

SOIL SURVEY, LAND EVALUATION AND FOOD SECURITY SCENARIO IN NIGERIA

^{*1}Obi J.C. and ²Ogunkunle A.O.

¹Department of Soil Science & Land Resources Management, University of Uyo, Uyo, Nigeria

²Nigeria Institute of Soil Science, Abuja, Nigeria

*Corresponding author's email: objbc@yahoo.com

ABSTRACT

Poverty and malnutrition are tragedies and their absence is the national development rubicon. They are captured in sustainable development goals (SDG) 1, 2 and 3 and remained intractable in most developing countries including Nigeria due to largely uncoordinated planning in majority of the facets of the country. The association of these goals (SDG 1, 2 and 3) with agriculture avails the sector a pivotal role and policy and planning becomes critical. The pivotal and critical role of planning in agriculture will be insignificant in the absence of a national soil classification system with accompanying detailed survey and land evaluation. This study highlighted the consequences of the absence of a pragmatic soil survey and land evaluation report for sustainable soil management and its implications to food security in Nigeria. The burden of poverty directly impacts the human dignity and Nigeria's quest for economic diversification has become imminently indispensable because dependence on fossil fuel is losing its capacity to support growth and development. The primary focus and best option for diversification is agriculture with soil as the basis. This is not just for sustainable development, but for food production in a drive for food security and probably sovereignty. The first step in this drive is proper understanding of the soil resources of the nation through soil survey and land evaluation at a level of realization for sustainable pragmatic agricultural purposes. These are impossible in the absence of a uniform and nationally acceptable classification system (at least at the series level of United States Department of Agriculture Taxonomy) which possess numerous benefits to the extent that continued delay is very detrimental to the growth and development of any contemporary society. This is prior to the indispensable establishment of localized and indigenous classification system for Nigeria soils.

Key words: soil survey, land evaluation, food security, SDG

INTRODUCTION

The tragedy of poverty has debilitated humanity to the extent that limitless effort is required to resolve the challenge. The indices used to measure the extent to which these challenges are resolved are sustainable development goals (SDGs). Sustainable development goals proffer a set of universal targets to meet the urgent environmental, political and economic challenges facing the world. Countries like Nigeria possess the requisite human and natural resources to be self-reliant and prosperous yet critically challenged especially with the first three SDGs (poverty, hunger and health) which are fundamental to human existence and livelihoods (UN, 2017; IITA, 2017; Otekunrin *et al.*, 2019a).

The Burden of Poverty and Human Dignity

The first three and most fundamental goals (to confront poverty, hunger and health) associate with each other to the extent that the availability of food seems the central point and singularly resolves the entire challenges. The indication is that food security is primary to human existence. The National Bureau of Statistics (NBS, 2019) released the 2019 poverty and inequality in Nigeria report,

which highlights that 40% of the total population, or almost 83 million people, live below the country's poverty line of 137,430 Naira (\$381.75) per year (approximately 376.5 Naira per day).

According to the Nigeria Bureau of Statistics (NBS, 2019) the poverty line is anchored in the minimum nutritional requirement of individuals. This is calculated with the aid of an official poverty line interpreted as the monetary value of the food and non-food entities referred to as the "cost of basic needs" approach. The inclusion of non-food component is to the extent that it affects the capacity of the family to fulfill nutritional requirements. Also, the report of National Food Consumption and Micronutrient Survey (Maziya-Dixon *et al.*, 2004) reported significant malnutrition among young children, including high levels of anemia, vitamin A deficiency, stunting, wasting, and underweight (note that this is the most recent report from NFCMS). These underscore the importance of food and the danger of scarcity. Gebrehiwot (2022) reported significant relationship between soil management, food security and livelihood. These are clear indications that food security is the beginning of the fight against poverty, assurance of human existence

and that soil is indispensably playing pivotal role at the centre. It is again emphasized that poverty, hunger and health are intricately intertwined to the extent that absence of poverty implied absence of hunger and presence of healthy humans.

Nigeria's Quest for Economic Diversification, Growth and Development

The current dynamics of the global scheme rendered fossil fuel, the erstwhile major source of revenue for Nigeria less attractive creating the need for alternative, dependable and sustainable sources. The advantage of size (approximately 923,768 km² land area), diversity of climate that span from humid tropical to dry savannah, soil etc. provide the advantage of agriculture for the desired economic diversification, growth and development. The history of Nigeria's past glory and exploits is replete with evidences that agriculture could successfully support the twenty first century growth and development especially practiced with a changed mindset of sustainability and profitability.

The understanding of the benefits of agriculture amongst the regional government led to the existing diverse and uncoordinated soil maps and accompanying naming or classifications systems (Moss, 1957; Smyth and Montgomery, 1962; Jungerius, 1964; Klinkenberg and Higgins, 1968). These described the trajectory of the former regional governments that would have given birth to a significantly developed country and would have been the basis for the beauty and advantages of agriculture in the Nigeria of today. The desire to trace back the route to growth and development through agriculture as late as it may seem established, emphasized and underscored the decision of the country to retrace the destined path of growth and development. These justified the decision to return agriculture as a genuine and sustainable source of revenue for growth and national development.

National development simply means a sustained improvement in the standard of living in the country as depicted economically, by sustained growth in per capita income. Economic development is brought about by sustained economic growth, which is characterized by high efficiency and productivity of resources (Ayinde, 2019). It is a fact widely acclaimed that no country can achieve economic freedom and development without effective, functional and properly designed agricultural policy. This will lead to food security and sustainability in the provision of abundant crop and livestock (food accessibility, food affordability, food utilization and food quality), to meet local consumption, raw materials for the processing industries, national reserves, export, etc. (Ayinde, 2019). Development of Nigeria must be hinged on sustained growth in agriculture and food security. Increases in production activities in the industrial, mining, metallurgy sub-sector, especially if it promotes

export (like the case of Nigeria being a net exporter of urea) must, without doubt, put food on the table of an average Nigerian. No economy can thrive sustainably without improving the human capital component of the economy and this starts with sustained availability of food for the health and mental readiness of the citizens (Otegunrin, 2011; Awoyemi *et al.*, 2015; Ayinde, 2019).

Soil the Basis of Agriculture

According to Parikh and James (2012) throughout history, human relationship with the soil has affected the food production capacity and civilizations to the extent that the contemporary hydroponic contraption remained abstract to the detriment of the ultimate end of food and fibre sufficiency. Therefore, same early and clearly established relationship between humans, the earth, and food sources have continued to affirm the soil as the foundation of agriculture and its intricate connection with nutriment and environment is inseparable. The art of food production is the ingenious, aggressive and creative utilization of natural resources primarily for selfish purposes but subsequently for sustainability. Soil and water are the resources that have provided humanity with the ability to produce food, through agriculture. Therefore, policies that emphasize understanding and care for soil is fundamental for human existence. The inseparability of soil and water presupposes that care for the soil includes the water. The crucial accompaniment is the knowledge of the various soils, distribution and characteristics in any Nation. Unless this is taken seriously on very concrete terms, food insecurity and its attendant problems of malnutrition, poverty, poor health condition and social insecurity will remain intractable.

Food Security

Food security is a complex, multifaceted concept usually influenced by culture, environment and geographical location (EIU, 2018). The Food and Agriculture Organization (FAO) gave a clear definition of food security at five different levels (individual, household, national, region and global). According to the World Food Summit (FAO/UN/WFS, 1996), food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The most important dimensions of food security are availability, access, stability and utilization without compromising the care-related aspects of good nutrition. The inadequacy of any of the important dimensions is still described as insecurity. Emphatically, the priority issues listed as the first three sustainable development goals are the core measurable issues that will satisfy food security and the absence of which is the manifestation of insecurity (Tittonell, 2015).

The major challenges of food security are the apparent indecipherable, retrogressive and intractable consequences of land degradation, climate change, population growth, rising food prices, environmental stressors. These have manifested significant yet uncertain impacts on food security and currently complicated and aggravated by the COVID-19 pandemic. The desire and efforts to confront these complications is the development of adaptation strategies and policy responses including options for handling water allocation, land use patterns, food trade, postharvest food processing, food prices and safety. Hoddinott *et al.* (2014) reported the factors confronting global food security to be cash transfers, promotion of sustainable agricultural technologies, building resilience to shocks, and managing trade-offs such as balancing the nutritional benefits of meat against the ecological costs of its production in the adaptation strategies in food security. The case of Nigeria is the absence of the soil survey and associated peripherals which are the fundamental bedrock of agriculture that will trigger other activities for sustainable food production and security.

Global Perspectives on Food Security

Food security is improving in every region of the world except Africa with progressively worsening scenarios. The discovery that Africa's weak policy performance in the food and farm sector may be in part an outgrowth of ethnic diversity compounded by political malfunction that date back to colonial history of externally imposed state formation is an inconvenient one for the economists (Paarlberg, 1999). The absence of food security (i.e., food insecurity) which is always rooted in poverty decreases the ability of countries to develop their agricultural markets and economies, leads to instability which is normally contagious (not restricted by physical boundaries). Thus, rendering food security that could be defined with personal rather than family, state or nation consumption pattern a global phenomenon. This is coupled with the consciences of sustainable development goals. These gave food security its complexity because it is defined with individual consumption pattern but achieved with communal effort from different nations for citizens. Food security or insecurity as a global phenomenon is enshrined in the communal effort that they either make for themselves or in support of stronger communities to ensure that the ability to feed its population with adequate amounts of nutritional foods and within the confines of the universally acceptable definition. Pinstrup-Andersen and Pandya-Lorch (1997) have reported that growth in the agriculture sector has been found, on the average at least twice as effective in reducing poverty as growth in other sectors. This is simply because measurement of poverty (NBS, 2019) is carried out with accessibility of food and the most important SDGs (1, 2 and 3) are about food with

inter-twined poverty, hunger and health. These are indications that free access to quality and nutritious food is fundamental to human existence and could produce such wide-ranging positive impacts as reported by Pinstrup-Andersen and Pandya-Lorch (1997) as economic growth and job creation, poverty reduction, trade opportunities, increased global security and stability, improved health and healthcare.

The rate of global food production in the world of today is high to the extent that there is enough food for humanity, yet about 840 million people are chronically under-nourished, around 185 million pre-school children are seriously underweighting for their age, and illnesses resulting from, or exacerbated by hunger and malnutrition are widespread (FAO/IFAD/UNICEF/WFP/WHO, 2020). The fact that the world's population is expected to increase by 80 million annually over the next quarter-century means that the world population will reach 9.8 billion in 2050, and 11.2 billion in 2100 (UN, 2019). Therefore, attaining food security becomes increasingly burdensome and by extension global challenge and achievement of peace in the world will to a large extent depend on the commitment of stronger communities. According to Pinstrup-Andersen and Pandya-Lorch (1997), will there be enough food to meet the needs of current and future generations? And even if enough food is available, will all people have access to sufficient amounts to lead healthy and productive lives? Can, and will, global food security be attained or will food surpluses continue to coexist with widespread hunger and malnutrition, further destabilizing and polarizing the world? What will it take to ensure a world of food-secure people?

Reports on food insecurity, hunger and malnutrition at the global and regional levels show that challenges remain in the fight against food insecurity and malnutrition in all its forms (FAO/IFAD/UNICEF/WFP/WHO, 2020). More than 820 million people in the world were still hungry in 2018, underscoring the immense challenge of achieving the Zero Hunger target by 2030 (FAO/IFAD/UNICEF/WFP/WHO, 2020). A greater focus on overweight and obesity including child overweight and adult obesity is needed to better understand the different dimensions of these nutrition challenges. Hunger is slowly rising in Latin America and the Caribbean while western Asia shows a continuous increase since 2010, with more than 12 percent of its population currently under-nourished. Hunger is on the rise in almost all African sub regions, making Africa the region with the highest prevalence of under-nourishment.

In the Africa regional overview of food security and nutrition of 2017 and 2018, FAO reported that the prevalence of undernourishment was rising. But from 2020, it was observed the deterioration has slowed, yet as much as 256 million (20%) people remained hungry. The case is worse in the sub-

Saharan region contributing as much as 239 million and 17 million in northern Africa. The report further documents that although many African countries are making progress towards reducing malnutrition, progress is too slow to meet six key nutrition targets, which form part of the sustainable development goals (SDGs) monitoring framework and the world health assembly global nutrition targets. Food insecurity has been rising in Africa in recent years and the continent is not on track to eliminate hunger by 2030. The report revealed that conflict, climate extremes, economic slowdowns and downturns are the key drivers of the rise in food insecurity. In most cases, the economic slowdowns and downturns that contributed to rising under-nourishment in 2014-2018 were the result of commodity price falls. Many effective policy tools are available, but their adoption will depend on the availability of fiscal space to affect the desired policy action. In the longer term, countries must develop policies and invest to achieve a more diversified economy and achieve an inclusive structural transformation. However, sustained economic growth is not enough, reducing inequalities, including gender-based and spatial inequalities, is essential to strengthening household resilience, laying the path to inclusive growth and reducing food insecurity and tackling the multiple forms of malnutrition (FAO/ECA/AUC, 2021).

Distressing as the Africa regional overview of food security and nutrition report may appear the case of Nigeria is more discomfiting. Nigeria has the highest number of people living in extreme poverty globally. The global food security index (GFSI) ranking of Nigeria has been unabatingly on the increase since 2013, ranked 94th among 113 countries in the world and 43rd among 52 countries in Africa in 2019. The challenges Nigeria is facing are enormous ranging from food insecurity, especially in the northeastern and north-central states where conflicts/insurgency, kidnapping, armed banditry, cattle rustling and weather extremes are aggravating the food insecurity (Otekunrin *et al.*, 2019b).

Importance of Soil to Food Production and Security

Food security is meaningless without sustainable agriculture and the environment and soil is the central entity. Globally, soils provide food for approximately seven billion people. These comprise locations of surplus and meager production leading to the overall average that should be enough to feed everyone, but unfortunately not accessible to everyone, indicating that availability of food globally is unevenly distributed. Hence mind boggling 1 billion people are structurally under-fed (Klinkenberg and Higgins, 1968). It is noteworthy that with the world population is estimated at 9 to 10 billion by 2050 and therefore provision of the biophysical characteristics, socio-economic availability as well as productive capacity of food must be significantly improved (FAO/ECA/AUC, 2021).

Crucial in this scenario is the capacity of land users to manage their soils sustainably and productively. Imperatively the soil, which is the effective component for land users in this sense, must be proper understood to a very large extent. This understanding is impossible without soil survey and land evaluation report produced at the level of realization that will be effectively suitable for such pragmatic uses.

Appropriate utilization and management of soil are indispensable in the realization of the first three interwoven and interconnected SDGs of poverty, hunger and health. This is particularly reflected in action point 2.4 of the SDG that by 2030 ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, and that progressively improve land and soil quality'. In other words, achieving food security is a challenge and maintaining it another one, but soils are indispensably an important part of the solution. Soils need maintenance, but exploitation of soils has only intensified due to increasing pressure. In 2014, arable land per person was 0.20 ha in the world and 0.21 ha in Nigeria while 50 years ago this was 0.37 ha in the world, with marked regional differences as reported by the World Bank (World Bank Group, 2015). For instance, the availability ratio of arable land in Akwa Ibom State, Nigeria is projected to be approximately 0.004 ha per person by 2036 (Obi and Ituen, 2017). This alarming trend cries for significant investments necessary to restore soil health through maintenance and progressively improving the productive capacity of soils. Yet, investments no matter the extent may not have significant impact without adequate soil information collected at an appropriate scale.

Soil health constitutes the foundation for the production of healthy food and thus contributes to local and global food security. Recent findings indicate that there will need to be a 60% increase in global food production and associated ecosystem services by 2050 (van Dijk *et al.*, 2021). However, one-third of global soils are currently facing moderate to severe degradation through soil erosion, nutrient depletion, salinity, sealing and contamination. Therefore, evidence-based decisions process with soil information is crucial for achieving sustainable soil management (Rojas *et al.*, 2016).

Soil Survey, Processes and Food Security

Soil is essentially indispensable to human survival on earth. The humans rely on the soil for the production of food, fibre, timber and energy crops etc. Together with climate, the soil determines the choice of crops, location, and potential yield. In addition to supporting the production of agricultural needs, the soil regulates the flow of ground water acting as a filter for aquifer recharge. The implication of these are the tremendous important roles of the soil and the imperatives of appropriate management for long-term productivity, sustainability, health of humans and the ecosystem.

The burden of the inability of humanity to appropriately and sustainably utilize the abundant natural resource to service everyone, everywhere at all times is a critical challenge. It becomes more challenging that enough food is really available, but not accessible for various reasons to the detriment of persons and communities without adequate resources for the production of enough food for free use. Therefore, food security will not be achieved in the presence of obvious injustice. Yet some of the challenges could be surmounted with minimal structural support for the communities with the dearth of resources. These resources could be as simple as the development of the land management system. The availability of a properly designed land management system ensures appropriate land utilization, the decimation of land degradation and possibly reclamation of degraded lands and discontinuation of parasitization of the land or natural resources (nutrient mining). Records have shown that major source of ill health is poor nutrition which is a component of hunger, and food security is the immediate panacea for hunger and poverty, free access to nutritious food in the right quantity, everywhere and at all time (Kirkpatrick and Tarasuk, 2008; Hanson and Olson, 2012; Tarasuk *et al.*, 2013). The absence of hunger will enshrine an egalitarian society that may be devoid of crisis. Agriculture has been reported as the easiest means of poverty alleviation and could be effective in the presence of detailed soil survey with appropriate interpretation supported with suitable policies (Pinstrip-Andersen and Pandya-Lorch, 1997).

Soil survey becomes handy in this regard for the provision of the appropriate land management information and production options. Some of the outcomes of the soil survey are soil and land evaluation map and accompanying reports. A farmer (or other users of land) achieves the greatest net return by using each soil for the crop and management which gives maximum return, and this will depend on the outcome of resource inventory contained in the soil survey report. The soil map as one of the outcomes of soil resource inventory indicates the boundaries between soils requiring different management for optimum returns and sustainable environment.

Soil survey is an inventory of the properties of the soil (such as texture, internal drainage, parent material, depth to groundwater, topography, degree of erosion, stoniness, pH, and salinity) and their spatial distribution over a landscape. Soils are grouped into similar types and their boundaries are delineated on a map. Each soil type has a unique set of physical, chemical and mineralogical characteristics and has similar reactions to use and management. The information assembled in a soil survey can be used to predict or estimate the potentials and limitations of the soils' behaviour under different uses. As such, soil surveys can be

used to plan the opening up of lands or to evaluate the conversion of land to alternative uses. Soil surveys also provide insight into the kind and intensity of land management. The capacity of soils with it accompanying environmental variables (i.e., land) could be assessed as highly, moderately, marginally and not suitable. Therefore, the first step in sustainable soil management is ensuring that the soil is suitable for the proposed land use activity. The suitability ranges from highly (optimal) to not suitable. For this reason, agricultural development should only occur in areas where the soil resource will support the agricultural activity. The only way to do this is to understand the soil resource that is available. Soil survey information is the key to understanding the soil resource.

Soil survey or soil resource inventory is the systematic description of soils in the field and grouping into well-defined mapping units such as soil series, phases etc. to identify their best use and show their location on the map. Soil survey an elaborate activity and some of the components may be listed for emphasis of the possible benefits obtainable. These components include delineation and mapping of the soils into homogenous units (mapping units), characterization of the mapping units, classification of the mapping units, and land evaluation for alternative uses and interpretation for various land uses. The outcome soil survey activities are the catalogue of very important information that could be used for sustainable land management decision processes. The information is unspecific, but typically a compilation of available natural resources within the study area. The information is compiled to suit the need and interpreted by the professional planners from diverse backgrounds. Predictions based on such soil surveys serve as a basis for judgment about land use and management for areas ranging from small tracts to regions of several million acres and these depend to a very large extent on the resources devoted to the activity. These predictions, however, must be evaluated along with economic, social, and environmental considerations before they can be used to make valid recommendations for land use and management.

The role of soil survey or inventory of land resources in the development of any nation is strategic to the extent that the entire sectors must directly or indirectly benefit from the soil map produced and subsequent interpretations in the forms of land evaluation and land use planning. It primarily determines the allocation of various resources within the physical environment. It is therefore required to be carried out during the planning stages for the allocation of all physical infrastructures. These are indications that soil survey activities are the very first that must be carried out in the planning and development for any entity that must occupy any physical or virtual space on the surface of the earth.

A soil map indicates the boundaries between soils requiring different management for optimum returns. The benefits from a soil survey increase with the 'purity' of the soil units as mapped. It is then obvious that the soil map of a country constitutes an indispensable basic national and infrastructural project for agricultural development and for the sustainable management of the primary sector. A farmer (or other users of land) achieves the greatest net return by using each soil for the management purposes which gives an optimum return.

Soil map is a capital-intensive investment which is a one-off activity but could only be improved within the dynamics of time. The details and usefulness of the soil survey depends on the intensity of field observation which will eventually lead to the soil map. These equally apply to the cost of soil survey which increases sharply with the purity. The mapping scale largely influences the accuracy of soils grouping into soil mapping units (SMUs). Detailed and semi-detailed soil maps are widely used for agricultural applications such as land resources assessment and land use planning. For the purpose of emphasis, a detailed survey is normally produced at scales that range from 1:25,000 to 1:10,000 and mapping units are soil series and phases of the series. These will easily result to availability of such specific purposes interpretive maps as land suitability (crop specific), irrigation suitability, drainage, salinity etc.

Technology Transfer

Soil survey is an important component of technology transfer. They are needed to move knowledge from agricultural research fields and plots to other areas. Soil surveys allow the identification of areas that have soils that are similar to those in the research fields. Knowledge about the use and management of soils is spread by applying experience from studied areas to areas that have similar soils and related conditions. The relationships between soils and deficiencies of phosphorus, potassium, nitrogen, magnesium, and sulfur are widely known (Grains Research and Development Corporation, 2009). Important relationships have been worked out between many soils and their deficiencies of trace elements, such as copper, boron, manganese, molybdenum, iron, cobalt, chromium, selenium, and zinc (Kihara *et al.*, 2020). Relationships between soils and some toxic chemical elements have also been established (Kihara *et al.*, 2020).

Implications of Soil Survey for Food Security

If food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO/UN/WFS, 1996), then healthy soils are preconditions for such high-quality food. Then the first process in the struggle for food

security is land that through the process of soil survey or inventory of the available natural resources is catalogued for proper land management. Then combination of soil data, climatic and other requisite environmental variables will be utilized for interpretation of suitability of different mapping units for sustainable rural or urban uses without the danger of depletion in any form. This will enable appropriate allocation of land resources optimal and sustainable use. Also, adequate policies, support and investment will easily be attracted for agricultural production and other alternative uses. So long as food security is the ultimate target for all people, households, communities, nations, then soil health becomes a priority and appropriate use of land for alternative sustainable uses becomes a policy for which abuse is frowned upon and appropriate sanctions inevitable. Then soil survey is therefore imperative and appropriate awareness is required for intending land users in all forms and all professional backgrounds. If soil survey is carried out at appropriate degrees of intensities, adequate purities achieved, policies of use put in place with commensurate awareness, then abuse of land resources will diminish and eventually discontinued, land degradation will be decimated, degraded lands will be reclaimed, there will be adequate supply of land resources for appropriate alternative uses and returns will be commensurate to investment. The fact remains that agriculture could effectively serve for poverty alleviation and healthy food will be produced from good quality lands. Then good health for all will be effectively pursued, poverty will be on its way out of tormenting humanity because hunger has been confronted frontally with physical, social and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life of everyone at all times. Therefore, the first step to confronting SDGs 1, 2 and 3 is adequate inventorization of the available land resources with the of soil survey at detailed levels.

Soil Fertility and its Role in Food Security

The ultimate end of food security resides in the fertility of the soil which is the ability of the soil to sustain plant growth and optimize crop yield. The key issues in the realization of food security or otherwise resides in the availability, accessibility, stability and utilization and these are primarily soil based: ensuring the adequacy of food supply or availability; ensuring the stability of supply; and ensuring economic and social access to food. Fertility is a quality of producing in abundance. Soil fertility is the contribution of soil to productivity referred to as the potential of a given site to produce in abundance to ensure food availability and stability of supply (conditions for food security). Constraints to high productivity are infertile soils due to low inherent fertility inadequate care, loss of top soil and

associated soil nutrients causing low per capita food production. The potential for achieving food security is in the preservation of soil fertility and enhancing productivity through appropriate soil management and conservation (Tittonell, 2015).

Food Security and National Development

National development could be broken into two clearly definitely understandable words. National is the fact or state of a thing, phenomenon, event that belong, pertain or peculiar to a nation whereas development are changes that meets the needs of the present without compromising the ability of the future generation to meet their own needs. National development is a comprehensive term which includes improvement in living standard of the people, increase in per capital income, providing social amenities like education, medical care, social services, etc. to the citizens of the country. Other aspects of national development should also include enlargement of economic knowledge, increasing agricultural outputs, eradication of poverty, development of rural areas and appropriate management of growth in urban areas and sprawl.

The effort of any nation for the achievement of development requires the contribution and participation of the citizens. The case of food insecurity then creates lopsidedness in the effort to achieve development because the extent to which food security is achieved will determine the percentage of individuals that will effectively participate in the national development. For instance, in Nigeria, approximately 40 percent (more than 83 million people) are poor and food insecure. Food insecurity has been shown to be associated with compromised nutrition, poor general health, and a myriad of chronic health conditions (Kirkpatrick and Tarasuk, 2008; Hanson and Olson, 2012; Tarasuk *et al.*, 2013). Food insecurity can lead to lower psychological ability, declined work performance and substantial productivity losses. All of these can hamper the growth and development of the national economy. National development can only be sustainable in an inclusive form that every individual will attain full health condition and possess the capacity to consciously contribute for the use and benefit of all. This can only be achieved under the condition of food security.

Urgency Required for the Survey of Nigerian Soils

The development of Nigeria was impressive pre-independence and oil boom era. This saw every region exploiting their comparative advantages in the development of different agricultural produces. The high population growth, dwindling incomes from the fossil fuel, land degradation, climate change and inadequate attention to the development of the agricultural sector through policies and investment become the quagmire which the country must strategically come out from, if insecurity and

development must take place in a sustainable manner. The effort of the various regions to vigorously pursue development through agriculture must be seen as the right direction and must be executed without considering the extent of investment required. This is simply because soil survey as important and indispensable as it is in the agricultural development is capital intensive and could easily discourage investments. But the fact that it is a one-off investment that could only be updated as the need arises and that no meaningful national policy could be effectively executed without soil survey suggest that the failure of many of the national investments in all sectors may have been directly or indirectly attributable to the absence of detailed national soil map. It becomes imperative and very urgent that every effort from all sectors both public and private should be invested in the production of such a detailed national soil map for Nigeria through survey of the soils that exist everywhere and anywhere.

The absence of soil classification system and national soil map is confusion and this affects all facets of the national life from education, agriculture, socio-economy to even religion. It is equally a national misnomer and disgrace. Misnomer because the different soil maps and naming system produced by regions, organizations, establishments and even individual had existed for a very long time that many people including professionals had ascribed their naming and used for national purposes creating more confusions. These efforts are greatly appreciated because all activities that will lead to the survey and production of detailed soil and fertility/suitability maps of Nigeria will not only acknowledge these efforts but build on their principles, data and other available information for the production of the urgently needed and very important detailed soil and fertility map of Nigeria to salvage everything that has been lost. The time is now.

REFERENCES

- Awoyemi T., Odozi J., Otekunrin O. and Ehirim N. (2015). Efficient resource use: Does human capital matter? The case of cassava production farmers in Oyo State, Nigeria. *Int. J. Agric. Rural Dev.*, **18** (1), 2064-2074
- Ayinde I. (2019). Food security in Nigeria: Impetus for growth and development. Waheed Kadiri Ann. Lect., Nig. Inst. Town Plan. Ogun State Waheed Kadiri Annual Lecture 2019 (2 July 2019)
- EIU (2018). Global food security index 2018: Building resilience in the face of rising food-security risks. A Report, Economist Intelligence Unit, 49 pp.
- FAO/ECA/AUC (2021). Africa – regional overview of food security and nutrition 2021: Statistics and trends. Food and Agriculture Organization (FAO), Accra. <https://doi.org/10.4060/cb7496en>
- FAO/IFAD/UNICEF/WFP/WHO (2020). The state of food security and nutrition in the world 2020. Transforming food systems for affordable healthy diets. Food and Agriculture Organization (FAO), Rome. Retrieved 04/04/2021 from <http://www.fao.org/publications/sofi/2020/en/>

- FAO/UN/WFS (1996). Report of the world food summit. Food and Agriculture Organization (FAO) of the United Nations, Rome. Retrieved 08/04/2021 from <https://www.fao.org/3/w3548e/w3548e00.htm>
- Gebrehiwot K. (2022). Soil management for food security. In: Jhariya M.K., Meena R.S., Banerjee A. and Meena S.N. (eds). *Natural Resources Conservation and Advances for Sustainability*. Chapter 3 (pp 61-71), Elsevier. ISBN 9780128229767. <https://doi.org/10.1016/B978-0-12-822976-7.00029-6>
- Grains Research and Development Corporation (2009). Nutrient deficiencies, toxicities and imbalances In: Identifying, understanding and managing hostile subsoils for cropping. A Reference Manual for Neutral-Alkaline Soils of South-Eastern Australia. The Profitable Soils Group, p. 87
- Hanson K. and Olson C. (2012). Chronic health conditions and depressive symptoms strongly predict persistent food insecurity among rural low-income families. *J. Health Care Poor Underserv.*, **23**, 1174-1188. <https://doi.org/10.1353/hpu.2012.0116>
- Hoddinott J. Sandström S. and Upton J. (2014). The impact of cash and food transfers evidence from a randomized intervention in Niger. Poverty, Health, and Nutrition Division, IFPRI Discussion Paper 01341
- IITA (2017). Synthesis report of the Nigeria zero hunger strategic review. International Institute of Tropical Agriculture, 60 pp.
- Jungerius P.D. (1964). The soils of eastern Nigeria. *Pub. Serv. Geol.*, **14**, 186-196
- Kihara J., Bolo P., Kinyua M., Rurinda J. and Piikki K. (2020). Micronutrient deficiencies in African soils and the human nutritional nexus: Opportunities with staple crops. *Environ. Geochem. Health*, **42**, 3015-3033. <https://doi.org/10.1007/s10653-019-00499-w>
- Kirkpatrick S. and Tarasuk V. (2008). Food insecurity is associated with nutrient inadequacies among Canadian adults and adolescents. *J. Nutr.*, **138**, 604-612. <https://doi.org/10.1093/jn/138.3.604>
- Klinkenberg K. and Higgins G. (1968). An outline of Northern Nigerian soils. *Niger. J. Sci.*, **2** (2), 91-115
- Maziya-Dixon B., Akinyele I., Oguntona E., Nokoe S., Sanusi R. and Harris E. (2004). Nigeria food consumption and nutrition survey 2001–2003: Summary. International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, 78 pp.
- Moss R. (1957). Report on the classification of the soils found over sedimentary rocks in western Nigeria. Soil Survey Report No., 67
- NBS (2019). Poverty and inequality in Nigeria: Executive summary. National Bureau of Statistics, 25 pp. Retrieved 20/10/2020 from <http://taxaide.com.ng/wpcontent/uploads/2020/05/2019-poverty-and-inequality.pdf>
- Obi J. and Ituen U. (2017). Timescale changes in suitability units of arable land in Akwa Ibom State, Nigeria. *Int. J. Soc. Sci.*, **11** (1), 160-173
- Otegunrin O. (2011). *The Effect of Human Capital Accumulation on Resource Use Efficiency among Cassava-Based Farmers in Oyo State*. Unpublished PhD Thesis, Department of Agricultural Economics, University of Ibadan, Nigeria
- Otegunrin O., Otegunrin A., Momoh S. and Ayinde I. (2019a). How far has Africa gone in achieving the zero hunger target? Evidence from Nigeria. *Glob. Food Secu.*, **22**, 1-12. <https://doi.org/j.gfs.2019.08.001>
- Otegunrin O., Otegunrin A., Momoh S. and Ayinde I. (2019b). Assessing the zero hunger target readiness in Africa: Global hunger index (GHI) patterns and indicators. Proc. 33rd Ann. Nat. Conf. Farm Manage. Assoc., 7th-10th October, Nigeria, pp. 456-464
- Paarlberg R. (1999). Politics and food insecurity in Africa. *Rev. Agric. Econ.*, **21** (2), 499-511
- Parikh S. and James B. (2012) Soil: The foundation of agriculture. *Nat. Edu. Knowl.*, **3** (10), 2
- Pinstrup-Andersen P. and Pandya-Lorch R. (1997). Food security: A global perspective. Proc. Int. Assoc. of Agric. Econ. Conf., 10-16 August, California. <https://doi.org/10.4324/9780429457326>
- Rojas R., Achouri M., Maroulis J. and Caon L. (2016). Healthy soils: A prerequisite for sustainable food security. *Environ. Earth Sci.*, **75**, 180. <https://doi.org/10.1007/s12665-015-5099-7>
- Smyth A. and Montgomery R. (1962). *Soils and Land Use in Central Western Nigeria*. Government Press, Ibadan, p. 265
- Tarasuk V., Mitchell A., McLaren L. and McIntyre L. (2013). Chronic physical and mental health conditions among adults may increase vulnerability to household food insecurity. *J. Nutr.*, **143**, 1785-1793. <https://doi.org/10.3945/jn.113.178483>
- Tittonell P. (2015). Soil fertility and the role of soils for food security in developing countries. EGU General Assembly, 12th-17th April, Vienna, Austria
- UN (2017). Sustainable development goal 2. Retrieved 20/08/2019 from <https://sustainabledevelopment.un.org/sdg2>
- UN (2019). World population prospects 2019: Highlights. Population Division, Department of Economic and Social Affairs, United Nations. Retrieved 17/06/2019 from <https://www.un.org/development/desa/publications/world-population-prospects-2019-highlights.html>
- van Dijk M., Morley T., Rau M. and Saghai Y. (2021). A meta-analysis of projected global food demand and population at risk of hunger for the period 2010-2050. *Nature Food*, **2**, 494-501. <https://doi.org/10.1038/s43016-021-00322-9>
- World Bank Group (2015). Arable land (hectares per person). Retrieved 04/04/2021 from <http://data.worldbank.org/indicator/AG.LND.ARBL.HA.PC/countries>