Abuja Journal of Economics & Allied Fields, Vol. 6(2), April, 2018
Print ISSN: 2672-4375; Online ISSN: 2672-4324

Water Supply, Telecommunication and Crop Production for Food Security in Nigeria

Chukwuemeka Ifegwu Eke[1], Ahmed Baba El-yaqub[2]

[1, 2]*Department of Economics, University of Abuja.*

Abstract

Food security is a high priority in the current government's political agenda. However, Nigeria's food security is challenged by several anthropogenic, sociological and policy factors. More so population growth; urbanization, climate change, farmer-herdsmen crisis; land use and water crisis, income distribution and turbulence in global energy, lack of access to robust information communication technology infrastructure and food market is adding to the constraints inhibiting steady growth in agricultural productivity and access to global food supply chain. The variables that were tested are water management, access to land, herdsmen-farmers' crisis, telecommunication, climate change, farm output, policy, genetically modified crops, urbanization, industrialization, population growth, and national politics. Secondary and primary data was assembled and descriptive statistics used. The study found out that increasing herders' clashes within farming communities, urbanization, climate change impacts, population growth, genetically modified foods and the perception of the direction of national politics are germane when addressing food security issues in an urban setting in Nigeria. On the other hand, in a rural setting, climate change impact and herdsmen – farmer clashes is paramount. Cross-sectoral policy responses and measures are needed to address the linkages between national politics, urbanization, population, energy, environment, and other development related sectors

Keywords: ICT, Agriculture, Development and Food Security
JEL Codes: E29, O13

1. Introduction

Nigeria's recessionary pressure set in 2015 and real GDP fell into the negative for more than two consecutive year averaging – 4.78%, compared with the world average of about 1.6% (World Bank, 2017). Growth in Nigeria is expected to exceed 4% in 2018, putting pressure on food prices. Increasing urbanization, herdsmen-farmer crisis, climate change and affluence will put further pressure on food demand (Oluduro, 2015). Nigeria's appetite for energy and the surging demand for food will worsen the situation. On the other hand, crude oil prices is surging towards to the $80 per barrel mark. The surge in oil prices and government intervention in the agricultural sector is stimulating aggregate demand, increasing fertilizer, and other farmer input costs. According to (FAO, 2018) there were unprecedented increases in the prices of maize (67%) and vegetable oils (59%) during 2017, and these price shocks were transmitted to other food cereals. Global wheat production fell below consumption as much wheat area was displaced by maize. Wheat stocks reached historic lows and wheat prices increased by about 30% (World Bank, 2018). In the same stroke, structural changes in global grain markets also increased rice prices, by around 40% between 2016 and 2017, and thus endangered food security in Nigeria (OECD, 2018). Turbulence in global energy and food markets can impact food security and poverty reduction in Nigeria (Akramov, 2017). Sudden increases in food prices due to mismatch in the market or crisis of any

kind can greatly impact urban and non-agricultural households, and farmers in rural households in several ways (Asogwa & Umeh, 2012). Price fluctuations can have adverse impact across household types in Nigeria due to heterogeneity in consumption behaviour and income sources, with possible policy implications (IFAD, 2017). The cost of intervention to enhance food security of these vulnerable households can be daunting, requiring as much as 5% of Nigeria's GDP (FAO, 2018). Population growth, urbanization, climate change, farmer – herdsmen crisis, income and consumption growth, will pose ever greater challenges to maintaining food security in Nigeria. Massive agricultural projects will require more land and water resources, with impacts regarding resource allocation to food production (Cabot, 2017). Pro-poor agricultural technologies and cash crops might provide opportunities to improve food security (IFAD, 2017). Investments in infrastructure, institutions and barrage of new policies are in Nigeria to achieve these goals. Water security is paramount while efforts must be harnessed to limit loss of fertile land to climate change, herdsmen farmer crisis, and urbanization. Given these challenges, we are using this paper to review the role of land, water, institutions, in promoting food security and reducing extreme poverty in Nigeria.

2. Literature Review

Economic Reforms and food security in Nigeria

Nigeria embarked upon ambitious economic reforms since the Babangida administration using the Structural Adjustment Programme, SAP, as a pretext to launch self-sufficiency and food security more than 30 years ago. Price distortions were smoothened and land rights were realigned. Bold policies and institutional reforms were implemented to motivate greater production by the rural households (Babatunde, Omotesho, Sholotan, 2007). The impacts on agricultural production, food security and poverty reduction have been documented. The reforms which at one time was purported to have lifted millions out of extreme poverty in rural residents stands to be studied more as an interim World Bank report published 2018 asserts that Nigeria has over taken India as the country with the highest number of abject poor in the world..

Prior to SAP and all the subsequent these agrarian reforms, much of Nigeria was a subsistent agricultural society. Rapid economic reform and the impact that was observed was because the large agricultural sector had surplus Labour over the years, coupled with the revolution in other sectors such as the banking and telecommunication, this led to massive reallocation of labour which allowed groups to gain, (Babatunde, Omotesho, Sholotan, 2007). Economic reform often generates major gain and losses and the distribution of impacts differs across the spectrum of society. It is pertinent to assert that in terms of food security and equity, Nigeria's peasant population is very crucial and vital.

During the 1980s to 2014, agricultural productivity and per capita income rose, declined and staggered. Many farmers shifted to higher valued crops and food exports grew as well (FAO, 2017). With sustained growth in agriculture, rural incomes rose dramatically, rural incomes rose on the average, lifting millions out of poverty temporary (IFAD, 2017). Despite these notable achievements, the rural and urban income gap remains wide and inequitable in Nigeria. Urbanization, climate change, herdsmen – farmer crisis and increasing affluence are placing new demands on food production (Cabot, 2017), requiring more land, water, environmental initiatives, dialogue and mutual coexistence. As a result, the overuse, bloodshed, degradation of resources have increased (Mortimore, 2013)

Challenges to food security

The challenge of maintaining food security while the population and income increase, herds men farmer crisis and climate change mount pressures is a classic research theme

and a high priority issue on the Nigerian agenda. Seven core factors influence the pace of increasing food demands: population growth, urbanization, herdsmen – farmer crisis, climate changes, industrialization and changes in lifestyle and consumption coupled with major shifts in political and economic arrangements (Mortimore, 2013; Cabot, 2017; FAO 2018). All of these factors are at work in Nigeria. The challenge of maintaining food security will remain substantial, in part because Nigeria's endowment of land and abundant water resources, which on a per capita basis is notably below the world standard.

In the next 50 years, Nigeria's population is expected to increase by about over 100 million (CBN, 2017) to over 250 million. Rural to urban migration, the growth of cities and industry, and changes in consumption patterns that accompany rising incomes may place additional pressure on land and water resources. Nigeria's demand for meat and dairy products, requires substantially more water in the production process than grains, will continue to exacerbate the situation (Ibok, Idiong, Brown, & Okon, 2013). In the same vein, more land will be needed for transportation infrastructure, grazing of animals, housing and energy generation to support the increasing population.

Innovation in technology and policy will be needed to maintain food security in Nigeria. Resources must be used efficiently and carbon emissions must be reduced to maintain environmental standards. Producing crops for biofuel in the future will certainly divert resources away from food production. Developing viable alternate to fossil fuels which Nigeria depends on for over 75% of its revenue, that reduce or negate the demand for biofuels might reduce the pressure on land and water resources in ways that enhance efforts to combat food insecurity. However, much will depend on the pace of technology development and how the global markets respond to the climate change.

Access to Arable Land

Land use changes in Nigeria are basically driven by the increasing demand for food for human and animal population (Otaiku, 2018) and other very sensitive economic and political factors (Cabot, 2017 & FAO, 2018). In Nigeria for instance, local or community and formal land sales are an important source of revenue in many areas. In 1985, about 74% of Nigeria's land was devoted to agriculture (Otaiku, 2018). The cultivated area was about 46 million ha. The amount of cultivated land per capita was only 0.098ha, much less than the world average of 0.236ha. The per capita value has continued to decline with Nigeria's increasing population, despite a substantial deployment of new agricultural policies in the country. For instance, between 1999 and 2014 the cultivated area decreased from 76.3 million to 68.5 million ha (a net loss of 7.8 million ha) or % (Ibok, Idiong, Brown, & Okon, 2013). Much of the loss was due to structural changes within agriculture such as the conversion of lands into industrial and residential areas. (Cabot, 2017) since the 2015, the population explosion, migration and climate has triggered competition for available land resources which has resulted in violence and bloodshed. This mass relocation of farmers as internally displaced refugees have caused substantial farmland loss (FAO, 2018). The major sources of changes in cultivated area (IFAD, 2017)

The potential impacts of changes in cultured area on food production and other eco system values vary with the sources of those changes. For instance, offering fertilizer discounts or improved seeds varieties cannot offset the productivity loss. The conversion of fertile land to non – agricultural uses is the primary threat to Nigeria's continued capacity to produce sufficiently (Babatunde, Omotesho, Sholotan, 2007; Cabot, 2017). Cultivated area has increased in some areas has partially offsets losses in the food grid. (FAO, 2018). This gain, however, has not been achieved without environmental harm. Long term studies in Nigeria have identified some prominent land degradation processes: desertification in the North, secondary

salinity, deforestation, loss of grassland and wetlands in the South. (IFAD, 2017)

The transition toward intensive but more sustainable land use systems is more important for food security than further intensification alone. Maintaining environmental standards should receive less emphasis than increasing food production (Otaiku, 2018). Nigeria must make commitment to expanding its arable land for true progress towards the goal of national food security (Cabot, 2017). Such a program should have two critical elements: (1) limiting the converting of arable land to non-agricultural purposes (2) implementing the various policy initiatives designed over the years that optimizes the comparative advantages across the senatorial zones in Nigeria.

Food production

Nigeria has made impressive attempts at achieving food security. Since the late 1980s when Nigeria started the SAP and Directorate for Food and Rural infrastructure, DFFRI which prompted the implementation of rural economic reforms, and food production increased substantially. From 1988 through 2014 total output increased by over 156 million tons or over 69%, despite a 9% decrease in the area deployed for production. The momentum to reform Land access started in the pre SAP era was sustained in the 1990s, however the food production reached a new high. Continued gains in food production is needed in Nigeria, where more than 80 million workers, or about half of the country's work force are actively engaged.

Technology adoption accounted for an estimated 32% of the increase in productivity during 1990 to 2015, while institutional reforms accounted for 24% (IFAD, 2017 & FAO 2018). Most of the increase in total factor productivity is attributable to yam, corn and rice (Ibok, Idiong, Brown, & Okon, 2013). National and international investment in new technology and continued institutional and policy reforms will continue to be crucial.

Water resources

Urbanization and industrialization mounts pressure on water supply and availability of farm, post farm and other agricultural activities in Nigeria (Olukunle, 2013). Invariably, fall in water supply places a limit on agricultural development. A clear understanding of the issues and trends in Nigeria's agricultural water management is germane to support a national development policy that focuses on food security. The federal government must determine the best policies for ensuring that increasing food demands are satisfied, while maintaining environmentally friendly standards that do not stifle our food supply and sustain a desirable economic development (IFAD, 2017)

Nigeria's annual water supply is equivalent to about 856 m^3 per capita or about 13% of the world's average. Supplies are particularly small in the arid portions of the Northern parts of the country. The average supply is much smaller than the internationally accepted levels of water scarcity (1000 m^3 per capita). These use rate of water in Nigeria increased from about 23% of available water resources in 2010 to 27% in 2015. The use rate will continue increasing in the future with increases in population and incomes (Mancosu, 2015)

According to Magaji & Eke (2015) boosting water productivity while in Nigeria will require a range of policies such as efficient deployment of ICT to increase the water use ratio, strengthening water institutions, policy implementation and demand management. Involvement of local, community, state and regional water management operation, recharging of aquifers and greater use of clean technologies (IFAD, 2017) and finally, on farm management practices that protect irrigation water supplies from pollution agents.

Information Communication Technology, ICT

Ozowa (2010) asserted that deliberate efforts have been made by international donors and African countries to bring about agricultural

development. Much of the setback is attributed to non-integration of agricultural information with other development programmes/sectors to address the numerous related problems that face farmers. Magaji & Eke (2013) and Magaji & Eke (2015) observed that information is an essential ingredient in development programmes. Practical approaches to the integration of Information and Communication Technology (ICT) in agriculture can be done through providing accurate, timely, relevant information and services to the farmers, thereby facilitating environment for more remunerative agriculture.

Furthermore, with ICT facilities, farmers can be updated on temperature, humidity and rainfall with additional parameters such as atmospheric pressure, solar radiation, and wind speed and soil moisture. Others are crops, crop management techniques, fertilizers and pesticides, and many other agriculture related materials.

Most farmers now have access to commodity prices and market information on real time basis available on the internet, the farming community are now provided with choices they lack before. This has ensured better price realization and stimulated a drive towards better productivity. Again with e-commerce farmers can sell their products online. Information sharing is achieved through computer network which helps in dissemination of research products and messages.

According to Hutchinson and Sawyer (2000) Global Positioning System (GPS) describes the exact latitude and longitude of one's farm. This enables precise farming which be exploited to control costs and boost crop yield. They added that with GPS, farmers can map and analyze their fields for characteristics such as acidity and soil type. By this farmers will become aware of the latest agricultural tools and methods that make farming easy instead of the use of crude methods.

Genetically Modified Food Crops

Genetically modified (GM) food and cash crops are increasingly touted as environmentally safe and fit to help combat global food crisis. For instance, GM cotton requires much less pesticides and has only small impact on yields (Huang; Hu; Rozelle; Quao; & Pray, 2002) In Nigeria, economy-wide assessments show that the impact of GM cotton on Nigeria's production, trade and welfare outweigh public research expenditures. Small and poor farmers may benefit from GM crops due to higher vitamin content and reduced use of pesticides, which can contribute to improved health (Stein; Sanchdev; & Qaim, 2008). Poor farmers in Nigeria can cultivate a large area of GM crops than small farmers in any other country in the West Africa.

3. Methodology

This research uses data from respondents in Benue (North Central, Nigeria) 2018. For this study, we established liaison with 60 farmers in Makurdi, Benue State (Nigeria's food basket). The analysis is conducted thus: Regressing food security on a number factors such as assess to land, herdsmen farmer clashes, perception of policy reforms, water management, perception of impact of climate change, farmer output, and their perception of genetically modified crops. Their responses are sourced from the questionnaire records. These records also contain certain basic demographic information such as marital status, family size and age. The dependent variable is the outcome for each member first meeting (impression). The key independent variable is their perception of impact on food security. We have data for fifty eight (58) of the sixty that were (60). The Probit model was adopted since its primary data laden with binary responses and the SPSS statistical package was used to process the information.

$$Y_i = \alpha + \beta_i X_i + \hat{u}_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where Y_i is their impact perception on food security variable, while $X_{i,\ \text{where I = 1, 2, 3,4,5,6,7,8,9 and 10}}$ representing water management practices, access to Land, herdsmen-farmer crisis, climate change, farm output, impact of

government policy, GM crops, urbanization, industrialization, population growth, and national politics are the independent variables in the model.

4. Discussion of Results

The value of R^{-2} = 47.8% for the sampled respondents (rural) and 65% (Urban) shows that the equation captures more of the phenomenon in the Urban setting than the Rural setting. In Markudi, these variables were statistically significant: Herdsmen-farmers' crisis, Urbanization, Climate change, Population growth, GM crops, and National politics. On the other hand, a typical rural setting in Benue state, Herdsmen-farmers' crisis and Climate change are significant (Table 1).

Table 1: Food security (Probit)

Binary Dependent Variables	Estimates	
	Urban	Rural
Water Management	0.054	0.033
	(0.032)	(0.400)
Access to Land	0.013	-0.032
	(0.105)	(0.252)
Herdsmen-farmer crisis	-0.040***	-0.035**
	(0.012)	(0.014)
ICT	0.411	0.394
	(0.025)	(0.012)
Climate change	-0102***	-0.045***
	(0.107)	(0.011)
Farm output	0.005	-0.013
	(0.054)	(0.060)
Impact of government policy	0.083	0.050
	(0.054)	(0.023)
GM crops	0.487***	0.458
	(0.033)	(0.050)
Urbanization	0.594***	0.561
	(0.020)	(0.180)
Industrialization	0.083	0.050
	(0.054)	(0.025)
Population growth	0.434***	0.470
	(0.035)	(0.050)
National politics	0.594***	0.562
	(0.020)	(0.174)
Number of Observation	28	28
R^2	0.650	0.478

**Significant @ 10per cent, **significant @ 5 per cent, ***Significant @ 1 per cent*

5. Summary of findings

The national development policy in Nigeria puts food security at the front burner.. form our findings, Nigeria's food security is challenged by several factors that have been discussed by many authors and researchers, however, conducting a small sample survey and regressing it gave a clearer picture of the core factors that should be prime in tackling Nigeria's lingering food security crisis. However, various authors proposed several factors: Water Management. Access to Land, National politics, Population growth, Industrialization, Urbanization, GM crops, Impact of government policy, Farm output, Climate change, and Herdsmen-farmer crisis. Conducting a scientific test on these issues revealed a divergence in terms of the urban rural perception of the food security crisis. Herdsmen-farmers' crisis, Urbanization,

Climate change, Population growth, GM crops, and National politics were crucial factors if food security is to be tackled. On the other hand, a typical rural setting in Benue state, Herdsmen-farmers' crisis and Climate change are the most crucial. ICT has profound impact on agriculture globally but Nigerian farmers seldom feel the impact of agricultural innovations either because they have no access to such vital information or it is poorly disseminate

Therefore, increasing herders' clashes within farming communities, urbanization, climate change impacts, population growth, genetically modified foods and the perception of the direction of national politics are germane when addressing food security issues in an urban setting in Nigeria. On the other hand, in a rural setting, climate change impact and herdsmen – farmer clashes is paramount. Cross-sectoral policy responses and measures are needed to address the linkages between national politics, urbanization, population, energy, environment, and other development related sectors.

References

Asogwa B.C; Umeh J.C (2012). Food security determinants among rural farm households in Nigeria. Proceedings of International conference on Ecology, Agriculture and Chemical Engineering, Phuket, Thailand. December 18th – 19th 2012.

Babatunde, R.O; Omotesho O.A; Sholotan O.S (2007) Factors influencing food security status of rural farming households in North Central Nigeria. Agricultural Journal. 2(3)351 – 357

Cabot. R (2017) Climate Change, Security Risks and Conflict Reduction in Africa, Hexagon Series on Human and Environmental Security and Peace 12, DOI 10.1007/978-3-642-29237-8_2.
https://www.springer.com/cda/content/document

Food and Agricultural Organization of the United Nations (2015): World Food Outlook, Nigeria Country Report, Rome, Italy.

Ibok O.W; Idiong I.C; Brown I.N; Okon I.E. (2013). Analysis of food insecurity status of urban food crop farming households in Cross River state, Nigeria. Canadian Journal of Agricultural Science. 246 – 260.

Khan, S; M. Hanjra; Jianxin Mu (2008) Water Management and Crop production for food security in China: A review. Agricultural Water Management Journal 96(2009) 349-360

National Bureau of Statistics (2016) Nigeria's Gross Domestic Product. Abuja.

The World Bank (2017) World Development Indicators. Washington DC, USA

Oludoro, O.F. (2015) Mitigating the Effects of Climate Change in Sub-Saharan Africa Via an effective International Legal Standard: A Case Study Of Nigeria. PhD dissertation. Available online. www. https://core.ac.uk/download/pdf/55726133.pdf

Food and Agricultural Organization (2018). Food Prices monitoring and analysis. www.fao.org/giews/food-prices/international-prices

OECD (2018) Rising Food Prices. www.oecd.org/trade/agricultural-trade

KT Akramov (2017) Economic Development, External Shocks, and Food Security in West Africa. www. citeseerx.ist.psu.edu/viewdoc

IFAD (2017) Livelihood Improvement Family Enterprises Project in the Niger Delta of Nigeria (LIFE-ND) www. https://webapps.ifad.org/members/eb/122/docs/EB-2017-122-R-8-Project-Design-Report.pdf

Mortimore. M. (2013) The place of crop agriculture for resilience building in the drylands of Africa. www.fao.org

CBN (2017) Annual Report

Otaiku, A.A (2018) Ecological Grazing Management, Food Security and Surveillance in Nigeria: Innovation

Ecosystem Approach. A PhD Thesis. https://www.researchgate.net

Olukunle, O.T. (2013) Challenges and Prospects of Agriculture in Nigeria. www. pakacademicsearch.com

Mancosu, N. (2015) Water Scarcity and Future Challenges for Food Production. www.mdpi.com

Magaji, S & Eke, C.I (2015) An economic assessment of the impact of information and communication technology (ICT) on performance indicators of water resource management in West Africa: A suggested strategy for avoiding the eminent international water wars. International Journal of Water Resources and Environmental Engineering. Vol 7(5): 66-74

Ozowa V.N (2010) Information needs of small scale farmers in Africa: www.worldbank.org/html/cgiar/newsletter/june97/9nigeria.html

Magaji, S & Eke, C.I (2013) Measuring the technical efficiencies of wired and wireless technologies in Nigeria's cyber cafes. CBN Journal of Applied Statistics. Vol. 4(1): 15-34

Nigeria's Agriculture and Food Security Challenges www.foa.org/tc/qork05/Nigeria ppt.pdf

Samuel. A.I (2010) Using ICTs to Bridge the Agricultural Extension Gap and in providing Market Access for Rural Farmers in Nigeria: A practical Approach. www.goole.com. "ICT in agriculture in Nigeria"

Hutching and Sawyer (2000) Computers, Communications, Information: Users Introduction, New York, Irwin McGraw Hill, P. 4.27.

Huang, J; Hu, R; Rozelle, S; Quao, F; Pray, C.E, (2002) Transgenic varieties and productivity of small holder cotton farmers in China. Appetite 46: 144 – 151

Stein, A.J; Sanchdev, H.P.S; Qaim, M, (2008) Genetic engineering for the poor: Golden rice and public health in India. World development 36(1): 144-158.