of it coming from urban agriculture on roof tops and gardens along rail- and waterways. A rail and road network that picks up food where it is produced and delivering it to consumers with a marginal loss of goods.

Imagine... Nigerian researchers breeding a cassava variety that grows in the most difficult of climates and gives double the yield, and breeding livestock that is immune to some of the new epidemics under extreme weather conditions. Imagine researchers and extension services supporting big and small farmers to decide what best to grow on their lands, even where extreme rains and droughts are degrading lands.

Imagine... small farmers growing more food throughout the year and making more money through processing of their products through drying, conserving, and juicing. Imagine subsistence farmers protecting their lands’ fertility because they have long-term rights to farm their lands, armed with knowledge of organic and sustainable farming techniques.

Imagine... a new generation of Nigerian female and male farmers who choose what to grow next season after checking domestic and international market trends online, using appropriate technology and machinery even on medium sized farms.

introduction

Nigeria has the ambition of diversifying her economy from crude petroleum dependency. The country also faces a looming food security crisis with a growing population becoming increasingly dependent on imported foods. At the same time, the once dominant subsistence-oriented farm economy is at risk of gradual marginalization. Insecure land tenure, scarcity of funds and credit, labour scarcity despite overall high unemployment and stagnant technology have crippled its further development. Until today, a wide range of policies, programmes and projects have had limited impact in ameliorating these problems. Given the choice, young people from the rural areas rather try their luck in urban centres.
Climate change compounds the challenges confronting agriculture. The sector is dependent on the natural resource base and thus faces risks such as desertification, rising temperatures, changing rainfall patterns and sea level rise, leading to degrading agriculture and exacerbating conflict. So, what are the prospects of a Green Deal for agriculture in Nigeria?

vision for 2020
The development vision by Nigeria’s government conceptualises a transformation in agriculture that would ensure food security, the right to sustainable development for all and adaptation to the climate change challenge. The government’s transformation programme is meant to wean Nigeria off food imports by boosting domestic food production. This entails reforms in the input supply regime, a targeted region-specific increase in the output of priority commodities, post-harvest systems development, a strong orientation towards agri-business and promoting value-addition in the product chain. The success of the transformation depends to a large extent on reforming the fertiliser supply mechanism which is fraught with corruption. This programme is being strongly promoted by the current Minister of Agriculture who, however, has to contend with officials in his own ministry not entirely convinced by this vision, and states that do not yet show much buy-in. State-level involvement in the agricultural reforms is key because agriculture is on the concurrent legislative list and, in practice, is largely dealt with at the local and state level.

problem statement
A green deal for Nigerian agriculture has to confront the following key questions:

- Will Nigeria remain a largely agrarian country in terms of the share of agriculture in aggregate Gross Domestic Production, employment generation, and income for majority of the people?
- Can agriculture be a primary driver of Nigeria’s future growth and provide an increased proportion of her foreign exchange earning?
- Can a green agricultural economy become an opportunity for ordinary Nigerians to benefit from development, reduce unemployment, alleviate poverty, and defuse conflict?

The declared aims of Nigeria’s national agricultural policy are to "(i) attain food security, (ii) increase production and productivity, (iii) generate employment and income, and (iv) expand exports and reduce food imports thereby freeing resources for critical infrastructure development and delivery of social services.” The current government seems to attribute the unsatisfactory state of Nigeria’s agriculture to a
dominance of subsistence-orientation. The efforts of previous governments have been characterized as treating agriculture purely as a development issue. Today, we witness a shift in policy concept, philosophy and approach to a business and commercial orientation. The focus of the transformation programme launched in August 2011 is on the role of agribusiness. Specifically, the Agriculture Transformation Action Plan (ATAP) seeks to develop value chains for five key commodities, i.e. rice, cassava, sorghum, cacao and cotton. But fundamental questions arise:

- Can the transformation programme deliver sufficient production and inclusive development?
- Can it indeed ensure food security and eliminate hunger as articulated in the national policy on agriculture, the Vision 2020, and the Millennium Development Goals, especially MDG 1 on food security and poverty?

“In ten years, time I want my farming occupation to go international, be married with children. I rear Catfish and Tilapia, I will love to be exporting my farm products to countries both far and near.”

C2DE, 20 – 25, Female, Lagos Semi Urban

background

Nigeria faces huge food security challenges. About 70 percent of the population live on less than N 100 (US$ 0.70) per day, suffering hunger and poverty. Nigeria’s claim to remain an agrarian economy hinges on two key facts. The first is the share of agriculture in the Gross Domestic Product (GDP) and the second is the proportion of the population engaged in the agricultural sector. On both scores, the agricultural sector contributes more than any other sector of the economy. Agriculture provides over 40% of GDP while the population of Nigeria involved in farming is between 60 and 70%. However, large regional differences exist. In the southeast, as few as 22% of the population live in rural areas, most of whom are engaged in non-farming activities.

Nigeria has about 79 million hectares of arable land, of which 32 million hectares are cultivated. Over 90% of agricultural production is rain-fed. Smallholders, mostly subsistence producers account for 80% of all farm holdings. Both crop and livestock production remain below potentials. Although the average agricultural growth rate was 7% between 2006 and 2008, this growth lies below the 10% necessary for attaining food security and poverty reduction. Among other factors, inadequate access to and low uptake of high quality seeds, low fertiliser use and generally inefficient production systems lead to shortfalls. As a result, Nigeria’s food import bill has been on the rise. Nigeria’s large, growing population has become dependent on imported food staples. This includes commonly consumed staples such as rice, wheat and fish. This was not the case prior to the boom in petroleum exports starting from the early 1970s.

Nigerian agriculture contributes to a small extent to global warming through bush burning and other environmentally adverse management practices, but it suffers the full impacts of climate change. All this is wholly consistent with the findings on the present and future state of agriculture in sub-Saharan Africa summarized in the excellent international assessment of agricultural knowledge, science and technology (IAASTD) concluded in 2008.

1 2020 - Young Nigeria’s Perceptions, research commissioned by hbs, May 2012
the challenges

Nigeria faces two central challenges to her agricultural sector and food security: population dynamics and climate change.

population dynamics

<table>
<thead>
<tr>
<th>Nigeria’s population</th>
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<tbody>
<tr>
<td>Population in 2050: between 230 and 430 million people.</td>
</tr>
<tr>
<td>Urban population in 2011: 51%, and growing.</td>
</tr>
<tr>
<td>Population earning less than US$ 2 per day in 2009 was 84%.</td>
</tr>
<tr>
<td>Nigeria in 2011: the world’s 7th most populated country.</td>
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<tr>
<td>Nigeria in 2050: the world’s 3rd most populated country after India, China, outstripping the USA.</td>
</tr>
</tbody>
</table>

A number of lessons emerge from the current and projected future population dynamics of Nigeria with major implications for agriculture and food security and, therefore, for the articulation of a Green Deal for Nigeria. These are:

- Nigeria’s population is growing, and the country’s food security challenges will grow with it. At the current growth rate of domestic food production, Nigeria is unable to feed its growing population. Domestic food production will have to expand at a faster rate.

- Nigeria’s urban population will soon outstrip the rural population. The population shift to urban centres is projected to become even more pronounced in the future. Despite its roots, the urban population is disconnected from the food production system and will rely on the market for food supply. This supply will have to come from domestic production or imported food.

- Youth make up a growing share of the population. They are the bulk of urban migrants and are thus unavailable for agricultural vocations. This raises the challenge of retaining and educating the next generation of farmers. As agricultural technology development and diffusion has stagnated, the sector continues to rely on human labour for farm power. This stagnation is due to a lack of local innovation, especially in mechanisation that is appropriate to the ecology. Farmers cannot afford the equipment, and in turn there is a lack of local maintenance capacity. Mechanisation and labour saving devices are in urgent need and require the development of local capacity.

- Rural poverty will increase just as urban poverty has increased. Employment and income will have to be created for a large and growing youth population. With modern research and technology, agriculture provides a great opportunity to turn rural poverty and stagnation into development. At least in theory, the rural youth could produce the food that the urban youth consume. However, this would assume that the urban youth have the required purchasing power. But a different scenario may play out in which the rural youth do not benefit, where big agribusiness produces the bulk of food for the urban centres. Can there be agricultural jobs without consumers? Can there be high demand for agricultural products without jobs for
youth? Whatever way one looks at it, it is clear that agriculture as a development issue will remain a core challenge for Nigeria for the coming decades.

- To address these challenges, Nigeria’s agricultural and food security policy and programmes should adopt a twin-track approach, on one side encouraging commercial agribusiness, while on the other side supporting the huge population of subsistence producers, as this is critical to rural food security, social cohesion and poverty alleviation.

“Instead of marrying a farmer I will pray to God to give me the right husband.”

ABC1, 20-25, Female, Abuja Urban

- The nature of these supports and encouragement should more than in the past consider the environmental challenges and remedy the consequences of past and present agricultural practices and management, which hinge on input support, and land resource utilization, management and conservation.

- The central role of women in the agricultural economy needs to finally be recognized and be reflected in the policies and measures that purport to buttress smallholders.

**climate change and Nigeria’s agriculture**

Nigeria’s climate is changing. The country’s current and future climate challenges are summarized in the National Adaptation Strategy and Plan of Action on Climate Change (NASPA-CCN):

<table>
<thead>
<tr>
<th>climate variables</th>
<th>mangrove zone</th>
<th>rain forest</th>
<th>tall grass (savanna)</th>
<th>short grass (sahel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>temperature</td>
<td>Up</td>
<td>up</td>
<td>up</td>
<td>up</td>
</tr>
<tr>
<td>rainfall amount</td>
<td>Up</td>
<td>up</td>
<td>down</td>
<td>down</td>
</tr>
<tr>
<td>rainfall variability</td>
<td>Up</td>
<td>up</td>
<td>up</td>
<td>up</td>
</tr>
<tr>
<td>extreme rainfall events: droughts</td>
<td>Likely</td>
<td>likely</td>
<td>up</td>
<td>up</td>
</tr>
<tr>
<td>extreme rainfall events: storms &amp; floods</td>
<td>Up</td>
<td>up</td>
<td>likely</td>
<td>likely</td>
</tr>
<tr>
<td>sea level rise</td>
<td>Up</td>
<td>n/a</td>
<td>n/a</td>
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Evidence clearly shows that the weather is becoming more extreme, be that in form of drought or rain, leading to different impacts according to climate and geographical zones.

The Nigerian Meteorological Agency (NIMET) has assessed the Nigerian climate over the period from 1941 to 2000 and has demonstrated dramatic changes in weather patterns: Irregular rainfall pattern give rise to fewer rainy days\(^3\). NIMET demonstrated that the combination of late onset and early cessation of rains led to a shorter rainy season in most parts of the country from 1971 to 2000 compared to the period 1941 to 1970. Between 1941 and 2000, annual rainfall decreased by 2-8 mm across most of the country, with the exception of Port Harcourt where it increased by 2-4 mm. The rainfall trend between 1901 and 2005 shows a general decline.

Long-term records show that over the past 105 years, the amount of rainfall per year dropped by 81 mm. The trend of declining rainfall worsened after 1970 and continues to this date. This coincides with a period

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\(^3\) Adelekan, I.O. (2009). Vulnerability of Poor Urban Coastal Communities to Climate Change in Lagos, Nigeria. *Fifth Urban Research Symposium 2009*
of sharp temperature increases. This general trend of a decrease in rainfall does not apply to the coastal areas, where places like Warri, Brass and Calabar have experienced a slight increase in rainfall recently.\(^4\)

Between 1941 and 2000, average temperatures increased by an alarming 1.4-1.9\(^\circ\) Celsius. It is exactly the kind of temperature increases that IPCC experts warn us would make parts of the world uninhabitable. Given the fact that scientists project a further temperature increase of between 2 and 5\(^\circ\) Celsius this century, one might wonder what kind of agriculture will still be possible in the areas most affected, i.e. in the extreme north-east, north-west and south-west of Nigeria.\(^5\)

Climatic changes already have varying, mostly adverse effects on agriculture and, therefore, food security in various parts of the country. Consequently the National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN), has identified a number of key measures with assigned roles to stakeholders at the national and sub-national levels. Higher temperatures result in decreased agricultural productivity and production, high evaporation rates and reduced soil moisture, lowering of the groundwater table and shrinking of surface water. Heat stress reduces human labour use on farms, lowers labour productivity and leads to rapid deterioration and wastage of farm produce.

Changes in the amount of rain, increased rainfall intensity and changes in rainfall patterns lead to decreased resource productivity and production (crops and livestock). 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. Erratic weather interferes with processing of produce (an example is sun-drying of crops and smoking of fish). Increased frequency of major storms causes 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.

The NASPA adopted by the Ministry of Environment in November 2011 and awaiting approval by the Federal Executive Council, has two overall focuses with respect to agriculture and food security, which we endorse. These are:

**Adopt improved agricultural systems for both crops and livestock**

For example, diversify livestock and improve range management; increase access to drought resistant crops and livestock feeds; adopt better soil management practices; and provide early warning/meteorological forecasts and related information.

**Implement strategies for improved resource management**

For example, increase use of irrigation systems that use small amounts of water; increase rainwater and


\(^5\) Also see technical background paper to NASPA, *Climate Change Adaptation Strategy Technical Report (CCASTR)* at [www.nigeriaclimatechange.org](http://www.nigeriaclimatechange.org)
Agriculture and Food Security

Groundwater harvesting for use in agriculture; increase planting of native vegetation cover and promotion of re-greening efforts; and intensify crop and livestock production in place of slash-and-burn practices.

**green agriculture and food security**

Before Nigeria can address the underlying problems articulated above, there are three contending issues that need to be resolved. These directly determine the potential of a successful green transformation of Nigeria's agricultural economy and food security situation in a changing climate. These are:

1. The sensitivity and vulnerability of Nigeria's economy to the often unstable international crude oil market. The Nigerian economy is for over 80% dependent on the petroleum sector for the provision of public finance. Despite its significance to the national economy, the oil sector has not spurred real economic growth, has created very few jobs and its wealth has been distributed amongst a small elite. A national policy framework is needed to diversify Nigeria's economy away from a mono-product one, which is heavily dependent on petroleum mining and export (see the other chapters in this report). It is well accepted that the agricultural sector will be a key sector in this pursuit.

2. The second issue concerns the preferred pathway for agricultural development in Nigeria. The rural economy is heavily dependent on smallholder producers, whose primary need is household subsistence. They produce little marketable surplus. Since at least 1972, the target group of the National Accelerated Food Production Programme (NAFPP) has been this category of farmers. The aim was to help them raise output, productivity, income and thus break out of a cycle of poverty. Obviously, the failure of this approach has a significant social impact. The contemporary policy thrust focuses on a transformation of the agricultural sector which seeks to promote agribusiness along the value chain.

3. The third issue is whether a green agricultural sector can assure food security for a growing population of Nigerians. The current controversies around different interpretations of what constitutes a green economy provides an opportunity for refocusing the policy thrust and refine strategies for an agricultural sector that is predominantly low carbon, resource efficient and socially inclusive. This will include more sustainable agricultural practices that protect the soil and use fewer external inputs (especially agro-chemicals, such as mineral fertiliser, pesticides and herbicides),

Understanding this we can proceed and address the underlying problems that a green deal for Nigeria's agriculture and food security needs to contend with.

**Nigeria remaining a largely agrarian country**

The lesson from developed economies and the experience of other countries is that, even where aggregate volume and value of production increases, the share of agriculture in GDP declines over time. Nigeria’s goal should still be to raise aggregate output and value of production through value addition along the production / supply chain. A similar trend can be observed in agricultural employment. A picture emerges in which less labour is engaged in the agricultural sector, yet output increases. This is generally attributed to the higher economic returns on labour in other sectors of the economy. In Nigeria’s case, the drop in the number of people engaged in agriculture has not come about through a process of structural economic transformation of the sector but by an abandonment of rural farm life for urban areas. In contrast, the transformation towards a higher-
yielding, more intensive agriculture in developed countries has often emerged from technological development, especially mechanisation which raises total factor productivity, specifically land, labour and capital productivity.

When projected into the future, Nigeria's young and growing population is increasingly living in urban areas and alienated from rural life and the farming vocation. With stagnant technology and virtually no advance in mechanisation, maintaining agricultural production will be difficult. This shows the urgent need for two national policy interventions. The first is developing local technology, especially mechanisation capacity. The second is developing a successor generation of farmers. Adequate incentives and subsidies are needed to achieve this.

agriculture as the prime driver of Nigeria's future development

Prior to the present era of dependence on crude petroleum exports as the source of Nigeria's public finance and foreign exchange, the agricultural sector was the prime driver of the economy and main source of foreign exchange. But for decades now the expenditures of the significant funds accruing to the public purse tend to favour the urban non-agricultural sectors. They have drawn labour and investment away from agriculture. There is little reason to expect this to change, but there are lessons to be learnt here.

The agricultural sector needs sustainable growth in output / production, with less carbon emissions. Contrary to common beliefs, according to the IITA and government statistics, cassava and maize yields per hectare have risen. The rate of increase has, however, not kept up with the increase in consumption. Growth also needs to be socially inclusive, with the benefits equitably distributed so as to reduce rural poverty and eliminate hunger and reduce food insecurity. The current policy emphasis is to increase the domestic production of basic staples. It would be commendable if Nigeria were to achieve this in the short or even medium term. But there is little basis for optimism that agriculture could once again become the prime driver of the Nigerian economy and an important provider of foreign exchange.

A supplementary policy tailored for high-value commodities, such as horticultural products, and developing a high-value (international) market for organic products could be initiated. A few state governments in Nigeria, such as Kwara State, appear to be working in this direction. The challenge here will be ensuring the social inclusiveness of the development and the distribution of the accruing benefits.

a green agricultural economy as an opportunity for ordinary Nigerians

While the current policy is designed for the commercial agribusiness sector to quickly produce surpluses for domestic consumption and reduce import dependency and foreign exchange expenditure, there is still a huge rural population that will require agricultural policy support with a development focus. In designing this policy, consideration should be given to the twin challenges of rising population in both rural and urban Nigeria and climate change.

Consequently, there is need for further policy reform on inputs supply, technology improvements, credits and subsidies. The recently launched transformation programme seeks to supports improved seeds and seedlings in particular. These cannot be diverted from agricultural use into non-farm uses. So far the government has not promoted or distributed genetically modified seeds, which are opposed by many
Nigerians including major NGOs. The main reason for this opposition is concern for health and ecology. Other reasons are the limited ability to pay, coupled with the risks associated with reliance on the market for supplies. There is also suspicion of the existence of terminator genes in GM crops. Were Nigeria to allow GM crops this would potentially harm its ability to export food to Europe. The National Agricultural Seeds Council (NASC) is the major government agency responsible in this area.

It is hard to see how without more development benefits reaching the rural poor, the trend of growing migration of people and livestock from the drier, hotter parts of the country can be stopped, with the attendant resource competition and social and security conflicts. It is being argued that the current social conflicts in the Northeast have a link to the severe temperature increases, and reduced precipitation. As discussed in the chapter on climate change and security this has reduced Lake Chad and led to the loss of livelihood for fishing and farming communities in that region.

A rapidly growing poor urban population may not be in a position to constitute effective demand for either locally produced or imported food. The large urban food-insecure and poor population could thus present future security challenges to Nigeria, as in other sub-Saharan countries.

**challenges to a green deal for agriculture and food security**

There a number of challenges to the attainment of a vibrant agricultural economy that sees an equitable distribution of the benefits of sustainable development and reduced carbon emissions. These can be articulated as follows:

- What is the potential of low external input and organic agriculture to feed Nigeria's large, growing population?
- Can resource use efficiency be increased significantly without further adverse environmental consequences (soil, water, etc.)?
- What are the critical low carbon issues in Nigeria's agriculture?
- How is gender inclusion central to alleviating poverty and improving food security?

The adaptation measures currently used by smallholders in the agricultural sector provide some insight. Traditionally, the response to resource problems by crop farmers and livestock herders is the seeking of new lands. This is a process that only functions where land use systems are extensive, allowing for migration of people and livestock. At present, farmers are not simply searching for new land and water sources, they also seek new external inputs such as drought-resistant bio-tech seeds and inorganic fertiliser to raise output per hectare as soil fertility declines and the limits of the traditional fallow measures are exceeded. In addition, farmers and herders seek non-agricultural livelihood means.

The green deal for agriculture and food security in Nigeria needs to embrace the complexity and heterogeneity of the sector both in ecology and socio-economy. But it is uncertain if the recommended adaptation measures in the NASPA will be adopted across government. This is due in part to the absence of information and large funding needs for adaptation at the national, state and local levels. In addition, at present there is no holistic governance of climate change matters in Nigeria. A national Climate Change Commission is expected to synergise policies and bring stakeholders from across the narrow confines of specific ministries, departments and agencies together.

The high population density seen in several regions makes maintaining or restoring soil fertility crucially dependent on the sourcing of external inputs by smallholders, who are the dominant producers. This is especially true for organic and inorganic fertiliser. While the emerging agribusiness sector uses more
external inputs, the extent of that use is still considered low by international standards. The current policy preference is, therefore, to promote the use of external inputs – inorganic fertiliser, bio-tech seeds, etc. This is, however, done in the absence of a true cost and sustainability analysis. In some areas Nigeria lacks adequate research findings on its policy options. Specifically, there is not enough comparative information on the cost and benefits, including the sustainability, of high-input versus organic farming in Nigeria.

Many agriculturalists worry that a transition to low external input organic farming may raise the cost of food. The experience in some more advanced economies with this is mixed. Furthermore, the potential of low external input and organic agriculture to feed Nigeria's large, growing population remains unclear. The goal of a 'sustainable agriculture' transformation requires that resource use efficiency be significantly increased without adverse social and environmental consequences. To make soil and water utilisation sustainable, the current generation of farmers will need to be weaned off of generations-old practices. This suggests that improved farm management practices are better introduced after educating future generations of farmers.

In this context it is noted that Nigerian farmers make a marginal contribution to global warming through such practices as deforestation and bush burning. This can be addressed through the extension services that advise on alternative land preparation and weed control measures. Nigerian farmers believe that without bush burning there will be more weed infestations that require more labour to handle. Ironically, labour scarcity on farms is prevalent and seems to be on the rise. In most Nigerian farming systems both women and men provide farm labour, but there is gender stereotyping of roles. Weeding and post-harvest handling are commonly the role of women. This is important as this is where harvest losses accrue. Policy and programme interventions, therefore, have to factor in gender roles in ensuring food security.

recommendations

A number of issues need to be considered in conceptualizing a green deal for Nigerian agriculture. This would be greatly aided by a comprehensive mapping of agricultural potentials, taking into account the factors listed below.

i. The fact that the agricultural sector is highly impacted by the changing climate should be at the fore in conceptualizing and further developing a green economy vision for Nigeria.

ii. Resources that where once taken for granted - water, land, minerals, fossil fuels – already face or will soon have limited availability and high cost. Water, for example, is increasingly scarce for Nigeria’s agriculture not just from the changing rainfall patterns but also from drying aquifers, rivers and rivulets.

iii. There is a need to reassesses the environmental footprint of agriculture and its greenhouse gas emissions, water use and soil management. Despite the existing regulations, land preparation and use practices entail deforestation and bush burning, which contribute to GHG emissions. Currently, no comprehensive annual assessment is made of the sources and volume of these greenhouse gas emissions.

iv. Appropriate technology can not only increase productivity and improve efficiency but also reduce GHG emissions. Thus the magnifying effect of green development impacts positively on agricultural output and on the environment. Specifically, technological and management innovations are recommended that reduce GHG emissions and land degradation, such as stopping bush burning, utilisation of waste from livestock farms in biogas silos and reducing post-harvest losses (also
through local fruit processing) as these also add to GHG emissions.

v. Farmers can be encouraged to identify and focus on increasing the production of high-value and organic agricultural products. Notwithstanding the fact that the organic foods sub-sector is a niche market aimed primarily at wealthy urbanites, it can boost farmers’ earnings and potentially bring in foreign exchange.

vi. Policy measures should be designed to reduce carbon footprints, encourage waste conversion, use energy-efficient means of production and employ renewable energy from wind farms, solar, small-scale hydro and biomass. In addition, a reduction in non-biodegradable waste and storage materials can be achieved.

Achieving the green deal for agriculture and food security in Nigeria requires a two track approach, on the one hand fostering a future for agri-business to increase food security for a growing urban population and on the other hand offering continued support to smallholder and subsistence farmers with the aim of alleviating poverty. Both tracks need incentives and subsidies to boost domestic production.

Nigeria needs a special programme devoted to a new generation of farmers. The programme should provide young educated people interested in agriculture with training in agricultural entrepreneurship. It should also provide some financial and technological support. This new generation of farm entrepreneurs will thus be enabled to use improved technologies and modern management approaches that help ensure farm profitability and sustainable resource use. Profitable agribusiness is important to keep an emerging farming entrepreneurial group engaged and stop a re-creation of current challenges with farm sector desertion by young Nigerians.

The government needs to guarantee land tenure security and land access in the face of changing population dynamics, migration, and potential competition between agri-business and smallholder and subsistence producers. This will also require adequate investments and funding incentives. Access to farm land is being restricted for cultural reasons, by the existence of communal holdings with unclear use rights, as well as misappropriation and large-scale acquisitions. Urbanisation has led to large-scale acquisitions of land by the government. This land has often been allocated to a small elite that have limited access to this land.

There is a need for the identification of agro-technologies for improved soil management that reduce carbon emissions while increasing production. Considering that Nigeria’s agricultural sector is mostly rain-fed, increased investment and extension for irrigation facilities, including water harvesting and precision drip systems may be an option for some farmers, the latter especially for market-oriented, often younger and educated, farmers.

To implement a green deal for Nigeria’s agriculture, a tighter regulatory environment may be required aimed at reducing GHG emissions. For now, consistent enforcement of existing regulations on land use and management, including bush burning and land degrading practices is needed.

It would generally be helpful to encourage a reduction in chemical use in crop and livestock production, including fishing. This would have immediate positive health effects, but could also result in an increase in farm employment. These jobs would help improve food security, reduce poverty and lead to a better distribution of the benefits of green development in the agricultural sector. Sustainable management and maintenance of soil fertility and the wider ecological diversity is crucial to the future of farming. Bush burning can be stopped by raising public awareness, moral and community-driven persuasion and consistent enforcement of the existing regulations. In addition, the next generation of farmers can be discouraged from such practices during their training.
The conventional approach to growth as substitutive of environmental health and sustainability has been shown to be false. Strong economic performance is not necessarily exclusive of great environmental performance. Through innovation Nigeria can solve the current challenges and her agriculture could aim to become carbon-neutral by 2030. Improved farm management that is conscious of soil fertility requirements, integrated soil and pest management that put an end to soil-degrading practices and integrated crop and livestock systems that operate as close loops linking waste, by-products and inputs are examples of such innovation. Material-flow analysis and application of such lessons should become mandatory in the education of a new generation of Nigerian farmers.

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