



Ceres2030 Deep Dives Into
the Nexus of Food Systems,
Climate Change, and Diets

Country Diagnostic Report:

NIGERIA





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Country Diagnostic Report: Nigeria Ceres2030 Deep Dives into the Nexus of Food Systems, Climate Change, and Diets

May 2022

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Abstract

The purpose of this report is to provide an overview of findings from the first round of activities for the four components of the project, namely the nutrition profile (Task 1), the data assessment (Task 2), relevant parts of the literature review (Task 3), and the findings of the first consultations (Task 4). Our research is based on diverse sources of information, including the relevant outcomes of the Ceres2030 project, public policy documents, peer-reviewed literature, and international databases. Using these sources of information, this report provides an overview of the current economic, social, and climate (mitigation and adaptation) trends in Nigeria, as well as projections based on the Ceres2030 project model. We also include a brief review of relevant policy documents addressing undernourishment, resilience building, and agricultural development, along with an overview of the approach we used in country consultations and early findings from this process. The report concludes with a brief summary of relevant national trends and planned next steps in the country-level research and analyses.



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1.0 Introduction

This report provides an overview of the findings from the first round of activities for the four components of the project, namely the nutrition profile (Task 1), the data assessment (Task 2), relevant parts of the literature review (Task 3), and the findings of the first consultations (Task 4). The findings reported here address research questions 1 and 3:

1. What are the expected trends in terms of diets for the three countries?
3. What is the definition of a healthy diet for a country, considering cultural and economic specificities, and the nutritional value of different food items?

This report also contributes to addressing research question 4:

4. What are the policy instruments and the food system¹ innovations required to achieve healthier diets?

This report is based on diverse sources of information, including the relevant outcomes of the Ceres2030 project, government policy documents, peer-reviewed literature, and international databases, such as those on official development assistance (ODA). When working with these sources, we outline relevant trends and key aspects of planned economic modelling without providing detailed background explanations or definitions, as we assume an informed audience.

This report provides an overview of current trends in undernourishment and basic economic indicators in Nigeria, summarizing projections for these indicators using the Ceres2030 model. We also outline current trends in nutrition profiles and challenges by population groups, from related data sources and data processing efforts. The report also describes trends in greenhouse gas (GHG) emissions, climate change impacts, especially on agriculture and nutrition, as well as adaptation measures proposed in key policy documents. We include a brief review of relevant policy documents addressing undernourishment, resilience building, and agricultural development, along with an overview of the approach and early findings from country consultations. The report concludes with a brief summary of relevant national trends and planned next steps in the country-level research and analyses.

The key messages are as follows:

- **Poverty and hunger today.** The poverty level in Nigeria is similar to the average of Africa, South of the Sahara (39% versus 42% in 2016) (World Bank, Development Research Group, 2021b). Food insecurity and the prevalence of undernourishment (PoU) are better than average for the region (13% versus 18% in 2018) (Food and Agriculture Organization of the United Nations [FAO], 2021a); however, Nigeria has experienced undernourishment and a deterioration of food security and in recent years

¹ A food system gathers “all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socio-economic and environmental outcomes” (High Level Panel of Experts on Food Security and Nutrition, 2014, p. 2).



due to political instability and conflicts, especially in the north, and several economic recessions triggered by declining oil revenue.

- **Poverty and hunger by 2030.** In the next decade, progress in reducing extreme poverty is expected to stagnate and even reverse slightly without additional measures (from 40% in 2020 to 41% in 2030), according to our projections. Chronic hunger is also predicted to rise (from 13% in 2020 to 17% in 2030), according to our projections (see Table 1).
- **GHG emissions from increasing animal production till 2030.** GHG emissions, mostly from livestock production, are a growing problem in Nigeria. In 2018, livestock accounted for 78% of agricultural production emissions in the country, followed by rice production (11%) (see Figure 2). The agricultural sector—especially animal production—will continue to grow. This will lead to a moderate increase in emissions from food production, by 2.3% per year, or 25% over 10 years. This 2.3% per year can be compared to the 0.2% on average for the world and the 1.2% for the rest of Africa, South of the Sahara, according to our Ceres2030 projections. Land-use change from forestry to agriculture is expected to plateau, with forested areas expected to decrease by 5% in the next 10 years (see Table 1).
- **Key nutrition challenges.** In 2018, 7% of children under 5 were affected by wasting and 37% by stunting. While stunting fell as much as 8% from 2008 to 2015, it drastically increased to 44% in 2016, due to factors including the Boko Haram violence and issues arising from the effect of low oil revenue on Nigeria's currency (Food Security Information Network, 2017). Anemia affects one in two women of reproductive age, slightly higher than the average for Africa, South of the Sahara. Compared to Malawi and Ethiopia, Nigeria also faces the challenges of addressing growing obesity (9% in 2016) (Chukwuonye et al., 2013).
- **Climate change impacts on agriculture.** Climate projections for agriculture indicate lower yields in the longer term, leading up to 2050. From the planted crops, rice demonstrated dropping yields from 7% to 25% over short- and long-term horizons (Federal Republic of Nigeria [FRN], 2020a; Morgan & Fanzo, 2020). It is expected that the total annual rainfall will increase, potentially having a beneficial effect on the productivity of cassava, but the productivity of some crops (such as yam, maize, tomato, and melon) is negatively affected by higher rates of annual rainfall. Rising temperatures rather than changing precipitation patterns often affect cassava and sweet potatoes negatively.
- **Efforts to address climate change.** At the national level, the country has developed the National Climate Change Policy Response and Strategy, launched Sovereign Green Bonds, and, more recently, adopted a National Adaptation Plan Framework and a National Agricultural Resilience Framework to support adaptation planning and resilience building. Specific adaptation measures include adopting drought-tolerant crop varieties, creating diverse sources of income, and planting cover crops to reduce soil erosion and pests while enhancing soil fertility and quality.
- **Higher share of animal-based protein for richer households.** As in Ethiopia and Malawi, the largest share of food expenditures for the poorest households is on grains and flours (29.6%), while for households in the highest quintile, this share is



lower (18.5%). Animal-based protein accounts for 15.9% of the estimated value for the poorest households, comprising poultry (2.6%), meat (5.4%), and fish or seafood (7.9%). This share is much higher for the richest households, with these categories accounting for 27.4% of the total value of consumption (6.7%, 10.4%, and 10.3%, respectively) (see Figure 4).

- **National dietary guidelines are developed.** Nigeria published food-based dietary guidelines in 2001 and 2006. The guidelines are rather general and stress the importance of eating a wide variety of types of food (grains, legumes, roots and tubers, fruits, vegetables, fish, lean meat, etc.), reducing the consumption of sugary foods and animal-sourced fats, reducing the use of salt in cooking, and eating in-season fruit. Similar to other countries, Nigeria does have other relevant nutrition policies that mandate the fortification of wheat and maize flour with several vitamins and minerals, salt iodization, and the fortification of cooking oil with vitamin A.
- **Role of ODA in the food system.** In total, USD 555 million was disbursed annually to projects directly affecting the food system (average, 2014–2018). This accounted for 26% of ODA grants and philanthropic donations (Organisation for Economic Co-operation and Development [OECD], 2021). Based on Ceres2030 modelling, the gap between current ODA and needed ODA till 2030 to meet targets of Sustainable Development Goal 2 (SDG 2) is the largest among the three countries studied (see Table 4 and Figure C2 in the Appendix).



2.0 Assessing Domestic Progress Toward Healthy and Sustainable Food Systems

2.1 Recent Evolution of Relevant Indicators, Including but not Limited to SDG2 Targets

Nigeria, located in West Africa, is the 14th largest country in Africa by land area. It has the largest population in Africa, estimated to be about 200 million (World Bank Development Research Group, 2021b). An important feature of the population structure in Nigeria is that two-fifths of the population (43.7%) is under 15 years old (World Bank Development Research Group, 2021a). The country's climate ranges from hot, arid desert in the north to tropical rainforest along part of the coast in the south; most of the country has a tropical savannah climate. Elevation ranges from sea level to over 2,000 metres in the highlands. Agriculture employs over 35% of Nigeria's labour force and represents over 22% of GDP. Agriculture is relatively inefficient in generating income: the value added per worker in agriculture is about half of what prevails in the rest of the Nigerian economy (World Bank International Bank for Reconstruction and Development, & International Development Association, 2021).

Extreme poverty rates (at the USD 1.90 per day international poverty line) in Nigeria are at a similar level to the average for Africa, South of the Sahara (39% versus 40% in 2018) (World Bank Development Research Group, 2021c). The PoU is lower than the regional average: in 2018, it was 13% in Nigeria versus an average of 18% in Africa, South of the Sahara (FAO, 2021a). Food insecurity is better than average for the region, with 9% of the population experiencing severe food insecurity in 2018 versus 21% on average in Africa, South of the Sahara for the same year (FAO, 2021a). Poverty and food security indicators for Nigeria are shown in Figure 1. Of course, these indicators obfuscate many dimensions of diversity within the nation, including north-south differences. The project's modelling work will include north-south diversity and diversity along other dimensions by representing diversity at the household level: the modelled population is composed of different types of households, which are distinguished by level of income, source of income, and consumption patterns, including dietary diversity.

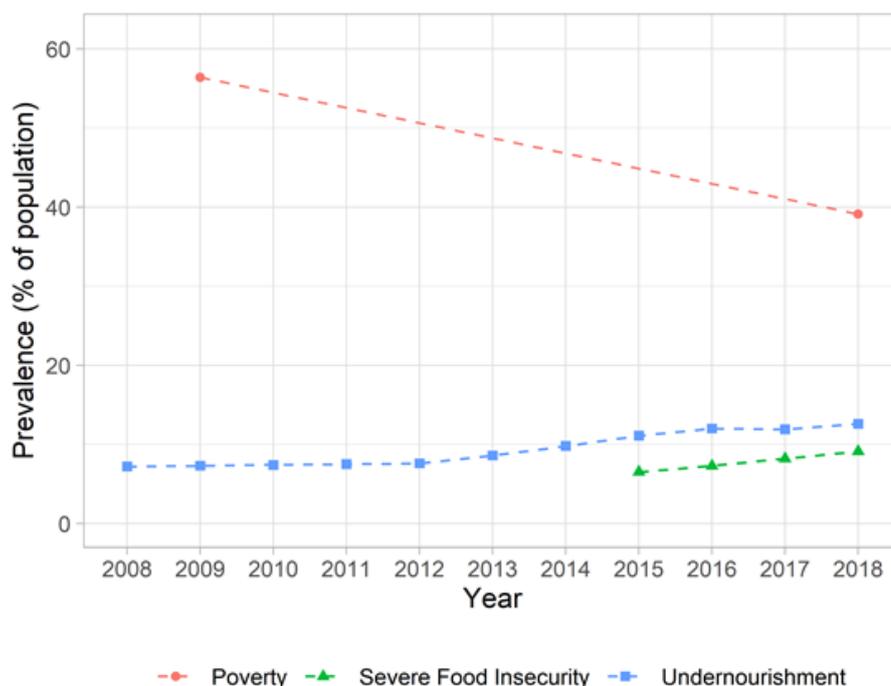
Recent years have seen a deterioration of the situation for both poverty and hunger, due to political instability and conflicts, especially in the north, and several economic recessions triggered by declining oil revenue. These issues are likely to be ongoing.

In terms of nutrition indicators, 7% of children under 5 were affected by wasting and 37% by stunting in 2018. While stunting fell as much as 8% from 2008 to 2015, it drastically increased to 44% in 2016, due to factors including the Boko Haram violence and issues arising from the effect of low oil revenue on currency (Food Security Information Network, 2017). Wasting rates have been even more variable than stunting rates over the last decade. Although the prevalence of anemia has been declining since 2000, it still affects one in two women of reproductive age, slightly higher than the average for Africa, South of the Sahara.



Importantly, this prevalence of anemia, around 50%, has remained persistent since 2011 (Global Nutrition Report, 2020).

Figure 1. Prevalence of extreme poverty and hunger in Nigeria



Sources: Poverty is defined by the poverty headcount ratio at USD 1.90 per day (2011 purchasing power parity (PPP)) (% of population), from PovcalNet via World Bank Open Data (World Bank, Development Research Group, 2021c). Undernourishment is the PoU (percent) from FAO (2021a). Severe food insecurity is the prevalence of severe food insecurity in the total population (percent) from FAO (2021a).

In 2016, the World Health Organization (WHO, 2021) estimated the prevalence of obesity among adults to be around 9%, although data from a systematic review in 2013 suggests this estimate may be a bit low (Chukwuonye et al., 2013). Obesity thus rivals the PoU (which was 13% in 2018, see above), and the Global Nutrition Report (2020) shows the prevalence of obesity and overweight to be increasing. Importantly, there is a significant gender difference in the trends of overweight and obesity, with 36% of women overweight and 13% obese, compared to 22% and 5% of men, respectively (Global Nutrition Report, 2020). In other countries, overnutrition has often risen with economic development, leading to the double burden of malnutrition and overnutrition (WHO, 2021). Nigeria may face this problem and will need to consider policies to promote diets that are both sufficient and healthy to avoid the double burden.

Nigeria devotes 12% of all arable land to cassava production. The five main crops (cassava, maize, yams, paddy rice, and sorghum) represent 51% of the harvested area and account for much of the average Nigerian diet (Elbehri et al., 2013).

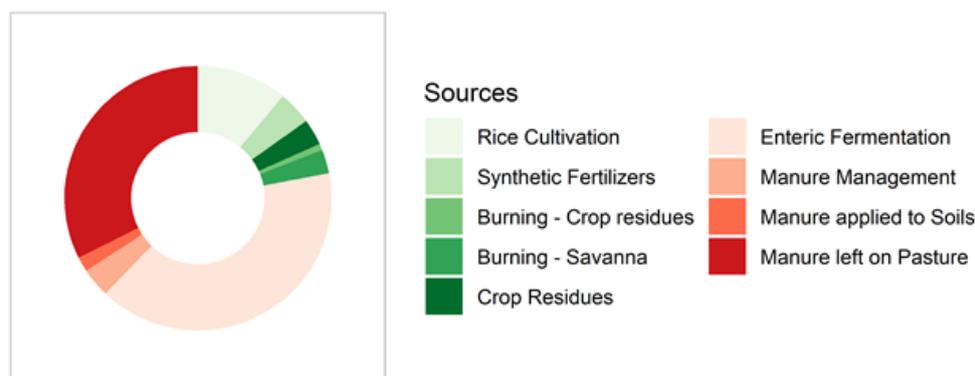
Like much of the region, the country's agriculture is vulnerable to climate change, including changes in rainfall. Irrigation coverage, which can mitigate the effects of erratic rainfall, is very



low. While recent statistics are not available, irrigation coverage was estimated to be at just 0.3% in 2004 (FAO, 2021a).

Emissions from agriculture² and agriculture-related land use³ per dollar of agricultural production are higher than the global average but average for Western Africa, at 4.9 metric tonnes per thousand constant 2014–2016 international dollars, versus 3.0 at the global level and 4.8 for Western African countries on average.

Figure 2. Agricultural emissions by source, 2018



Source: Author diagram, based on data from FAO, 2021a.

As is the case in Malawi and Ethiopia, Nigeria's agricultural GHG emissions, mostly from livestock production, are a growing problem. From 2008 to 2018, GHG emissions from agricultural production (production not including deforestation for agriculture or other uses)⁴ increased by 31%, driven largely by increasing livestock production (see Appendix C, Figure C1). In 2018, livestock accounted for 78% of agricultural production emissions. Rice cultivation is the largest crop emission category, accounting for a further 11% of agricultural emissions.

Agriculture-related land-use emissions, which are generally emissions from converting natural land to agricultural land, are about one half the magnitude of agriculture emissions and have been stable over the last decade (agriculture-related land-use emissions averaged

² Agricultural emissions include emissions from crop and livestock production and associated activities: enteric fermentation, manure management, manure left on pasture, manure applied to soils, cultivation of organic soils, rice cultivation, synthetic fertilizers, crop residues, burning of crop residues, burning of savanna, and on-farm energy use. They do not include, and are measured separately from, agriculture-related land-use emissions. See the methodological note available at <http://www.fao.org/faostat/en/#data/GT> for details. While on-farm energy use is included in the modelling, it is omitted from some items here due to data gaps.

³ Agriculture-related land-use emissions include emissions from cropland, grassland, net forest conversion, and fires from burning of organic soils and humid tropical forests. They do not include, and are measured separately from, agriculture emissions. See the methodological note available at <http://www.fao.org/faostat/en/#data/GL> for details. While agricultural emissions can largely be conceptualized as flows (emissions that are released each year due to production activities, such that emissions and production occur in the same year), agriculture-related land-use emissions can be better conceptualized as stocks (emissions come from a one-time action such as deforestation or draining of histosols, with emissions occurring over one or many years but not linked to the year of production).

⁴ FAOSTAT reports land-use emissions, including emissions from deforestation. However, deforestation is not directly attributable to agriculture versus other uses such as timber or fuel.



46 megatonnes of carbon dioxide equivalent (CO₂eq) per year from 2008 to 2018, versus 70 megatonnes for agricultural emissions in 2018). Deforestation accounts for almost all of these emissions, accounting for about 20% of emissions from agricultural production and agriculture-related land use combined in 2018 (FAO, 2021a). However, it should be noted that, while these emissions are counted as agriculture-related, they are also driven by mining and logging. With the caveat that the estimation is very approximate, roughly 7% of forest land was converted to agricultural use from 2008 to 2018.

2.2 Baseline Results Regarding a Business-as-Usual Situation Based on Modelling Results

Existing projections, based on the Ceres2030 model and without considering additional public investments, are summarized in Table 1. It shows that Nigeria is one of the countries with the strongest demographic pressures in the world, with an annual population growth rate of about 2.5% in the next decade (compared to 1.1% worldwide). Because the country's per capita GDP is currently low, the relatively weak economic growth (projected at 3.2% per year, near the average for Africa, South of the Sahara) means it will remain relatively low compared to the global average.

Table 1. Summary results regarding existing model projections for Nigeria

Indicator	2020	2030	Annual growth rate
Population, millions	206	263	2.5%
Agricultural production emissions, megatonnes Co ₂ eq	73.3	91.9	2.3%
Agricultural production, volume, million 2017 USD	181	258	3.6%
Agricultural land, million ha	69.3	70.3	0.2%
Forest, million ha	21.8	20.7	-0.5%
Prevalence of extreme poverty USD 1.90	40%	41%	0.2%
Prevalence of extreme poverty USD 1.90 among farmers	46%	47%	0.2%
PoU	13%	17%	2.7%

Source: MIRAGRODEP Simulations, Ceres2030 baseline.

The agricultural sector will continue to expand to meet rising local food demand, in particular in animal products. This will lead to a moderate increase in production emissions, by 2.3% per year, or 25% in 10 years. Land-use change from forestry to agriculture is expected to plateau, with forested areas expected to decrease by 5% in the next 10 years. The livestock sector, in particular, will require sustainable intensification if Nigeria is to achieve its environmental



objectives. Finally, despite moderate economic growth, progress in reducing extreme poverty is expected to stagnate and even reverse slightly. The expansion of agricultural production will not be able to keep up with demographic growth, so chronic hunger will rise. However, with additional public investment from donors and national governments, eliminating chronic hunger and significantly reducing poverty appears to be within reach by 2030, as shown in the Ceres2030 findings.

2.3 Climate Change and Weather Variability Exposure and Adaptations

Recent analysis shows that the temperature increased by 1.1°C from 1901 to 2005, while annual rainfall has decreased by 81 mm in the same period (FRN, 2020a). Further, the number of rainy days has fallen by 53% in the northern parts of Nigeria and by 14% in the Niger–Delta areas (FRN, 2020a). Observed impacts include desert encroachment of the Sahara Desert, coastal inundations, drying up of water bodies such as Lake Chad, and a shift in the types of crops cultivated and cultivation times.

According to the climate scenarios, for the period 2040 to 2060, annual rainfall is projected to increase by 15 cm (average level assumption) in the southern parts of the country and decline by 7.5 cm annually (average level assumption) in the north. Temperatures are expected to increase within the range of 1.48°C to 3.48°C by 2060 (FRN, 2020a). It is also expected that more severe floods and droughts will occur with higher frequency. It is expected that the northern part of the country will become drier, with increasing desertification, and the southern parts wetter, with increased flooding and saltwater intrusion (FRN, 2020b). Because these regions are already vulnerable, these trends will lead to increases in food insecurity and other negative impacts on people's well-being and natural ecosystems.

Box 1. Summary of historical and projected climate change impacts in Nigeria

Historic Weather and Climate (FRN, 2020a)

- Between 1901 and 2005, temperatures increased by 1.1°C.
- Rainfall has declined since the 1970s.
- The number of rainy days has declined by 14%–53% in different parts of the country.
- Over a period of four decades, Lake Chad has shrunk from over 40,000 km² to 1,300 km².

Projected Weather and Climate

- It is projected that temperatures will increase within the range of 1.48°C–3.48°C by 2060, with temperatures rising by an average of 0.04°C per year up to 2020 and increasing to 0.08°C on average per year after 2050 (FRN, 2020b).
- It is projected that annual precipitation will increase by 15 cm in the south but decrease by 7.5 cm annually in the north (FRN, 2020b).
- Coastal erosion is expected due to sea level rise by 1 m by 2050.



Climate projections for agriculture indicate lower yields in the longer term, up to 2050. Rice appears to be the most vulnerable crop, with yields falling as much as 7% in the short term and 25% in the longer term (FRN, 2020a; Morgan & Fanzo, 2020). It is expected that total annual rainfall will increase, potentially having a beneficial effect on the productivity of cassava but a negative effect on maize, tomato, and melons. Rising temperatures, rather than changing precipitation, often impact cassava and sweet potatoes negatively.

Some of the adaptation measures proposed in the National Adaptation Plan Framework (FRN, 2020b) are as follows:

- Adoption of drought-tolerant and early-maturing plants
- Provision of accurate and timely weather forecasts
- Diversifying livelihoods to improve incomes
- Planting cover crops such as potatoes and melon to mitigate against soil erosion and pests as well as enhance soil fertility and soil quality.

The Government of Nigeria has adopted policies and strategies to address climate change issues. At the international level, Nigeria has submitted its 3rd National Communication and its Nationally Determined Contribution to the United Nations Framework Convention on Climate Change. At the national level, the country has developed the National Climate Change Policy Response and Strategy, launched Sovereign Green Bonds, and, more recently, adopted a National Adaptation Plan Framework, which aims to facilitate investments in diverse responses to climate change.

These climatic changes are already influencing food production, distribution, utilization, and availability, which in turn affects dietary and nutrition outcomes. Studies show that rainfall conditions that are favourable to farming and agricultural practices are associated with higher dietary diversity (Morgan & Fanzo, 2020). Further, undernutrition has been higher in the northern parts of the country as compared to the south (Morgan & Fanzo, 2020). Climate change and variability are already affecting nutritional outcomes in Nigeria, with malnutrition labelled as the most significant risk for the country (Morgan & Fanzo, 2020). However, to this date, the integration of climate change adaptation and mitigation into the sections on nutrition in the policy documents is very limited.

2.4 Understanding the Dynamics of Local Food Systems

2.4.1 Data Sources

The principal source of primary data used in the estimation is the most recent round of household survey data from the World Bank's Living Standard Measurement Survey (LSMS) data set for Nigeria. Table 2 presents a summary of its key features.

A key feature of the LSMS data set for the purposes of demand system information is that it provides high-quality and nationally representative data on household food consumption decisions reported directly by respondents. A designated respondent is asked to recall their household's consumption of a uniform list of food items, adapted to be contextually



appropriate to Nigeria, and to report how much the household consumed, the source of the food item (whether it was purchased, produced by the household, or obtained from other sources such as gifts or non-monetary transfers) and how much was spent to acquire the item if it was purchased. This information allows us to estimate the value of all food items consumed by each household in the sample, which in turn forms the basis of the estimation of the demand system. A notable feature of the Nigeria data set is that it was collected in two periods, during the agricultural planting and post-harvest seasons.

Table 2. Summary of LSMS data for Nigeria

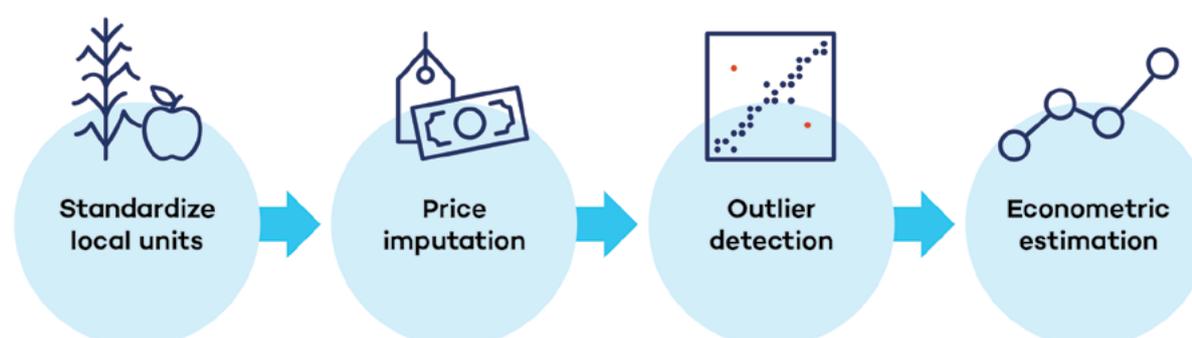
Country	Nigeria
Years covered	2018–2019 (Wave 4)
Coverage	Nationally representative; representative by zone
Geopolitical zones	6
Number of enumeration areas	402
Number of households interviewed	4,980
Key modules of interest	Food consumption (7-day recall); Household roster; Non-food expenditures; Agricultural production

Source: Authors' summary.

2.4.2 Stages of Data Processing

In order to use the information from the primary data in the LSMS data set as an input into the modelling exercise, we undertake a number of processing steps: conversion of quantities from local into metric units; imputation of prices and estimation of the value of food items produced or otherwise not commercially acquired by households; outlier detection; and econometric estimation of the demand system. Figure 3 summarizes these steps.

Figure 3. Data processing flow diagram



Source: Authors' summary.



A key challenge in estimating quantities of food items consumed by individuals is that people typically do not think about the foods they consume in terms of standard scientific units; for example, it is natural to report having a bowl of cereal for breakfast, rather than an amount in grams. Rather than asking respondents to provide conversions, which is likely to be challenging, particularly for individuals who have had limited access to formal education, they instead report in familiar units, which are often locally specific. The first stage of data processing is therefore to convert these quantities from non-standard units into metric units, using auxiliary data on conversion factors collected as part of the LSMS data collection process.

After converting the quantities reported in the consumption module to metric units, we next estimate prices for those units. To do so, we first calculate the implied price reported by each individual for purchased items (which is simply dividing the total expenditure on a given item, by the reported quantity purchased). For households who report purchasing an item, we can use this price to estimate the value of the amount of that item, on a per unit basis, that the household produced itself or it obtained from other sources. This procedure implicitly assumes that the per unit value of a food item that the household produced or obtained from other sources is equal to the value of the same quantity of that item purchased on the market; e.g., that there are no quality differences. By making this assumption, the overall value of the total amount of the item consumed by the households can be calculated. For households that consumed an item but did not purchase it, we calculate the median price of that item reported by other households within the same geographic area (at various administrative levels) and use this to impute the value of that item that the household produced or obtained from other sources.

The last stage of processing to prepare the data for use in the econometric model is outlier detection. This is an important consideration when using primary data since a reporting error by a small number of individual respondents (or indeed even one respondent) could bias our estimate of the quantity and/or value of a given food item for the whole sample. To deal with the issue of outlier values, we adopt a simple procedure to identify observations taking on values to the extreme left- or right-hand side of both the quantity and price distributions of a given food item. We calculate the mean and standard deviation of the quantity of each food item and identify any observations for which the reported (or imputed) value is greater than the mean plus or minus three times the standard deviation. Under a normal distribution, we should, on average, observe 99.7% of observations within this range. Truncating the distribution in this manner thus entails a very small loss in terms of information if all values are accurate representations of actual consumption. This data-driven approach allows us to straightforwardly exclude erroneous extreme values without ourselves having to define numeric values for an appropriate range for food items.

2.4.3 Summary Statistics

The LSMS data set for Nigeria has one notable feature in that data collection is divided into two data collection periods—one during the planting season and a separate round following harvest. For this assessment, we provide summary statistics on the latter data set since overall dietary diversity is likely to be highest in rural areas in the post-harvest period. For the



estimation of the demand system for Nigeria, we will explore how best to utilize both data sets to get the best possible representation of households' diets and food consumption patterns.

To reflect the quality issues relating to these data processing steps, Table 3 summarizes the share of quantities we are able to convert into metric units, along with the rate of outlier detection for reported quantities and prices for all food items, and disaggregates these shares by food category, using data from the 2018–2019 harvest survey.

Table 3. Overview of consumption data processing issues in Nigeria

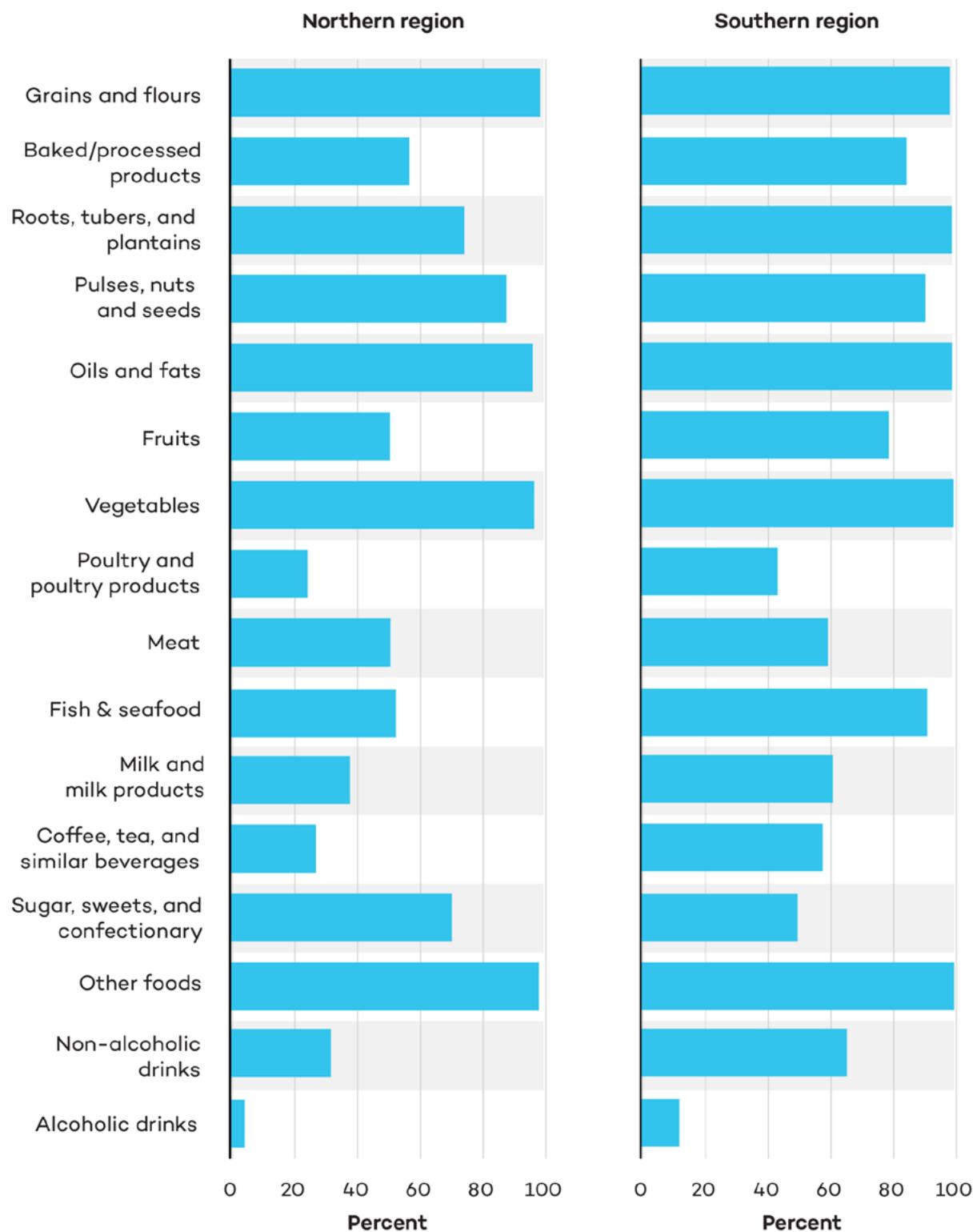
Food category	Conversion available	Quantity outliers	Price outliers
All	99.6%	1.7%	1.3%
Grains ⁵ and flours	99.6%	1.8%	1.2%
Baked/processed products	100.0%	1.7%	0.5%
Roots, tubers, and plantains	99.5%	2.0%	1.6%
Pulses, nuts, and seeds	99.3%	1.9%	1.0%
Oils and fats	99.8%	1.7%	1.5%
Fruits	99.4%	1.5%	1.5%
Vegetables	99.7%	1.8%	1.3%
Poultry and poultry products	98.8%	2.4%	0.6%
Meat	99.7%	1.9%	0.8%
Fish and seafood	98.6%	2.0%	1.5%
Milk and milk products	99.3%	1.0%	0.8%
Coffee, tea, and similar beverages	99.3%	1.5%	0.5%
Sugar, sweets, and confectionery	99.5%	2.2%	0.9%
Other misc. foods	99.8%	1.0%	2.5%
Non-alcoholic drinks	100.0%	2.0%	0.9%
Alcoholic drinks	99.0%	2.7%	1.4%

Source: Authors' calculations.

⁵ Both yam and cassava flour fall under grains in this categorization.



Figure 4. Share of households reporting food category, by region (Nigeria)



Source: LSMS Nigeria, Harvest Questionnaire Wave 4.

For this data, conversion factors are embedded in the main data set: as a result, we are able to convert non-standard units in almost all cases, with an overall conversion rate of 99.6%.



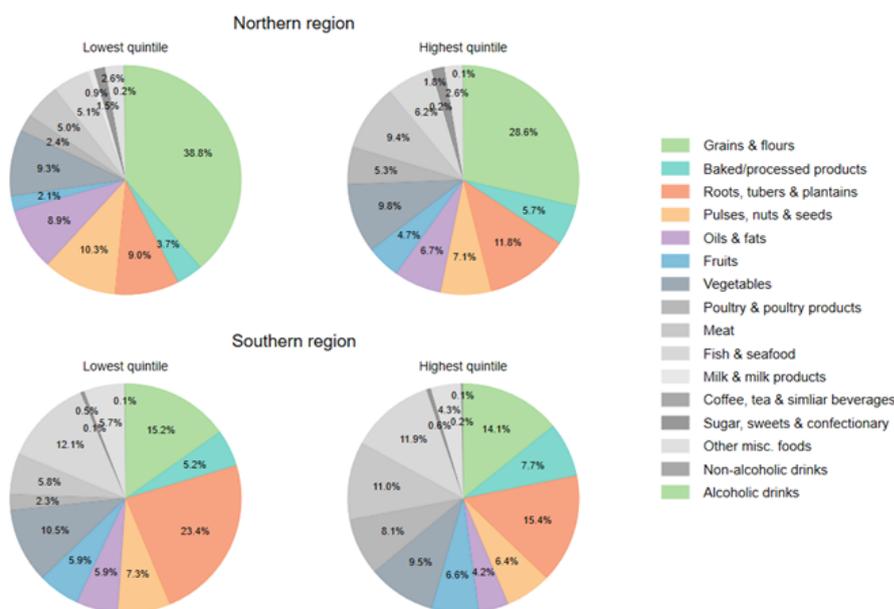
This is uniformly high across categories, with the lowest, poultry and poultry products, still covering 98.8% of observations. Nigeria has the highest outlier rate of the three selected countries, though still low for a primary data source, with an overall rate of 1.7% for converted quantities and 1.3% for estimated prices, respectively.

The data comprises 4,976 households reporting on 110 distinct food items for a total of 547,360 observations. These are divided into 16 categories: grains and flours; baked and processed products; roots, tubers, and plantains; pulses, nuts, and seeds; oils and fats; fruits; vegetables; poultry and poultry products; meat; fish and seafood; milk and milk byproducts; coffee, tea, and related beverages; sugars, sweets, and confectionery; other foods; non-alcoholic drinks; and alcoholic drinks. Figure 4 shows the share of households reporting consuming foods from each respective category, disaggregated by region of the country (north and south).

Comparing the two regions, we can observe important differences as well as commonalities. While staples (including grains and flours) and vegetables are consumed by almost all households in both regions, for other food categories, there are important distinctions. The share of households reporting consuming roots, tubers, and plantains is 74% in the north of the country, compared to 98% in the south. Animal-sourced protein is more commonly consumed in the south, particularly poultry (25% of households in the north, 43% in the south) and fish and seafood (53% and 90%, respectively).

Figure 5 breaks down the value share taken up by each of these categories, comparing households in the dataset by income level (estimated from reported expenditures on non-food items) in the northern and southern regions, respectively.

Figure 5. Share of value by food category, by non-food expenditure level and region (Nigeria)



Source: LSMS Nigeria, Harvest Questionnaire Wave 4.



This allows us to observe important differences across both regions and income groups. In the north, grains and flours make up the largest share of overall expenditures, representing 38.8% of the total value of all consumption for the poorest households and 28.6% for the wealthiest. By contrast, in the south, grains and flours account for a much smaller share, and the gap between poor and rich households is small in relative terms (15.2% of total value in the poorest, 14.1% in the richest households). In the south, roots, tubers, and plantains take up a much larger share, particularly for poorer households (23.4% of total consumption value) in contrast to the north, where poorer households allocate less than 10% to this category. Among poorer households in both regions, meat and poultry account for a relatively small share of consumption value relative to wealthy households. Notably, this is not the case for fish and seafood, which account for similar relative shares across wealth groups within regions, but different relative shares when comparing regions (5.1% for the lowest quintile and 6.2% for the highest quintile in the northern region, compared to 12.1% and 11.9% in the southern region, respectively).



3.0 Existing Action Framework for Healthier and Sustainable Food Systems

3.1 Existing Nutrition Guidelines for Healthier Diets

Nigeria published food-based dietary guidelines in 2001 and reprinted them in 2006. According to the FAO database of food-based dietary guidelines, they have not changed since then (FAO, 2021b). While the food-based dietary guidelines do mention the issue of overweight and obesity (and associated non-communicable diseases), the problem has grown substantially since that time. Further, the prevalence of eating away from home has increased since the guidelines were published.

The guidelines are also quite broad rather than prescriptive. In general, the guidelines suggest the following points for basically everyone:

- Eat a wide variety of types of food (grains, legumes, roots and tubers, fruits, vegetables, fish, lean meat, etc.)
- Reduce or limit the consumption of sugary foods and animal-sourced fats
- Limit the use of salt or bouillon cubes in cooking
- Eat in-season fruit.

Like other countries, Nigeria does have other relevant nutrition policies that mandate the fortification of wheat and maize flour with several vitamins and minerals, salt iodization, and the fortification of cooking oil with vitamin A.

Box 2. Overview of the Agricultural Promotion Policy based on the findings from the consultations

The Agricultural Promotion Policy, which embraces a food systems approach to address the problems of malnutrition, identifies food as a human right and presses policy-makers to protect the population from undernourishment (Federal Ministry of Agriculture and Rural Development, 2016). Nutrition-sensitive agriculture is listed as an approach to reduce stunting, wasting, and underweight within the country. Furthermore, institutional frameworks on nutrition and health were enhanced with the creation of the National Council on Nutrition as the highest decision-making body on food security and undernourishment. It serves as the policy body for all efforts geared towards ensuring food and nutrition security for all Nigerians. One respondent highlighted that “there is a fairly high public awareness regarding healthy nutrition and diets” that, to their mind, is not yet sufficiently reflected in national policy documents or strategies.



3.2 Ongoing Policies and Investments Toward Healthier and Sustainable Food Systems

Nigeria developed a national resilience strategy mostly focused on the impacts of climate change, adaptation needs, and creating pathways to a low-carbon economy (Adegoke et al., 2014). Relating to agriculture, key challenges identified included addressing the lack of investments, limited services to agricultural producers, low productivity, and weak income in rural areas all of which affect the sustainability of the food system in Nigeria. The strategy also stressed the need for investments in the agri-food sector (from both domestic and foreign sources), which is considered high risk due to weak value chains, underdeveloped infrastructure, and vulnerability to environmental, economic, and political factors (Adegoke et al., 2014).

In total, USD 555 million was disbursed annually to projects directly affecting the food system in Nigeria (2014–2018 average), accounting for 26% of ODA grants and philanthropic donations (OECD, 2021). The United States accounted for 34% of this disbursement, making it the top donor to projects in the food system, followed by the United Kingdom and European Union (EU) Institutions. The top 10 donors account for USD 521 million of the USD 555 million spent (Table 4). In addition, based on Ceres2030 modelling outcomes, the current ODA relevant to food systems is considerably lower than that needed to meet SDG 2 in Nigeria (Figure C2 in the Appendix). In Nigeria, quantifying on a yearly basis, the gap between current and needed ODA is the largest from the three studied countries (Malawi, Ethiopia, and Nigeria).

Table 4. Top 10 donors by average annual disbursement, 2014–2018

Donor	Average annual ODA (million constant 2018 USD)
United States	187
EU Institutions	120
United Kingdom	116
Bill & Melinda Gates Foundation	36
Germany	21
Canada	18
Sweden	7
Japan	5
UNICEF	5
Norway	5

Note: This table shows a total of USD 521 out of the USD 555 million constant 2018 USD disbursed to food system projects in Nigeria.

Source: Authors' analysis of OECD's Creditor Reporting System (OECD, 2021).



4.0 Next Steps

4.1 Summary of Key Messages

This report provides an overview of recent data on undernourishment, current and projected economic development, climate change, and ODA in Nigeria. It also includes current strategies and policies addressing climate change, agriculture, and undernourishment. In addition, the report provides a summary of efforts by the team to include nutrition in the economic modelling developed in the Ceres2030 project. These indicators and policy documents reveal specific findings relevant for the next steps of this project, as follows:

- **Poverty and hunger today.** In Nigeria, poverty is at a similar level to the average for Africa, South of the Sahara (39% versus 42% in 2016) (World Bank, Development Research Group, 2021). Food insecurity and the PoU are better than average for the region (13% versus 18% in 2018) (FAO, 2021a); however, Nigeria has experienced undernourishment and a deterioration of food security in recent years due to political instability and conflicts, especially in the north, and several economic recessions triggered by declining oil revenue.
- **Poverty and hunger by 2030.** In the next decade, progress in reducing extreme poverty is expected to stagnate and even reverse slightly without additional measures (from 40% in 2020 to 41% in 2030), according to our projections. Chronic hunger is also predicted to rise (from 13% in 2020 to 17% in 2030), according to our projections (see Table 1).
- **GHG emissions from increasing animal production till 2030.** As in Malawi and Ethiopia, GHG emissions, mostly from livestock production, are a growing problem in Nigeria. In 2018, livestock accounted for 78% of agricultural production emissions, followed by rice production (11%) (see Figure 2). The agricultural sector—and especially animal production—will continue to grow. This will lead to a moderate increase in production emissions, by 2.3%, per year, or 25% over 10 years. Land-use change from forestry to agriculture is expected to plateau, with forested areas expected to decrease by 5% in the next 10 years (see Table 1).
- **Key nutrition challenges.** In 2018, 7% of children under 5 were affected by wasting and 37% by stunting. While stunting fell as much as 8% from 2008 to 2015, it drastically increased to 44% in 2016, due to factors including the Boko Haram violence and issues arising from the effect of low oil revenue on currency (Food Security Information Network, 2017). Anemia affects one in two women of reproductive age, slightly higher than the average for Africa, South of the Sahara. Compared to the other two countries, Malawi and Ethiopia, Nigeria also faces the challenges of addressing growing obesity (9% in 2016) (Chukwuonye et al., 2013).
- **Climate change impacts on agriculture.** Climate projections for agriculture indicate lower yields in the longer term leading up to 2050. From the planted crops, rice demonstrated falling yields from 7% to 25% over short- and long-term horizons (FRN, 2020a; Morgan & Fanzo, 2020). It is expected that total annual rainfall will



increase, potentially having a beneficial effect on the productivity of cassava, but the productivity of some crops (such as yam, maize, tomato, and melon) is affected by higher rates of annual rainfall. Rising temperatures often impact cassava and sweet potatoes negatively, rather than changing precipitation patterns.

- **Efforts to address climate change.** At the national level, the country has developed the National Climate Change Policy Response and Strategy, launched Sovereign Green Bonds, and, more recently, adopted a National Adaptation Plan Framework and a National Agricultural Resilience Framework to support adaptation planning and resilience building. Specific adaptation measures include the adoption of drought-tolerant crop varieties, creating diverse sources of income, and improving planting cover crops to reduce soil erosion and pests, while enhancing soil fertility and quality.
- **Higher share of animal-based protein for richer households.** As in Ethiopia and Malawi, the largest share of food expenditures for the poorest households is on grains and flours (29.6%), while for households in the highest quintile, this share is lower (18.5%). Animal-based protein accounts for 15.9% of the estimated value for the poorest households, comprising poultry (2.6%), meat (5.4%), and fish or seafood (7.9%). This share is much higher for the richest households, with these categories accounting for 27.4% of the total value of consumption (6.7%, 10.4%, and 10.3%, respectively) (see Figure 4).
- **National dietary guidelines are developed.** Nigeria published food-based dietary guidelines in 2001 and 2006. The guidelines are rather general and stress the importance of eating a wide variety of types of food (grains, legumes, roots and tubers, fruits, vegetables, fish, lean meat, etc.), reducing the consumption of sugary foods and animal-sourced fats, reducing the use of salt in cooking, and eating in-season fruit. Similar to other countries, Nigeria does have other relevant nutrition policies that mandate the fortification of wheat and maize flour with several vitamins and minerals, salt iodization, and the fortification of cooking oil with vitamin A.
- **Role of ODA in the food system.** In total, USD 555 million was disbursed annually to projects directly affecting the food system (average, 2014–2018). This accounted for 26% of ODA grants and philanthropic donations (OECD, 2021). Based on Ceres2030 modelling, the gap between current and needed ODA up to 2030 to meet the targets of SDG2 is the largest among the three countries studied (see Table 4 and Figure C2).

4.2 Implications for Next Steps and Potential Revision of the Proposed Methodologies

Setting Up and Conducting Country Consultations

The Senior Special Assistant to the President on Agriculture, whose responsibilities include oversight of agricultural interventions and Nigeria's flagship agriculture projects, has expressed a keen interest in the project. He sees the project as very timely in providing an opportunity to further establish the linkages between nutrition, climate change, and food systems to influence Nigeria's overall agriculture strategy, especially in the framework of the formulation of a replacement for the Nigerian Agriculture Promotion Policy that ended in



2020. A respondent in consultation round 1 flagged that this policy has a section on climate-smart agriculture and a section considering the links between agriculture, food consumption, and nutrition that the findings of this project could help substantiate for the new version.

The Bureau of the Senior Special Assistant will play a prominent role in ensuring the appropriate stakeholders are targeted and included in consultation rounds 2 and 3. A partnership has also been established with Akademiya2063 for the organization of the next rounds.

National dialogues ahead of the UN Food Systems Summit in Nigeria are being led by the Ministry of Budget and National Planning, and we are exploring routes for collaboration to ensure that our consultations are integrated into the UN Food Systems Summit process in Nigeria.

Estimating the Characteristics of Healthy Diets

The available food-based dietary guidelines for Nigeria are quite general. In keeping with the spirit of the guidelines, as well as maintaining consistency with the other two country studies, we will examine how locally available foods can be combined to constitute a diet that meets micronutrient needs. Given findings in the available literature, we are cognizant that there are both regional (north and south) and rural/urban differences in diets; we will, therefore, ensure that we build off a basis for each of those four location types differently.⁶ As in other countries, the Nigerian diet is broadly lacking in fruit and vegetable consumption (CGIAR, n.d.), and dairy consumption is quite low, as well. In developing healthier diets, we will account for elasticities as estimated to modify current consumption patterns and bring them closer to adequate key nutrient levels for most people.

Adapting the Economic Modelling

The model adjustment will focus on two main dimensions. First, we will integrate new data on household consumption, in particular capturing the urban versus rural diet structure. Second, the Nigeria baseline will be reassessed. Indeed, Nigeria is the only country in this project that has been on a deteriorating trend, due to both conflicts and economic recession driven by the fall in oil revenue. To what extent these trends will continue, or will reverse, generating an improved situation in 2030, is under assessment.

Like our other countries in this project, Nigeria contains diversity that can be seen from many dimensions; for example, facts are often stylized as north–south to highlight regional differences. Our model accounts for regional diversity through household-level detail on production and consumption. Households are represented by different types based on level of income, source of income (which includes information about what kind of employment household members have), and consumption (the model does not account explicitly for region due to constraints with the externally obtained data it uses as an input). Consumption is especially relevant here because it includes food consumption—that is, diet. While there is a strong story that can be framed around gender in the north–south dimension, data to properly

⁶ There are more differences, as well, given Nigeria's substantial diversity and a federal government that has policy differences by state, for example. We pick north and south and rural/urban as areas for which we know data will support meaningful measurement.



account for gender, either regionally or otherwise, is not available for modelling; thus, it must be accounted for through separate analyses. Emissions can be mapped regionally based on crop production data while the team is investigating the degree to which livestock emissions can be analyzed regionally.



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Appendix A. Country-Level Consultations

Approach and Method

To help determine to what extent the three dimensions of climate, nutrition, and agriculture are integrated into ongoing projects in Nigeria, we undertook a consultation and a desk review. The latter helped gather information on appropriate projects from the donors' websites. This round of consultation had two components: the first was an online survey that focused on gathering from specific donors the profile of their projects, trying to get specifications on their objectives and targeted groups (see below for the survey questionnaire). For the second, the team conducted a series of semi-structured interviews with the same objectives plus covered a direct validation of the methodology as we confirmed respondents to participate in rounds 2 and 3 of the project. Consultations were held with the Senior Assistant to the President on Agriculture, who sits in the office of the Vice President.

The Survey Questionnaire

Ceres2030 Deep Dives Into the Nexus of Food Systems, Climate Change, and Diets

Country-Level Consultations, Round 1

Introduction

“How can we influence consumption patterns through policy interventions that will lead to better environmental and nutritional outcomes?” This is the central question that Ceres2030 is exploring through a study on the nexus of climate change, food systems, and nutrition. The project will identify food system transition pathways and their associated costs, toward improving nutrition outcomes through healthy diets using a more climate-resilient production system with fewer greenhouse gas emissions in three countries: Ethiopia, Nigeria, and Malawi.

We would like to invite your participation in a first round of consultations aimed at establishing an accurate inventory of ongoing projects and policies in these three countries. The consultation aims to assess how the nexus between food security, environmental sustainability, and healthy diets is conceived and integrated into the national strategy and donor agencies' strategies and programs.

Your response will provide key elements to the research teams on how to connect the research conducted in the two other components, i.e., the large-scale modelling exercise based on the Ceres2030 framework and the research into food-demand behaviour at the household level, with respective countries' policies and institutional environments.



Online Survey

Section 1 – Profile

1. Contact
 - Name
 - Role
 - Department
 - Email address
2. Are you a
 - Government official (Go to 2B and 3B)
 - Donor Agency (Go to 2A and 3A)

Section 2A – Project and Policies Profiles (Donors)

3. Does your department have a project/program/strategy linking food systems, food security, climate change, and nutrition?
 - Yes
 - No
4. If you answered yes above, please provide information here to relevant material related to your projects and their status.
 - Name of the project/strategy/program
 - Links if available:
 - Any other information or comments
5. If you answered no, could you please provide a little more information on your current or future plans?
6. Does your project/program/strategy use a definition of “healthy diet”?
 - Yes
 - No
 - Please specify and briefly explain.
7. Does your project/program/strategy have a clear set of objectives related to supporting the nexus between food systems, food security, climate change, and nutrition?
 - Yes
 - No
 - Please specify and briefly explain.
8. Who are the target recipients of your project/program/strategy?
 - Children below three years of age
 - School-aged children
 - Pregnant and lactating women
 - Women
 - Small-scale producers
 - Others (please specify)



Section 2B – Project and Policies Profiles (Government Officials)

9. Does your country have a strategy/policy/program linking food systems, food security, climate change, and nutrition?

Yes

No

10. If you answered yes above, please provide information here to relevant material related to strategy, policy, or program and their status.

Name of the strategy, policy or program

Links if available:

Any other information or comments

11. If you answered no, could you please provide a little more information on your current or future plans?

12. Does your strategy, policy or program use a definition of “healthy diets”?

Yes

No

Please specify and briefly explain.

Section 3 – Objectives of Your Programs/ Projects? (Donor)

13. What are the objectives of your project/program/strategy?

	Very important	Important	Less important	Not important
Enhance understanding and awareness of healthy diets				
Promote the production of food with high nutritional values, aligned with national dietary or nutrition guidelines				
Improve access to fresh and nutrient-dense foods for consumers				
Support the development of technological innovations that increase productivity and nutritional content [of crops and food products]				
Promote environmentally sustainable agriculture				



	Very important	Important	Less important	Not important
Increase household production and consumption of micronutrient-rich foods				
Improve nutrition through behaviour change				
Invest in the implementation of good practices and technologies for resilience to climate variability and change				
Other objectives (please specify)	Yes		No	

14. What is the share of your project/program/strategy that contains quantifiable objectives?
- > 75%
 - 75%–50%
 - 50%–25%
 - < 25%
 - Not sure
 - Not applicable
15. Please provide one or two examples of how these objectives are quantified.
16. Has the demand for aid from your partner countries changed to reflect a systems approach to food security, climate change, and healthy diets?
- Yes
 - No
 - Not sure
17. If the demand increased, how is this reflected in the specific local projects and activities for which aid requests are made?
18. Are you harmonizing your strategy with other donors?
- Always/usually
 - Sometimes
 - Rarely/never
 - Not sure
 - Not applicable



19. If you are harmonizing, how often do you use the following approaches?

	Always	Sometimes	Rarely/never	Not sure
Joint needs assessment				
Co-financing				
Sector-wide approaches				
Joint implementation				
Joint evaluation				
Other (please specify)				

20. Please rate the importance of the following challenges in evaluating your programs and projects:

	Very important	Important	Less important	Not important
Difficulty in identifying quantifiable objectives				
Absence of suitable indicators				
Budgetary constraints				
Ability of in-country staff to collect and report data				
Ability of project partners to collect and report data				
Difficulty of assigning changes to the program				
Other (please specify)				

Section 3B – Objectives of Your Policies? (Government Officials)

21. What are the objectives of your policies?

	Most important	Important	Less important	Not important
Improved nutrition and healthier diets				
Increasing production and consumption of nutritious foods				



	Most important	Important	Less important	Not important
Promoting changes in behaviour toward healthier diets through education, communication strategies, and school programs related to nutrition.				
Increasing capacity to measure and monitor weather or climate risk exposure to food systems				
Taking action to address weather or climate risk exposure to the food system				
Other (please specify)				

22. Which funding and financing sources do you primarily use?

Public

Donor Aid

PPP arrangements

Other (please specify)

23. Has your country benefited from donor-funded projects related to food systems, food security, climate change, and nutrition?

No

If yes, please specify.

Section 4 – Further comments or suggestions

Please feel free to share with us any additional information that might be of interest for our project.



Appendix B. Overview of Projects by International Agencies

This table is the result of the consultations and desk review. It offers a non-exhaustive overview of the projects funded by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the EU, and the United States Agency for International Development (USAID) in Nigeria.

Table B1. Projects by international agencies

Agency	GIZ
Project Title	Sustainable Smallholder Agribusiness
Objective	The objective is to increase food production and promote agricultural diversification, in line with good practices and healthy diets, in order to improve income and food supply
Strategy	Offers training for farmers on how to improve cocoa and food production, yields, and income. Farmers also receive information on improved cultivation practices. Business service centres are set up to provide farmers with advice, market information, access to agricultural inputs, and support in accessing finance. Business service centres also assist young people with qualifications to find employment, offering them income (GIZ, n.d.b).
Agency	GIZ
Project Title	Competitive African Rice Initiative
Objective	Increasing the income of smallholder farmers and providing high-quality rice for Nigeria (GIZ, n.d.a).
Strategy	Variety of interventions that enable smallholder farmers to increase productivity and the quality of rice. These include Training smallholder farmers in agricultural practices to increase productivity in rice cultivation Assisting smallholder farmers in developing supply relationships with processing and marketing companies Provision of inputs, equipment or technologies to smallholder farmers (GIZ, n.d.a).



Agency	EU
Project Title	Restoring and Promoting Sustainable Agriculture Based Livelihoods for Food Security, Employment, And Nutrition Improvement in Borno State
Objective	<p>Build the food and nutrition security and resilience of those affected by conflict in Borno State, using an approach that is conflict and environmentally sensitive.</p> <p>Specifically, the aim is to improve social protection by creating livelihoods and increasing access to basic services in order to strengthen resilience and reduce malnutrition in conflict-affected communities (Delegation of the European Union to Nigeria and ECOWAS, 2019c).</p>
Strategy	<p>Provide beneficiaries with training in good agricultural practices and nutrition-sensitive agriculture</p> <p>Assist beneficiaries in accessing credit and finance</p> <p>Provide agricultural inputs and start-up kits</p> <p>Support the establishment (or development) of agri-enterprises, cooperatives, and institutions</p> <p>(Delegation of the European Union to Nigeria and ECOWAS, 2019c).</p>

Agency	EU
Project Title	RESILAC – Lake Chad Inclusive Economic and Social Recovery Project
Objective	<p>Support the economic recovery, social cohesion, strengthening, and resilience of the areas of the Lake Chad Basin most affected by climate change and the Lake Chad crisis</p> <p>(Delegation of the European Union to Nigeria and ECOWAS, 2019b).</p>
Strategy	<p>The first phase of the project includes</p> <p>“Psycho-social support;</p> <p>Organized and equitable access to natural resources;</p> <p>High labour intensive micro-projects with rapid impact/ rehabilitation of community assets;</p> <p>Creating sustainable jobs and sources of income for rural youth;</p> <p>Diversification and adaptation of family production systems to climate change;</p> <p>Improving the economic autonomy of the target groups;</p> <p>Strengthening of public authorities, local authorities and CSOs [civil society organizations];</p> <p>Research”</p> <p>(Delegation of the European Union to Nigeria and ECOWAS, 2019b).</p>



Agency	EU
Project Title	Improved Regional Fisheries Governance in Western Africa
Objective	Increase the impact of fisheries on sustainable development, food and nutrition security, and poverty reduction in West Africa (Delegation of the European Union to Nigeria and ECOWAS, 2019a).
Strategy	Improve the governance of regional fisheries in West Africa and improve the policy coordination of national fisheries (Delegation of the European Union to Nigeria and ECOWAS, 2019a).

Agency	USAID
Project Title	Feed the Future
Objective	Feed the Future seeks to increase livelihood opportunities, promote innovation, and empower women and young people, in order to transform the Nigerian agricultural sector, enhancing the food and nutrition security of Nigeria and contributing to poverty alleviation
Strategy	<p>“Increase agricultural productivity by connecting smallholder farmers to resources</p> <p>Develop inclusive and resilient markets</p> <p>Strengthen household and community resilience to shocks</p> <p>Improve the nutrition of women and children</p> <p>Strengthen policy systems related to resilience, agriculture and nutrition”</p> <p>(Feed the Future, n.d.).</p>

Agency	USAID
Project Title	Feed the Future Nigeria Nestle Maize Improvement Activity
Objective	“Reduce the levels of aflatoxins and other contaminants in maize and soybean produced by smallholder farmers” (USAID, 2018).
Strategy	

Agency	USAID
Project Title	Feed the Future Nigeria Livelihoods Project
Objective	Enhance household nutrition and alleviate poverty (USAID, 2018).
Strategy	



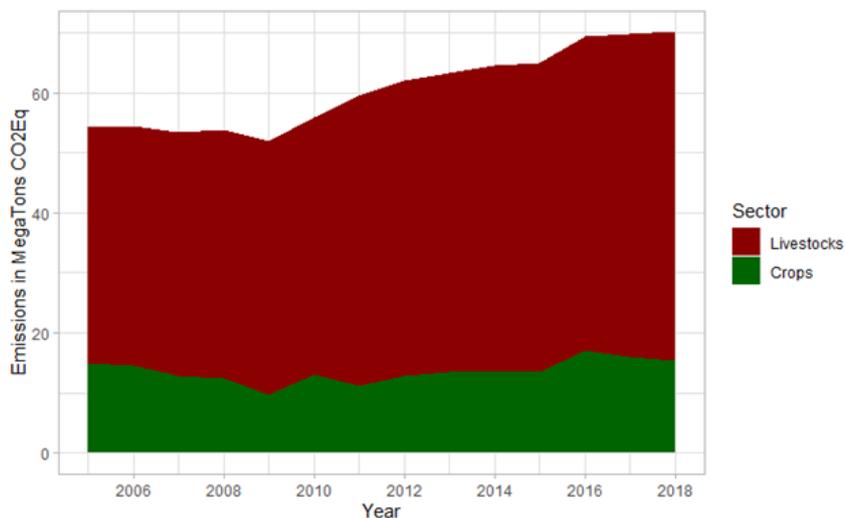
Agency	USAID
Project Title	Feed the Future Nigeria Agribusiness Investment Activity
Objective	<p>In partnership with Cultivating New Frontiers in Agriculture, this project promotes private-sector investment in agriculture in order to develop and strengthen a business-friendly environment in Nigeria.</p> <p>The project seeks to facilitate USD 200 million in new lending and USD 100 million in new investment (USAID, 2019).</p>
Strategy	<p>In collaboration with Nigerian agribusinesses, the initiative seeks to improve the business environment of the agriculture sector by broadening access to finance and promoting investment opportunities for agribusinesses. By integrating micro, small and medium enterprises into commercial agriculture, there is increased access to and diversification of the Nigerian agriculture market.</p> <p>The initiative also advocates for more effective and efficient policies, production practices, and investment flows to assist entrepreneurs and increase the competitiveness of agribusinesses (USAID, 2019).</p>

Agency	USAID
Project Title	Partnership for Inclusive Agricultural Transformation
Objective	Improve the income and food and nutrition security of smallholder farmers in order to support an inclusive, sustainable agricultural transformation
Strategy	<p>Range of activities. Examples include:</p> <p>Provision of a free value kit that includes all the required inputs for maize production</p> <p>Assistance in the development of seed systems</p> <p>Support of the Nigerian government in their efforts to address issues of productivity amongst smallholder farmers, including access to inputs, markets, and extension services</p> <p>Development of the capacity of state and national governments (USAID, 2020).</p>



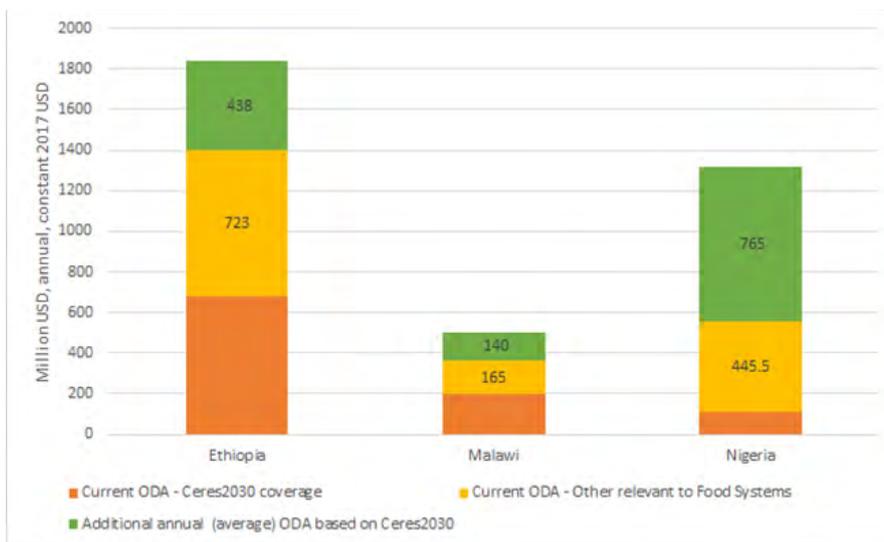
Appendix C. Additional Figures

Figure C1. Evolution of agricultural emissions



Source: Author diagram based on data from FAO, 2021a.

Figure C2. Comparing current ODA, future ODA needs to support systems based on Ceres2030 modelling and also current ODA relevant to food systems



Source: Author diagram based on data from Ceres2030 and OECD, 2021.



Appendix D. List of Research Questions

The project will answer seven research questions by applying them to the three countries, Nigeria, Malawi, and Ethiopia, and is aimed at studying the food system transitions and supporting decisions to trigger transformative changes:

1. What are the expected trends in terms of diets for the three countries?
2. What is the definition of a healthy diet for a country, considering cultural and economic specificities, and the nutritional value of different food items?
3. Based on micro-econometric evidence, how well do we understand consumer decisions regarding food, in particular in transitioning food systems (for example, with rising income, urbanization, food processing, and food consumed away from home)?
4. What are the policy instruments and the food system innovations required to achieve healthier diets?
5. What are the costs and benefits, both in economic and environmental terms (GHG focus) of these diets, and what is their mitigation value?
6. Considering the answers from questions 2–4, what is the most efficient set of actions to achieve this transformation? (Criteria to assess efficiency include these factors: feasibility, potential costs/benefits, gender-transformative or -sensitive aspects, if applicable.)
7. How do the different sets of actions in question 6 translate in terms of weather or climate risk exposure to the future food systems?

The project is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and the European Commission, through the GIZ-implemented projects Knowledge for Nutrition (K4N) and Agricultural Policy and Food and Nutrition Security as a contribution to the 2021 UN Food Systems Summit. The results will contribute to the Summit's goal of providing healthy diets for all, in a sustainable way, and will be published to coincide with the dates of the Summit.

Ceres2030 is a partnership between academia, civil society, and economists, led by three institutions—Cornell University, the International Food Policy Research Institute, and the International Institute for Sustainable Development—who share a common vision: a world without hunger, where small-scale producers enjoy greater agricultural incomes and productivity, in a way that supports sustainable food systems.



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