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Food Insecurity in Nigeria: Food Supply Matters

Nigeria

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Food Insecurity in Nigeria: Food Supply Matters
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ABSTRACT: Against the backdrop of high international food and fertilizer prices, this paper discusses food insecurity in Nigeria, investigates its drivers in a cross-country setting, and assesses the role of policies. Using two proxies for food security, we find that high per capita consumption, high yields and low food inflation support food security. Cross-country estimates of yields and production provided by the FAO/OECD reveal that use of inputs is lower in Nigeria than in other countries, and that policies to raise crop yields positively correlate with better food security conditions. The paper also uses detailed domestic commodity price indices to assess linkages with international prices and the role of import bans. Central bank policies for funding agriculture and import bans have not managed to stimulate agricultural output nor moderated the impact of international food prices. Rather, policies should focus on use of inputs that are severely underused in Nigeria as elsewhere in SSA.

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Food Insecurity in Nigeria: Food Supply Matters

Nigeria

FOOD INSECURITY IN NIGERIA: FOOD SUPPLY MATTERS[1]

A. Background

1. Food security has become a major policy issue in many countries with the increase in food prices worldwide. Food security is defined as having sufficient food to generate a calorie requirement of about 2200-2300 calories per day for adult females and 2900-3000 calories per day for adult males (see Box 1 for various food security benchmarks). Children require a lower calorie level to maintain themselves in adequate health. In 2022, countries that are highly dependent on food imports have seen a spike in food inflation, as the war in Ukraine and associated supply shortages caused sharp price hikes for wheat and other staples on top of high fuel and transportation costs resulting in a deterioration in food security. The prices of staple food in sub-Saharan Africa (SSA) have surged by an average of 23.9 percent in 2020-22 (Okou, Spray, and Unsal, 2022).

2. Food insecurity is elevated in Nigeria. Using the September 2018 to October 2019 household survey of expenditures, the cost of achieving 2251 calories per day (age-weighted caloric need for food security), is about 82,000 naira per person per year. Based on this survey, about 40 percent of the Nigerian population is identified as food insecure**.** Mekonnen et al. (2021) show similar results using the same data survey, arguing that about 28 percent of the population was food insecure based on the cost of a diet with localized food preferences that achieves food-based dietary guidelines.[2]

3. Further, acute food insecurity has likely risen in Nigeria since the last household survey in 2019, given the adverse impact of the COVID-19 pandemic and the surge in food inflation in 2022. In Nigeria, food inflation rose to 23 percent in September 2022. Unlike better-off households who can afford a wider range of foods, the poor have very few substitutes for staples, which make up nearly two-thirds of their daily diet. Data from the World Food Program (WFP) in November 2022 for 26 states in Nigeria and the Federal Capital Territory (FCT) show that the share of those in stressed food security situations with minimally adequate food consumption is at 34 percent of the

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[2] A diet that respects sustainability of food production by consuming less dairy and meat (EAT-Lancet diet) is more expensive than the average Nigerian diet, because the average Nigerian consumes very little dairy and meat. For this diet, the food insecure level is just over 40 percent of the population.

population (levels 2 and above).[3] The acute food insecure population has risen by 5.4 million people to 17 million over the past year (almost 9 percent of the respective population).[4,5]

Box 1. Definitions of Food Security Benchmarks

The basic food security benchmark is the cost of an **energy sufficient diet** that provides adequate calories per day based on one basic starch staple (usually maize, wheat or rice). The cheapest starchy staple is used to obtain the cheapest diet that achieves caloric sufficiency. For the Food and Agricultural Organization (FAO) analysis, a 30-year-old woman is chosen as the benchmark person and the energy intake for this person is 2329 calories per day. The estimate used for Nigeria is slightly lower at 2251 calories per day and is a weighted average of the minimum caloric intake for women (2117), men (2900) and children (783-2958, depending on age).

The **nutrient adequate diet** provides adequate levels of all essential nutrients for a healthy life through a balanced mix of carbohydrates, protein, fat, vitamins and minerals. It reflects the minimum cost that meets all nutrient requirements. The nutrient diet achieves its mix of nutrients based on food-based dietary guidelines (FBDG). Since a recent FBDG does not exist in Nigeria, studies have used the FBDG from Benin as a reference point. Foods are broken up into starchy staples (maize, rice, cassava), protein-rich foods (meat, fish eggs), dairy (yoghurt, local cheese), vegetables (leaves, carrots), fruits and fat. The number of recommended servings per food category is used to generate the nutritional requirements and linear programming is used to calculate the least cost bundle.

Source: Global Report on Food Crises, 2022, Food Security Information Network

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4.   This paper presents stylized facts about food insecurity in Nigeria, investigates its drivers in a cross-country setting, and assesses the role of policies. Section B describes regional aspects of Nigeria's food insecurity and compares the impact of COVID-19 and the war in Ukraine on food security in Nigeria and other countries. Section C provides an overview of agricultural production and consumption in Nigeria. Section D investigates the drivers of food security using an empirical cross-country framework including demand, supply, and price factors, and offers thoughts on policies to improve agricultural yields and production. Section E summarizes key agricultural support policies in Nigeria to secure food availability and their effectiveness. Section F concludes.

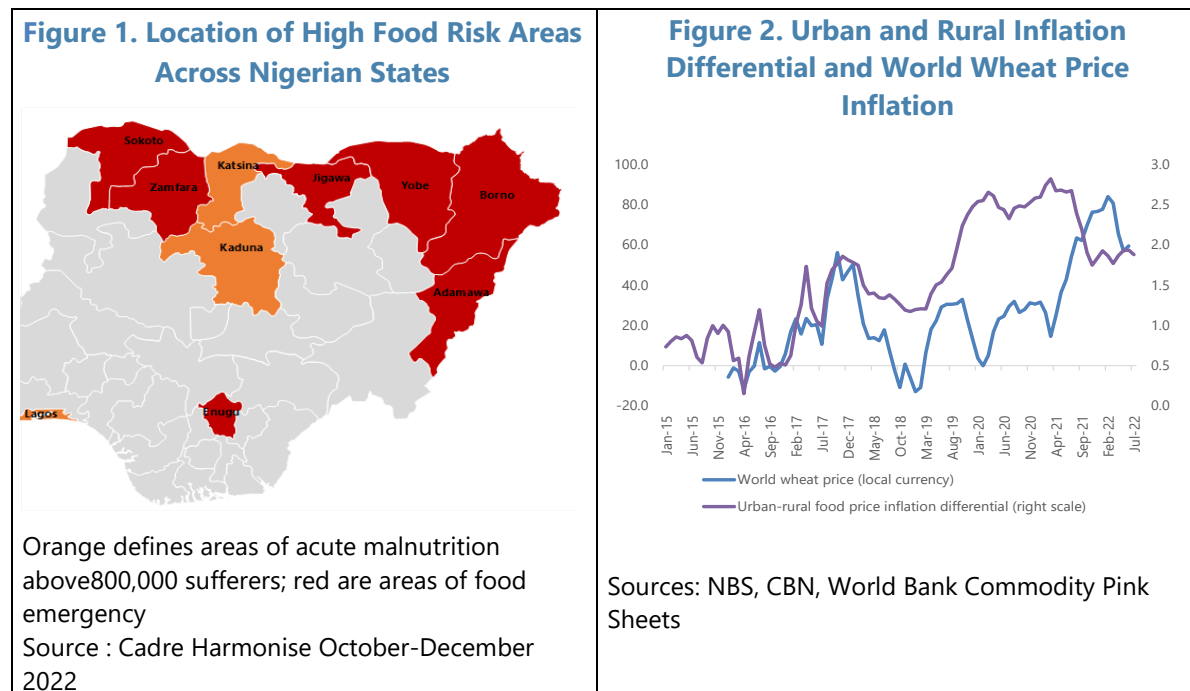## B.   Stylized Facts About Food Insecurity in Nigeria

5.   Food insecurity varies across regions in Nigeria and rural-urban settings. According to the 2018/19 household survey, the North-East and North-West regions have the most acute levels of food insecurity, and this is confirmed by data from the recent Cadre Harmonise surveys (Figure 1). The household survey also found large differences in food insecurity estimates between urban (18 percent) and rural areas (52 percent), a view also supported by Mekonnen et al. (2021). However, the

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[3] The phases of food insecurity rank from level 1 (none/minimal) to level 2 (stressed), level 3 (crisis), level 4 (emergency), and level 5 (catastrophe).

[4] This total corresponds to food insecurity at level 3, defined as acute malnutrition, with households being able to minimally meet their food needs only by depleting essential livelihood assets or by engaging in crisis-level coping

[5] The report analyzed 194 million people in 26 states and the Federal Capital Territory, or 88 percent of total population in Nigeria.

urban-rural food inflation differential has been positive in recent years, possibly indicating a more nuanced impact of global prices on rural food inflation due to heavier reliance on home production (Figure 2). Household survey data reveals that the median rural family produces 35 percent of its food consumption at home, with this ratio rising to 39 percent for families below the food security threshold (82,000 naira per day). In contrast, urban families only produce 5 percent of their food needs at home at the median, suggesting that poor urban families are more sensitive to rapid changes in food prices.

Figure 1. Location of High Food Risk Areas Across Nigerian States

Orange defines areas of acute malnutrition above 800,000 sufferers; red are areas of food emergency
Source : Cadre Harmonise October-December 2022

Figure 2. Urban and Rural Inflation Differential and World Wheat Price Inflation

Sources: NBS, CBN, World Bank Commodity Pink Sheets

6. **Food security in Nigeria is worse than in comparator countries, and its position has deteriorated since 2019**. We chose a set of 14 countries based on income, geographic location and other similarities and two commonly used indicators to conduct an analysis of Nigeria's relative food security (see Box 2 for details). A simple plot of the European Intelligence Unit (EIU) and the International Food Policy Research Institute (IFPRI) indices for Nigeria and comparator countries reveals a high positive correlation between the two proxies of food insecurity (Figure 3). This figure illustrates that Nigeria ranks near the top for both indicators of food insecurity relative to the comparator countries. While its global hunger estimate improved in absolute terms over time (though not in comparative terms), very little improvement is visible on the EIU food insecurity scale. In 2019, prior to the start of covid, Nigeria was ranked at 97 out of a total of 113 countries, with only Angola, Burundi, Ethiopia and Sierra Leone worse among SSA countries. The best performing country in the comparator sample is China, ranked at 34. Since 2019, Nigeria has maintained its EIU food security score but given improvements in Ethiopia and Angola, it is now the worst ranked among the comparator sample (Figure 4).

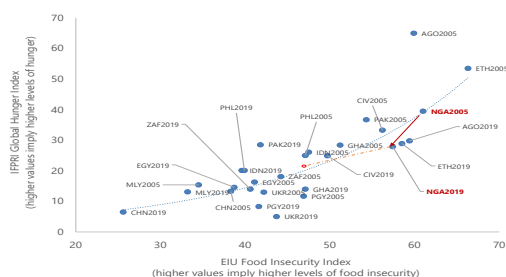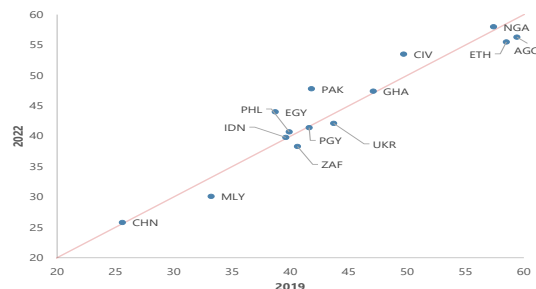Figure 3. IFPRI Global Hunger Index vs EIU Food Insecurity Index

Figure 4. EIU Food Insecurity Index Score (2019 vs 2022)

Source: IFPRI Global Hunger Index and EIU Food Security Index

Table 1. Nigeria: Choice of Comparator Countries and Indicators for Food Security Analysis

Choice of Comparator countries

Three groups of countries are selected as the benchmark: (i) those that are close to Nigeria in terms of real per capita incomes in 2000 valued at PPP exchange rates; (ii) other countries in Sub-Saharan Africa (SSA); and (iii) non-SSA countries with large populations and sizable commodity exports, such as Indonesia and Malaysia. Except for some countries in SSA (Angola, Ghana, Cote d'Ivoire), all comparator countries appear in the detailed FAO/OECD database on yields per crop

Comparator country group for Nigeria

(Inverse Order of Real GDP per Capita Values in 2000)

Country	Real GDP per Capita in 2000 (At 2011 PPP Exchange Rate)	Agricultural Growth Rate (2000-19, Average)	Global Food Security Index in 2022 (Higher Values Indicate Greater Security)
Ethiopia	618	6.1	44.5
Ghana	2259	3.7	52.6
Nigeria	2848	5	42
Angola	2873	5.8	43.7
Cote d'Ivoire	2948	n.a.	46.5
Pakistan	3495	2.5	52.2
China	3701	3.9	74.2
Philippines	4224	2.8	59.3
Ukraine	4797	4	57.9
Indonesia	5806	3.6	60.2
Paraguay	6085	5.9	58.6
Upper middle income	7226	3.4	
Egypt, Arab Rep.	7388	3.3	56
South Africa	9539	2.5	61.7
Malaysia	16310	2.7	69.9

> **Table 1. Nigeria: Choice of Comparator Countries and Indicators for Food Security Analysis**
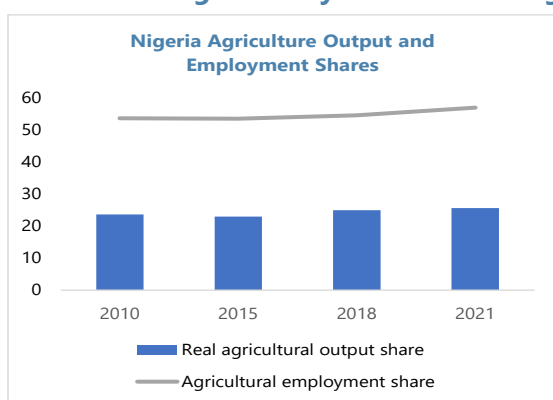> (concluded)
>
> **Choice of indices**
>
> Two closely related indices are considered to assess developments in food insecurity between countries over time. One measure developed by the Economist Intelligence Unit (EIU) ranks countries along three dimensions namely affordability, availability, and quality and safety of food, with each dimension based on a set of indicators drawn from either direct data sources or qualitative scoring methods. A separate measure developed by IFPRI (the global hunger index) is based on four indicators, namely the proportion of undernourished in the population and child wasting, stunting, and mortality for children under 5 years.
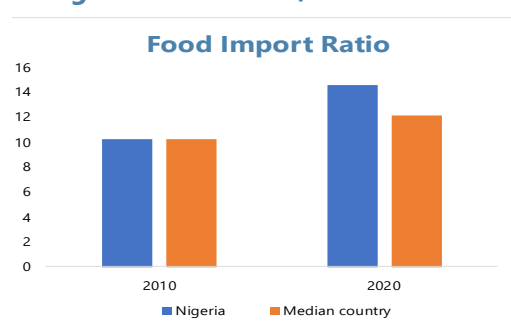
C.   Agricultural Production and Consumption in Nigeria

7.   Agriculture is a key economic sector in Nigeria. It represents about 23 percent of real GDP and has remained at this level over the past decade. Its share in employment is considerably higher at 51 percent (2018/19 household survey) and this ratio is estimated to have risen subsequently associated with the weakness in industry and services output in 2019/20 and an absence of notable structural transformation of the economy (Jayne et al. ,2017).

Figure 5. Stylized Facts of Nigeria's Agricultural Sector, 2010-21

Nigeria Agriculture Output and Employment Shares

- Real agricultural output share
- Agricultural employment share

Source: LSMS survey, Fox and Thomas (2013)

Food Import Ratio

- Nigeria
- Median country

Notes: Median is derived from a country sample of China, Egypt, Ethiopia, Nigeria, Indonesia, Malaysia, Philippines, Pakistan, Paraguay, South Africa, Ukraine

Source: The World Bank

8.   Most staple foods in Nigeria are produced domestically, but the food import ratio remains high (Figures 5 and 6). Food consumption makes up over 50 percent of the total consumption basket and food availability plays an important role in the welfare of Nigerians. The major carbohydrate food category is roots and tubers, which has a food consumption weight of 20 percent in Nigeria's food basket, along with maize (6 percent weight in the food basket), and both are almost fully supplied domestically (Figure 6). Rice and vegetable oils are both produced domestically and imported, while the share of rice imports in consumption has fallen slightly over time due to CBN policies that restrict access to FX for importing rice. As for wheat and sugar, they are completely imported despite a recent impetus to start domestic production. In aggregate, dependence on imported food has risen over the past decade in Nigeria. At 14 percent in 2020, it surpasses the median country in the comparator sample, although the data fluctuates considerably across years reflecting highly variable food prices compared with other import categories.

9.   **The increase in the per capita food aggregate over time indicates that Nigeria's agricultural production has kept up with the growing population at the aggregate level, though sizeable differences exist across staples.** Per capita consumption of roots and tubers and pulses (basic staples) is much higher in Nigeria than in the median sample country (Figure 7). In contrast, per capita consumption of rice and wheat–staples that provide the major source of carbohydrate in other countries–is considerably lower in Nigeria than in other countries (sample mean represented by Egypt and Paraguay, respectively). When aggregating the carbohydrate dense foods (maize, rice, roots and tubers and wheat), cross country differences become less evident, with Nigeria converging toward the sample median (Philippines in this case). There is however significant cross-sectional variation in consumption across Nigeria's population. For example, staff analysis shows that the consumption premium of families with unemployed and college educated individuals and wage workers is up to over 50 percent compared with families with agricultural workers and regional disparities accentuate the differences even further (SM/21/210).
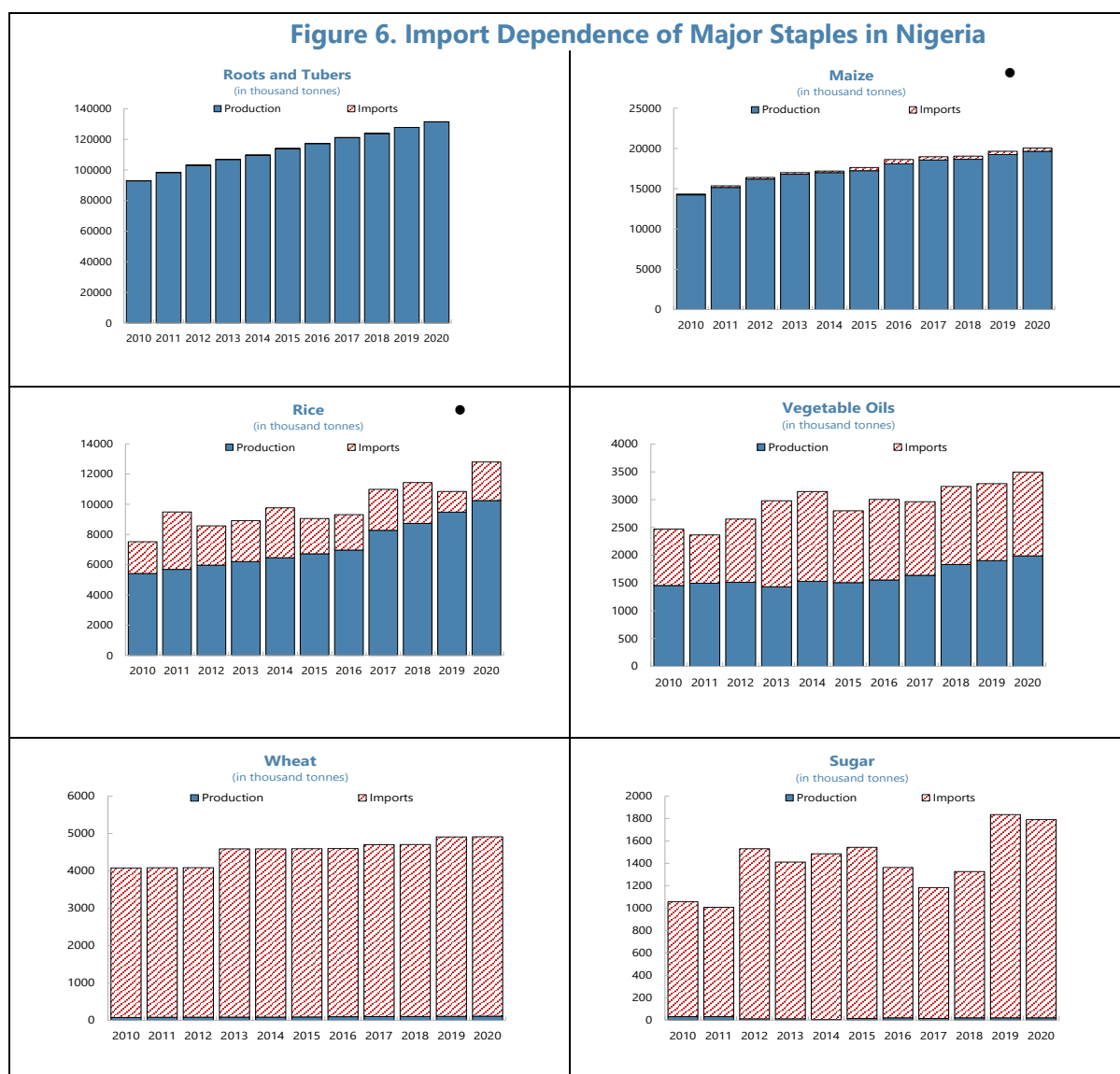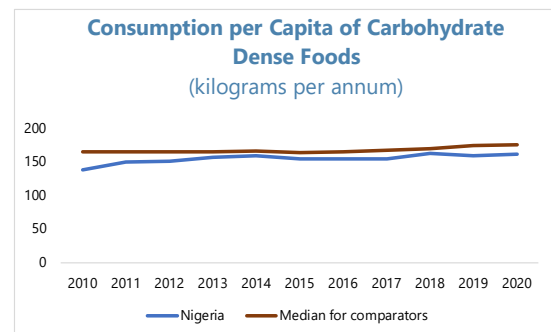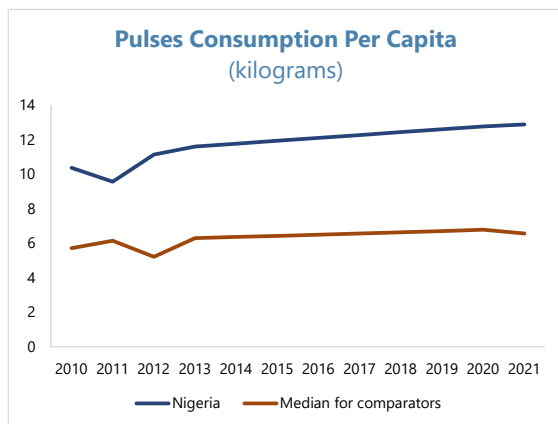

Figure 6. Import Dependence of Major Staples in Nigeria

Figure 7. Consumption per Capita of Key Staples

Rice Consumption Per Capita
(kilograms)

Wheat Consumption Per Capita
(kilograms)

Maize Consumption Per Capita
(kilograms)

Roots and Tubers Consumption Per Capita
(kilograms)

Pulses Consumption Per Capita
(kilograms)

Consumption per Capita of Carbohydrate Dense Foods
(kilograms per annum)
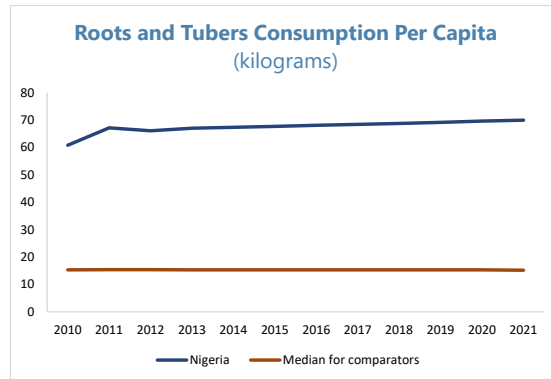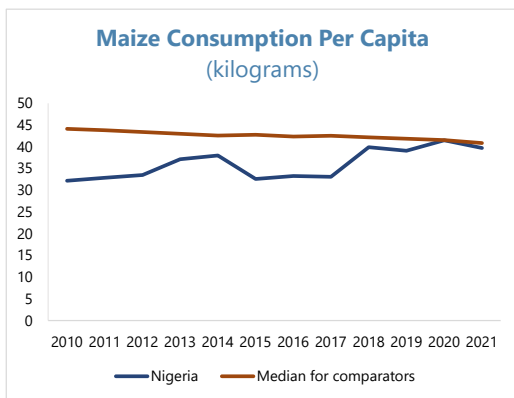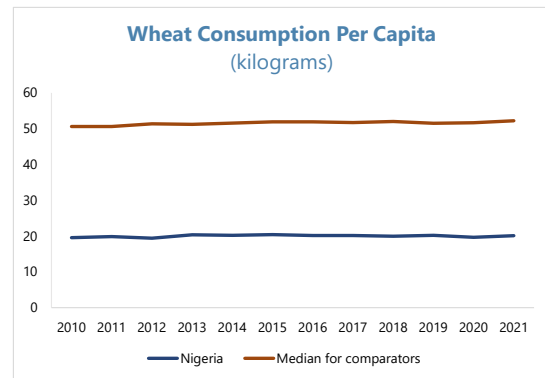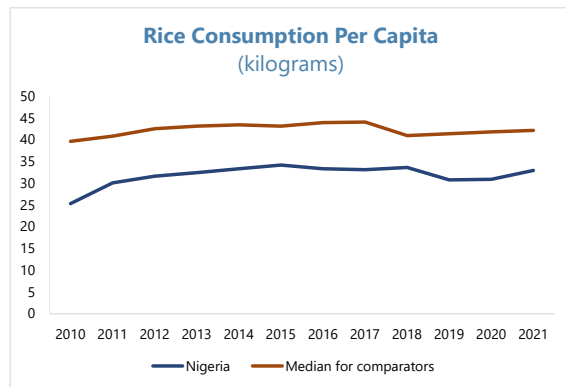
Notes: Carbohydrate dense foods is the sum of maize, rice, roots and tubers, wheat
Country sample is China, Egypt, Ethiopia, Nigeria, Indonesia, Malaysia, Philippines,
Pakistan, Paraguay, South Africa, Ukraine

D. Drivers of Food Security Over Time: Role of Demand, Supply, and Price Factors

10.   On the demand side, consumption per capita is expected to be an important determinant of food security.
For the population to be adequately nourished, it is important to be able to demand food in sufficient quantities, for food to be suppl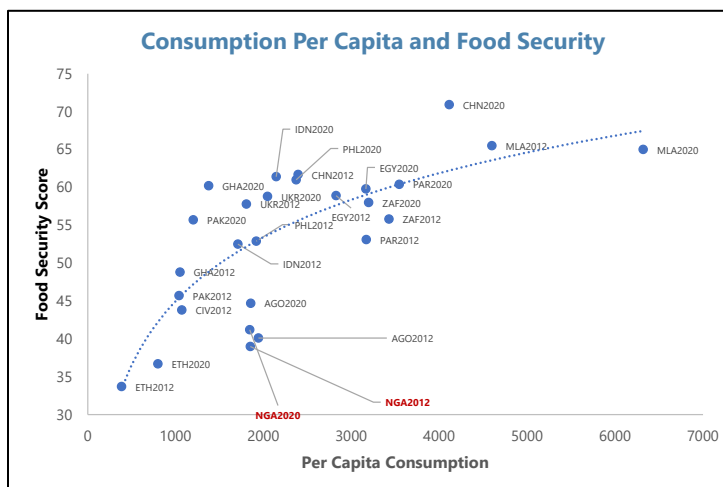ied, and for the price to be kept at an affordable level. Previous work on the determinants of the demand for food have highlighted the role of consumption/GDP per capita in PPP terms since, by definition, higher consumption per capita should lead to greater food security because of its role in

Consumption Per Capita and Food Security

increasing calories (Allee et al. (2021) and Cai et al. (2020). The text chart shows a tight relationship between per capita consumption and the EIU food security index (the initial and most recent matched datapoints are shown for the sample of countries).

11.   Surprisingly, few papers have emphasized food supply as a major factor in ensuring food security, even though national authorities are very much aware of the importance of domestic production. A possible reason is the absence of quality data on crop yields, at least until recently. To address this gap, the FAO and OECD recently produced comprehensive data on yields, production, consumption, and imports of crops for many countries

Relationship Between Yields and Food Security
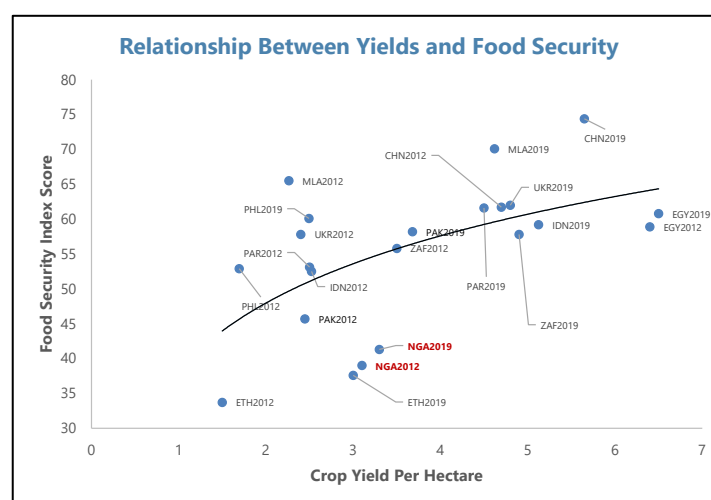
and this data is used to derive average yield estimates of maize, rice, roots and tubers, and wheat. Data limitations preclude the use of a weighted average based on consumption shares, which would be preferable given sizeable differences across countries (as documented above). Once again, the text chart depicts a strong positive relationship between yields and food security.

12.   Falling at the intersection of demand and supply, food prices could have an independent effect on food security, especially when comparing rural and urban areas. Stylized

facts once again illustrate this relationship, with higher food inflation rates being associated with lower food security (see text chart).

13.   The drivers of food security are assessed empirically in a multivariate cross-country setting. Controlling for time effects and country idiosyncrasies, the coefficients of regressions of food security and absence of hunger on per capita consumption, crop yield, food inflation, and food import reliance are presented in Table 1 (see Annex I for data definitions).

14.   Demand and supply factors as well as food price inflation are key drivers of food security. The results across all regressions confirm the significant positive roles of per capita consumption and crop yields in securing better food security and eliminating hunger. Reducing food

Food Price Inflation and Food Security
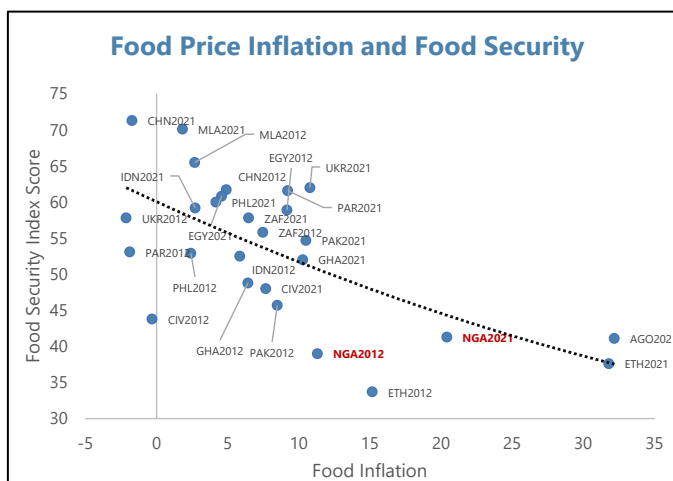
price inflation also improves food security, though the parameter estimate loses significance when using absence of hunger as the dependent variable in the baseline regression. Interestingly, the adverse effect of food inflation on absence of hunger reappears when including an interaction term between food inflation and high yield countries. Since the sum of the coefficients on food inflation and the interaction term is not significantly different from zero, the adverse effect of food price inflation on absence of hunger is only found for countries with low yields. Finally, while no significant effect is found for the share of food imports in the food security regression, this variable is significant in explaining high levels of hunger and could be associated with high imported food prices raising the share of food imports and making them unaffordable.

15.   There is significant scope to improve food security in Nigeria. To get a sense of the role of the variables in propelling Nigeria toward higher food security levels, we consider how much of a gap Nigeria would fill if it managed to reach the levels of Rwanda, Ghana, and Kenya at about 50 on the EUI food security index and the level of Philippines and Indonesia at 80 on the absence from hunger index. For this to happen, Nigeria would need a food inflation rate of 5 percent, a crop yield of 6.5 tons per hectare and a food import share of about 10 percent. These parameters are associated with countries in the comparator sample at the frontier. but they fail to propel Nigeria to the levels of the frontier countries because the country specific component plays a significant role in explaining its low index value and this component is not affected by policy changes. [6]

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[6] One of the missing indicators from the analysis is the share of food lost after harvest because of lack of data and this share is particularly high in Nigeria and could partly explain its poor ranking.

Table 2. Nigeria: Determinants of Food Security and Absence of Hunger

(Log Specification)

	Food security		Absence of hunger		
Per capita consumption (real 2015 US$)	0.15 ***	0.15 ***	0.08 ***	0.07 ***	0.07 ***
Cereal, rice and roots yield (average)	0.2 ***	0.21 ***	0.13 ***	0.11 ***	0.06 *
Food price inflation	-0.42 ***	-0.41 ***	-0.003	-0.01	-0.36 *
Food price inflation interacted with dummy for high yields					0.49 **
Share of food imports in total imports (percent)		0.08		-0.4 *	-0.4 **
Chi squared test for corr(u_i, Xb)	0.1	4.05	4.45	1.98	1
Nobs	107	107	174	173	173

*** 99 percent significance; ** 95 percent significance

Note: Results are based on a random effects model that includes random effects at the country level and satisfied by the insignificance of the Chi squared statistic

16.   High yields are clearly a major determinant of food security, and they are currently low in Nigeria. (Table 2). While the yield of roots and tubers is strong and this food category provides most of Nigeria's carbohydrates, the yields of the next two main sources of carbohydrates–maize and rice–are the lowest in the sample. Similarly, the milk return per cow is very low in Nigeria and its vegetable oil production is below the sample median.

17.   Low yield levels in Nigeria are strongly associated with scarcity of agricultural inputs. First, the application of fertilizers correlates positively with crop yields across the sample countries between 2000 and 2019 (prior to the Covid-19 pandemic). The data shows a non-linear relationship that levels out at about 200-250 kg per hectare.[7] Figure 8 suggests that the application of fertilizers in Nigeria is extremely low compared with other countries although the yield is stronger than suggested by the trend relationship, possibly due to elevated rainfall levels. A positive relationship is also visible between irrigation levels and yields across countries (Figure 9 using 2018 datapoints) and between rainfall and agricultural production in Nigeria (Figure 10). The strong seasonality of agriculture in Nigeria is governed by the timing of rainfall with production surges in the third quarter each year. Finally, mechanization (as proxied by farm machinery per unit of land in Figure 11) is also almost absent in Nigeria, although a recent initiative with Brazil is trying to rectify the situation.[8]

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[7] For instance, while Egypt applies much more fertilizer on its fields, crop yields have not surpassed 6.5 tons per hectare over the past two decades.

[8] Brazil has offered to supply 10,000 tractors to Nigeria over the next 5 years as part of a $1.2 billion agricultural sector contract that also offers technical knowledge to farmers

Table 3. Nigeria: Staple Yields
(Tons per Hectare Unless Otherwise Noted)

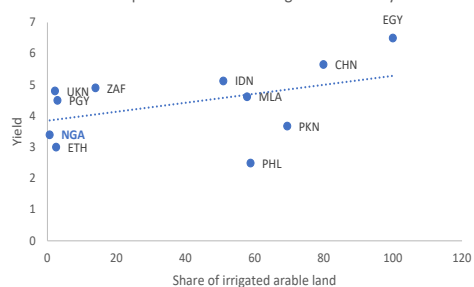|	Maize	Rice	Roots and Tubers	Sugar Cane	Vegetable Oils (production per capita, kilos)	Wheat	Milk (tonnes per cow)
Nigeria	2.2	1.5	8.2	15.3	9.7	1.5	0.2
Egypt	7.2	6.4	6.0	110.8	19.8	6.4	0.7
Ethiopia	4.8	1.9	2.2	44.7	0.6	3.3	0.2
South Africa	5.5	-	4.9	66.5	0.0	4.2	4.5
Paraguay	5.4	4.6	5.5	59.9	110.3	2.7	2.2
Ukraine	7.2	3.7	4.2	n.a.	166.7	4.2	3.7
Indonesia	5.6	3.3	10.7	51.9	177.7	1.0	1.1
Malaysia	7.1	2.3	8.1	n.a.	686.9	1.0	0.5
Pakistan	5.0	2.4	4.5	n.a.	7.9	2.8	1.2
China	6.3	4.8	5.8	n.a.	19.5	5.6	2.4
Philippines	3.2	2.7	3.1	n.a.	17.0	1.0	2.7

Source: FAO/OECD Agricultural Outlook 2000-2030 Database

Figure 8. Relationship Between Fertilizer Application and Yield
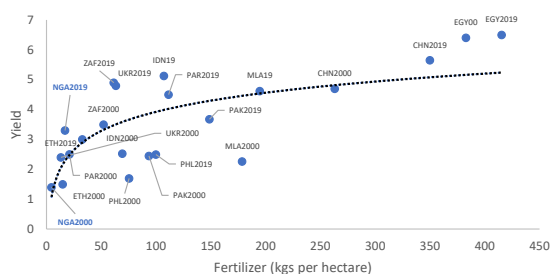
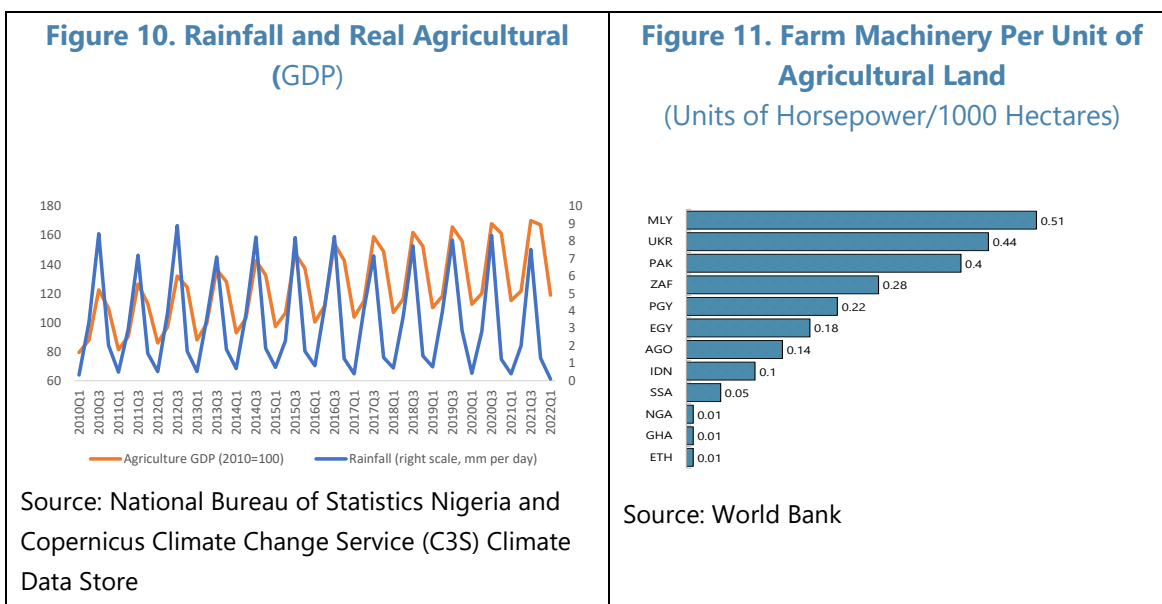
Source: FAO/OECD Agriculture Outlook 2000-30 database and FAO Fertilizer database

Figure 9. Relationship Between Share of Irrigated Land and Yield

Source: FAO Irrigation Database

Figure 10. Rainfall and Real Agricultural (GDP)

Source: National Bureau of Statistics Nigeria and Copernicus Climate Change Service (C3S) Climate Data Store

Figure 11. Farm Machinery Per Unit of Agricultural Land
(Units of Horsepower/1000 Hectares)

Source: World Bank

18.   The important role of inputs is evident in the policy experience of comparator countries. Box 5 shows a few commonalities in the policies adopted by South Africa, Paraguay and Ukraine in helping them to achieve high levels of food security over the past two decades, with emphasis on use of inputs, boosting trade and supporting agricultural credit.

Box 2. Agricultural Policies of Successful Comparator Countries

Among the low- and middle-income countries in Nigeria's comparator group, three countries stand out as having adopted successful agricultural policies over the past two decades: **South Africa, Paraguay, and Ukraine**. These three countries experienced strong agricultural output growth rates ranging from 4-5.9 percent per annum over the 2000-19 period and achieved sizeable improvements in crop yields.

South Africa focused its policy on creating greater efficiencies through lowering subsidies and liberalizing its trade regime. This allowed sizeable yield improvements, as total cultivated area was reduced through the release of marginal fields. Various policies were introduced to foster productivity:

- Lowering of food trade tariffs in the mid-1990s and the introduction of a free trade agreement with the EU.

- Loosening the regulation of the marketing of agricultural products and the setup of the National Agricultural Marketing Council to dismantle sector control boards.

- Increase in input usage over time

Paraguay benefitted from the prior existence of strong agricultural capacity in neighboring countries (Argentina, Brazil) that got transferred at the end of the 1990s. It focused on:

- Making strong use of inputs such as fertilizer and improved seeds and keeping land costs low.

Box 3. Agricultural Policies of Successful Comparator Countries (concluded)

- Using the benefit of large price surges from the major crop soybean to develop agriculture in rural areas.

- Wide availability of credit to finance needed agricultural investments.

- On the downside, agricultural production remains concentrated among the elites, and this can only be changed through extensive land reform.

Ukraine benefitted from high quality black soil but, following independence in 1992, it took many years for the use of inputs to reach significant levels. Proper policies include:

- Increased fertilizer and improved seed use – the country is now an important seed producing center and the use of hybrid varieties that protect against pests and climate change is growing rapidly

- increased free trade linkages with Europe and surrounding countries (except Russia) that have helped to stimulate agricultural investment and yields.

E. Government Efforts and Effectiveness in Securing Food Availability

Agriculture Policies in Nigeria

19.   To diversify the economy and boost domestic production of key staples, Nigeria has adopted explicit agricultural policies since independence, with some success. Following limited government emphasis on agriculture during the oil bonanza years of the 1970s and 80s, President Obasanjo embarked on a series of reforms to eradicate poverty. He launched the National Special Program on Food Security (2002) and the National Economic Empowerment and Development Strategy (2004) to shift the economy away from oil dependence to agriculture and other non-oil activities and to promote food security. In 2008, a Root and Tuber Expansion Program (RTEP) was launched to stimulate demand for cheaper staple food such as cassava, *garri*, yam, and potato. It empowered small-scale farmers with less than two hectares of land in commercial root and tuber agriculture and was extremely successful in raising the productivity of these food products as highlighted earlier. Subsequent policies focusing on agriculture include the Agriculture Transformation Approach (2011-15)[9], the Agricultural Promotion Policy (2016-20)[10], the Economic Recovery and Growth Plan (2017-20)[11], and the National Agricultural Technology and Innovation

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[9] The goal was to ensure that domestic food production increased by 20 million metric tons (MTs) within four years and that 3.5 million new jobs were created in the agricultural value chain (Adesina 2013).

[10] The policy aimed at creating employment, ensuring food security, eliminating poverty, and repositioning the nation's economy. (Olomola and Nwafor 2018)

[11] The plan came on the heels of the sharp decline in oil prices from about $112 a barrel in 2014 to below $50 in 2016. It recognizes the need to leverage science, technology and innovation and build a knowledge-based economy to change the role of the government from being the provider of citizens' needs into eliminating bottlenecks that impede innovation and market-based solutions (Williams and Francis, 2021).

Policy (2022-27)[12]. Recently, a new program built around special agro-industrial processing zones was introduced and is projected to run through 2027. The program aims to establish new economic zones located in rural areas, and fully supported by infrastructure (power, water, roads, digital infrastructure, and logistics) that facilitates food and agribusiness companies to locate there. [13]

20.   Successive Nigerian governments have endeavored to reduce import dependency. After the first oil era economic crisis in the early 1980s, the Nigerian government curtailed imports before requiring licenses for their usage and closing Nigeria's borders. Despite adopting pro-market policies, the Babangida regime imposed a 30 percent levy on all imports in 1985 and introduced a tariff system that served as a major protectionist tool, with tariffs increasing up to 100 percent for some products. Obasanjo's government used import bans extensively to protect local industries and boost manufacturing capability (Fasan 2015) and they have continued to prevail until today**.** Since 2016, the CBN has banned importers from accessing the foreign exchange market for 41 foreign products, most of which are consumer or intermediate products including key staples with the objective of "changing the economy's structure" and "resuscitating local manufacturing" to reduce forex demand by importers, and ultimately conserve the nation's international reserves (Central Bank of Nigeria 2015).

21.   The CBN has also been an active lender to the agriculture sector. Given the widespread understanding that the private sector is averse to extending credit to the agricultural sector, (Paloma et al. 2015), and that directed credit in agriculture has been successful elsewhere (Seven and Tumen 2020), the government has been instrumental in supporting low interest loans to farmers through the CBN. One of the earliest schemes was the Agricultural Credit Guarantee Scheme Fund set up in 1978 providing agricultural loan guarantees for commercial banks. The Anchor Borrowers Program established in 2016 initially set aside 40 billion naira to support farmers by offering single digit interest rate loans. Since then, over 1 trillion naira has been disbursed through mid-2022 from this program, with CBN providing a rising share of banking system agricultural financing.

Agricultural Credit from Banking System
(in billions of naira)

Central Bank Agriculture Credit | Private Bank Agricultural Credit
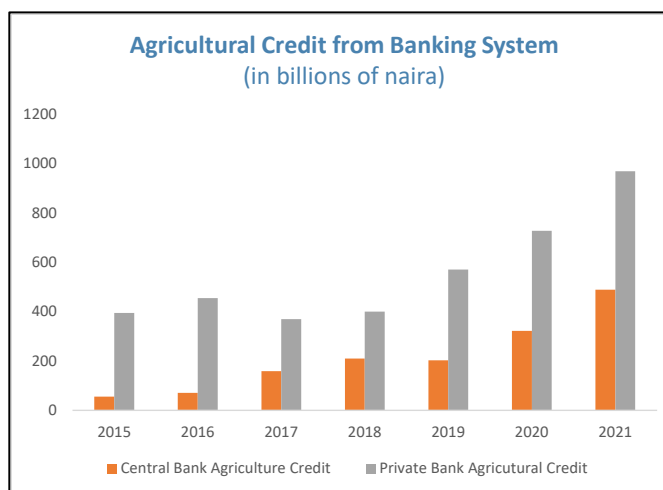
22.   Input subsidies were also successfully introduced in Nigeria and are looking to be reintroduced. The e-voucher subsidy scheme was developed during 2011-15 and provided electronic vouchers to farmers to obtain

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[12] The objective is to promote digital and climate-smart agriculture to reduce imports of food such as rice, dairy products, and fish as well as increase resilience for farmers, and boost high potential value chains (Voice of Nigeria 2022)

[13] Financed by AfDB and IFAD, the program emphasizes facilitating farm access to essential inputs through an electronic wallet and targets tomato, rice, cassava, maize, soybeans, ginger, beef and dairy (African Development Bank Group 2022).

subsidized NPK or urea fertilizer and improved seeds from private sector input retailers. Internal estimates suggest that between 12-14 million farmers received e-vouchers in total, but the initiative was withdrawn in 2015 as macroeconomic conditions worsened and government revenues declined associated with the dramatic fall in oil prices. However, a new program based around agricultural special processing zones financed by the African Development Bank (AfDB) and International Fund for Agricultural Development (IFAD) is reintroducing them.

Evaluation of Policy Effectiveness

23.   Over the past two decades, dependence on food imports has remained elevated in Nigeria relative to the comparator sample group, but notable reductions have been visible for rice and fertilizer. Import dependence is assessed by comparing long term changes in the food import ratio across the country sample group and looking at changes over time across specific commodities in Nigeria. Little change is noted in the food import ratios across countries over the past two decades (Figure 12) - countries with low levels of import dependency (below 10 percent) at the beginning of the 2000-09 period have increased their ratios slightly, whereas other countries (including Nigeria) have generally maintained earlier high levels of import dependency. The view is more nuanced when considering specific commodities in Nigeria since fertilizer and rice imports have fallen over time although no visible change is seen for wheat and sugar imports (Figure 13).

Figure 12. Change in Food Import Ratios Over Time

Source: UNCOMTRADE

Figure 13. Import Dependency (Imports/Consumption, in Percent)

Source: CBN
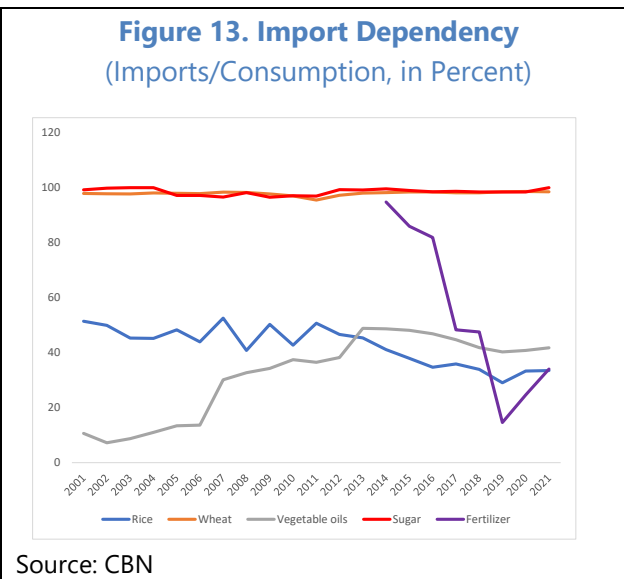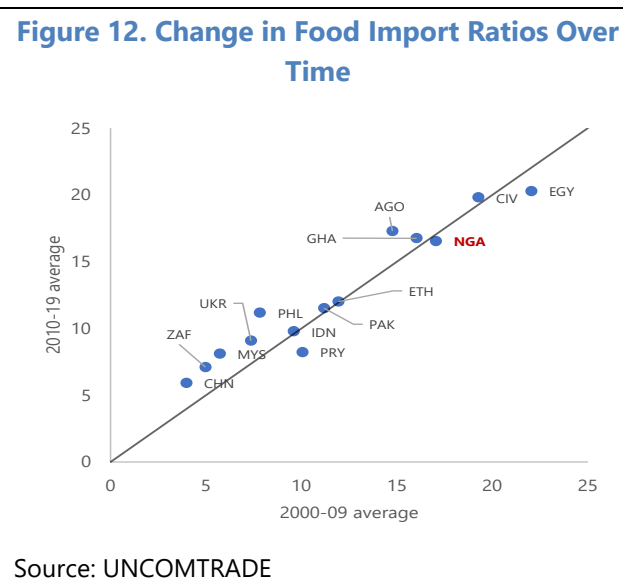
24.   One important measure of the success of import bans is whether, following their imposition, domestic conditions become more important in the setting of domestic prices.[14] Figure 14 indicates that, historically, the prices of domestic staples that are internationally traded have co-moved with international prices expressed in local currency (converted at the parallel market

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[14] The import ban should also lead to increased domestic production. However, without a more competitive market structure, import substitution policies may not ultimately benefit consumers. Indeed, a rigid market structure in agriculture can also distort price signals and limit the benefits of higher prices to the farmer in favor of the middleman (see IMF 2022).
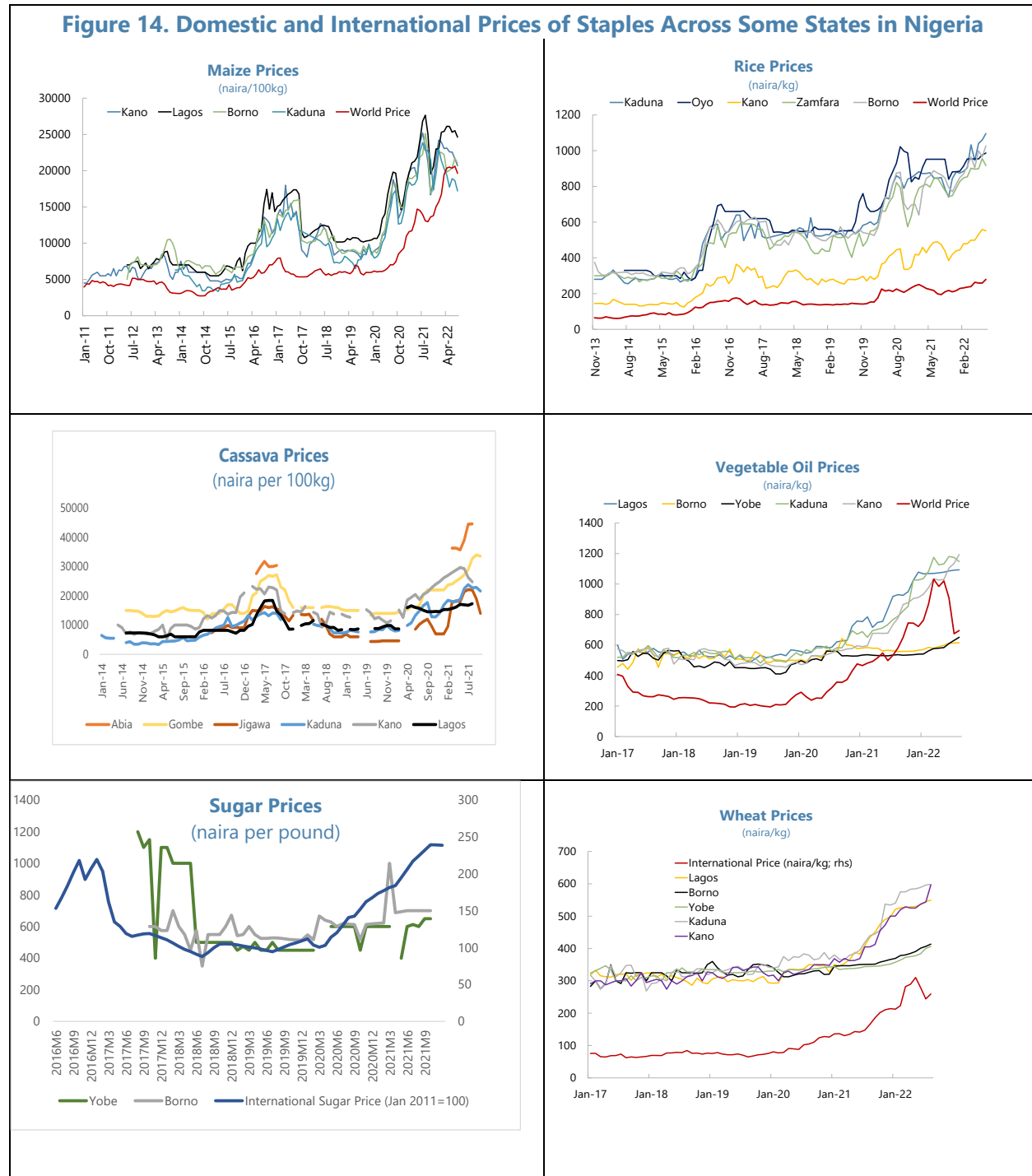
exchange rate). Prices of traded goods across regions (maize and rice) also move closely together, while for cassava, and to a lesser extent vegetable oils, prices across Nigerian states are more variable over time, demonstrating the importance of local conditions in determining their pricing. The same holds for wheat flour and sugar in the northern states where the available supply of WFP food support packages in Borno and Yobe (which comprise wheat flour, vegetable oil and sugar) have helped to stabilize the prices of these staples. In areas without WFP food support (e.g., Kaduna and Lagos), domestic wheat and vegetable oil prices move more closely with international prices.

25.   The limited effect of domestic conditions and import bans on food prices is confirmed using an empirical assessment. We run separate regressions of maize and rice prices using as right-hand side variables their lagged prices, their international price in local currency valued at the parallel market exchange rate, and a dummy variable for the period following the imposition of the import ban. The estimation is run for the state of Kano for which data for the two staples is available prior to and after the setting of the ban. The results reveal that lagged domestic food prices and international prices are significant determinants of current maize and rice prices. Also, the sum of the coefficients on the international price over four quarters is insignificantly different from unity, suggesting full pass through to domestic prices. Moreover, the dummy variable for the period following the import ban is insignificant in both price equations and the sensitivity of the prices of staples to the international prices is not diminished following the imposition of import bans.

26.   A similar outcome is found for fertilizer with little change in the sensitivity of the domestic price to the international urea price in recent years despite a significant increase in production.[15] It could be argued however, that transportation costs are putting additional upward pressure on domestic fertilizer prices and this effect is masking any price moderation in response to more domestic supply. It is also the case that the new supply coming from Dangote is being fully used for export and is therefore not yet impacting the domestic supply and demand mix.

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[15] The lack of responsiveness of fertilizer prices to increased production could be due to monopolistic conditions in the industry (see IMF 2022).

Figure 14. Domestic and International Prices of Staples Across Some States in Nigeria

Maize Prices
(naira/100kg)

Kano — Lagos — Borno — Kaduna — World Price

Rice Prices
(naira/kg)

Kaduna — Oyo — Kano — Zamfara — Borno — World Price

Cassava Prices
(naira per 100kg)

Abia — Gombe — Jigawa — Kaduna — Kano — Lagos

Vegetable Oil Prices
(naira/kg)

Lagos — Borno — Yobe — Kaduna — Kano — World Price

Sugar Prices
(naira per pound)

Yobe — Borno — International Sugar Price (Jan 2011=100)

Wheat Prices
(naira/kg)

International Price (naira/kg; rhs)
Lagos
Borno
Yobe
Kaduna
Kano

27.   Notwithstanding strong regression results from cross-country studies, it is difficult to identify an agricultural credit channel for boosting agricultural supply in Nigeria, though the findings could reflect the short estimation period.[16] We construct an agriculture supply function and test whether credit impacts production over the short run. The estimated agricultural supply function has real agricultural output growth as the dependent variable and is estimated using lagged food prices and contemporaneous rainfall as instruments for the food price. The relationship is correctly specified since the

Fertilizer Prices
(USD per kilo)

food price has a significant positive effect on food supply (see Table 3). However, the other variables except for lagged agricultural growth are insignificant, including those related to the change in banking credit and the component that is provided via the central bank. Of course, the lack of significance could be associated with the short period and the dominant effect from rainfall (see Figure 11).
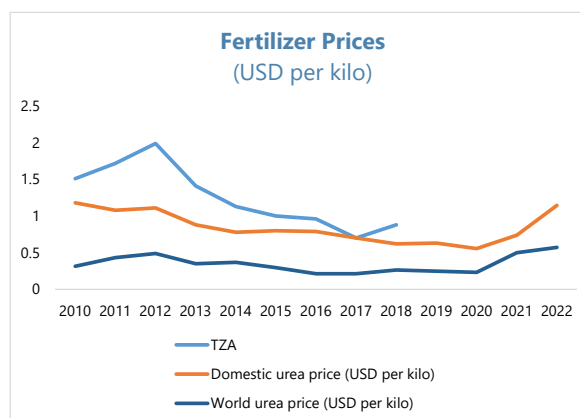
Table 3. Nigeria: Role of Credit in Agricultural Production Growth			
Change in food price	0.19 **	0.18 **	0.21 **
Change in real banking credit (-1)	-0.03	-0.02	-0.03
Change in real banking credit (-2)	-0.01	-0.01	-0.01
Change in rainfall (-1)	0.12	0.09	0.11
Change in rainfall (-2)	0.15	0.14	0.18
Agricultural growth (-1)	0.41 *	0.44 *	0.34 *
Agricultural growth (-2)	-0.44	-0.43	-0.43
Share of central bank credit			0.01
Nobs	26	24	25
R squared	0.4	0.4	0.44

** 95 percent significance; * 90 percent significance

Note: Results are based on an instrumental variables regression with contemporaneous rainfall and lagged food prices used as instruments for the contemporaneous food price.

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[16] See Seven and Tumen (2020) for a typical example of cross-country findings.

28.   The weak effect of agricultural credit on production growth could be associated with difficulties in targeting the correct recipients. Empirical papers document a 50-60 percent repayment rate over the course of an agricultural loan, with late administration of the loan and diversion into other uses as typical explanations for the weak repayment profile (Edet, 2016, Anigbogu, 2014, Mbam 2021). Recent data (November 2020) from the central bank indicate that the repayment rate for the Commercial Agricultural Credit (CAC) Scheme is at almost 66 percent but, since the loans started in 2009, this is not a particularly high outcome. For the Anchor Borrowing Program, repayment is also low at 24 percent, especially since repayment can be made in kind, thereby limiting the tenor of the loans to one year. Part of the problem is that the incentive structure for repayment is weak, the recipient loans are not always well targeted and occasionally the funding is used for other purchases (e.g., new agricultural input trading companies to elicit trading rents).

29.   Finally, on input subsidies, most micro data studies suggest that significant improvements were achieved through the e-voucher subsidy program. Wossen et al. (2017) show that farmers who participated in the subsidy program increased their maize yield by over 26 percent and per-capita consumption expenditure grew by almost 31 percent. Moreover, netting out the cost of the subsidies provided a net benefit of 11 percent (excluding economy-wide effects). A complementary study on the use of biofortified cassava seed with vitamin A supplements by Adetomiwa and Kolapo (2021) reported increased cassava yields (over 28 percent), and higher per-capita consumption (39 percent). Moreover, following the introduction of the e-voucher program, Benjamin (2020) documents a substantial increase in fertilizer expenditure by farmers, but Kujima (2021) asserts that this was not the case in a region that was already using fertilizer to a large extent.

30.   For the reintroduction of the e-voucher program to be effective, the papers on the Nigerian experience as well as reflections on the experience in Malawi and Zambia (Mason et al. 2020) suggest the following measures ex ante:

- Provide the subsidy on time.
- Conduct the scheme over a long period (over 5 years) to show the population that the scheme is here to stay.
- Avoid elite capture by making the scheme available to anyone and not self-selected groups.
- Allow flexibility in purchase so that the voucher can be used for various types of seed.
- Source the fertilizer locally so the recipients do not have large distances to travel.
- Provide the voucher in tandem with extension services so that the input is properly applied.
- Avoid areas where crowding out of fertilizer demand is likely to happen.

Of course, large expenditures are needed for these conditions to hold but the size of the fuel subsidy provides some potential financing.

F.   Conclusions

31.   Food insecurity is an increasing policy concern in Nigeria. The country is endowed with immense agricultural resources and over 81 million arable and largely fertile hectares, with maize, cassava, guinea corn, yam beans, millet, and rice being the major crops (Odukoya, 2020). Despite rising

domestic production of staples, the global increase in food prices is adversely affecting food security conditions. Rural areas are insulated somewhat from the recent price surge because of more home production although peripheral areas of the country have suffered the worst effects in recent years.

32. **Key drivers of food security are demand and supply factors as well as food price inflation**. The cross-country analysis identifies four levers for raising food security levels: raising per capita consumption, raising production yields, limiting food price inflation, and reducing reliance on food imports. Per capita consumption is far below comparator countries in Nigeria, and it could be stimulated through increased diversification. Yields are also lower in Nigeria than in other countries due to scarcity of inputs (fertilizers, modern irrigation methods, and mechanization). Addressing challenges to access to timely, high quality, and price competitive inputs would not only achieve optimal productivity of agricultural outcomes but also temper food inflation.

33. **Nigeria has achieved a substantial increase in agricultural production associated with its policies but some have been less successful**. Import dependency for key staples has not fallen and the cost of these agricultural products remains driven by international prices. Further, central bank credit to the agricultural sector has not succeeded in increasing production beyond the stimulus of high rainfall and high food prices. In contrast, the government's e-voucher schemes to farmers to obtain subsidized inputs has proven to boost yields. This latter policy is currently being introduced in tandem with the creation of new special processing zones and offers good prospects provided it is handled efficiently.

Annex I. Variable Definitions and Sources for Econometric Specifications

Variable Definition	Variable Source
Determinants of Food security (annual data)	
Food security index: country index based on affordability, availability, quality and safety of food (varies between 0-100)	EIU Food Security Index 2012-22
Absence of Hunger index: 100-Global Hunger index based on the proportion of undernourished in the population, proportion of child wasting, stunting and mortality for children under 5	IFPRI 2006-21
Per capita consumption: Index of real consumption per capita valued at 2015 US dollars	World Bank 2000-21
Cereal, rice and roots yield: average of yield for maize, rice, roots and tubers, wheat	FAO/OECD 2000-20
Food price inflation	Haver 2000-22
Food imports in total imports	World Bank 2000-20
Determinants of Agricultural Production Growth (quarterly data)	
Agricultural production (2010=100)	NBS 2015Q1-2021Q4
Food price (2009m12=100)	NBS 2015Q1-2021Q4
Rainfall (mm per day)	Google earth climate real analysis
Real banking credit: agricultural credit offered through banks deflated by the GDP deflator	CBN 2015Q1 -2021Q4
Share of central bank credit: central bank credit to agriculture divided by total agriculture credit offered through banks	CBN 2015Q1 -2021Q4

References

Adesina, A. 'Transforming Nigeria's Agriculture', speech delivered at the Inauguration of the Agriculture and Food Security Center of the Earth Institute of Columbia University, New York, 2013.

Adetomiwa, K. and A. Kolapo, Welfare and productivity impact of adoption of biofortified cassava by smallholder farmers in Nigeria, Cogent Food and Agriculture 2021, vol. 7.

African Development Bank Group, African Development Bank and partners launch $520 million special agro-industrial processing zones to transform Nigeria's agriculture, 2022. Available at: afdb.org.

Allee, A., Lynd L. and Vaze V., Cross-national analysis of food drivers: comparing results based on the food insecure experience scale and global food security index, Food Security 2021 13.

Anigbogu, T., Onugu, C., Onyeugbo, B. and Okoli, M., Determinants of Loan Repayment among Cooperative Farmers in Awka, Anambra State, European Scientific Journal, 10, 2014.

Benjamin, E.O., Ola, O., Lang, H. *et al.* Public-private cooperation and agricultural development in Sub-Saharan Africa: a review of Nigerian growth enhancement scheme and e-voucher program. *Food Sec.* 13, 129–140, 2021.

Cai, J., Ma, E.,Lin J., Liao L., and Han Y., Exploring global food security pattern from the perspective of spatio-temporal evolution, Journal of Geographical Sciences 30(2) 2020.

Central Bank of Nigeria, Press Release, Further Explanation on Selective Forex Restriction: CBN replies to *The Economist*, 2015. Available at: CBN replies to the economist press release.

Edet, O., Agbachom, E., Igiri, J., and Sampson, G., Analysis of Borrowing and Repayment of Credit among Livestock Farmers in Cross River State, Global Journal of Pure and Applied Sciences, 22 2016.

IMF, Nigeria Selected Issues 21/210, Washington DC.

Fasan, O. Nigeria's import restrictions: A bad policy that harms trade relations, Blog editor, London School of Economics, 2015.

Food Security Information Network, Global Report on Food Crises, 2022 New York.

IMF, Climate Change and Chronic Food Insecurity in Sub Saharan Africa, 2022, DP2022/016, Washington DC.

Jayne, T., Yeboah, C and Henry, C., The Future of Work in African Agriculture- Trends and Drivers of Change, ILO working paper no. 25, 2017.

Kujima, Y., Effect of Nigeria's e-voucher input subsidy program on fertilizer use, rice production and household income, GRIPS discussion paper 21-00.

Mason, N., Kuteya, A., Ngoma, H., Tossou, D., and Baylis K. Does switching to a flexible voucher approach improve input subsidy program outcomes, Feed the future innovation lab for food security policy, January 2020.

Mekonnen, D. et al., Affordability of healthy and sustainable diets in Nigeria, Frontiers in Sustainable Food Systems, September 2021.

Mbam, B., Nwibo, S., Nwofoke, C., Egwu, P. and Odoh, N. Analysis of Smallholder Farmers Repayment of Bank of Agriculture Loan in Ezza, Ebonyi State, International Journal of Sustainable Agricultural Research, 8, 2021.

Odukoya, A., Political Economy of Agricultural Commercialization in Nigeria, Agricultural Policy Research in Africa (APRA) working paper 29, Future Agricultures Consortium, 2020.

Okou, C., Spray, J. and Unsal D., Staple food prices in Sub-Saharan Africa, IMF working paper 22/135.

Paloma, S., Riesgo, L. and Luchini, K., *The Role of Smallholder farms in Food and Nutrition Security*, Springer Verlag, Cham, Switzerland, 2015.

Olomola, A.S. and Nwafor, N., Nigeria Agriculture Sector Performance Review: A Background Report for the Nigeria 2017, *Agriculture Joint Sector Review*, 2018.

Seven, U. and S. Tumen, Agricultural Credits and Agricultural Productivity: Cross Country Evidence, The Singapore Economic Review Vol 65, 2020.

Synak, W. and R. Turk. Trade Diversification in Nigeria: How to Get There? Nigeria: Selected Issues. IMF Country Report No. 22/34, 2022.

Thomas, A., Synthesis of Nigerian Labor Market: Putting the Emphasis on Agriculture. Nigeria: Selected Issues. IMF Country Report No. 22/34, 2022.

Voice of Nigeria, Nigerian Government Launches National Agricultural Technology /Innovation Policy (2022-2027), 2022. Available at: von.gov.ng

World Bank, Nigeria Climate Risk Assessment Profile, 2021, Washington DC.

World Food Program, Hunger Hotspots, 2022, Rome.

Williams, E. A. and Francis. E, O. O. The Economic Recovery and Growth Plan (ERGP) as Developmental State Paradigm: An Introspection. *International Journal of Public Administration and Management Research*, 5(3), 12-20, 2021.

Wossen, T., T. Abdoulaye, A. Alene, S. Feleke, J. Ricker-Gilbert, V. Manyong, and B. Amoke, Productivity and Welfare Effects of Nigeria's e-Voucher-Based Input Subsidy Program, World Development, 2017, Vol 97.

Yao, J. and Y. Liu. Diversification of The Nigerian Economy. Nigeria: Selected Issues. IMF Country Report No. 21/34, 2021.