EFFECTS OF FOOD INFLATION ON HOUSEHOLDS' NUTRITIONAL OUTCOMES: POLICY IMPLEMENTATIONS FOR THE NATIONAL SCHOOL FEEDING PROGRAM

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Abstract

Food inflation poses a significant threat to household nutritional outcomes, particularly in low- and middle-income countries where large segments of the population are vulnerable to price shocks. This study examines the nexus between rising food prices and the nutritional well-being of households, with a focus on the implications for children who depend on the National School Feeding Programme (NSFP) using Delta State as a focal state. A fixed effect model is estimated to analyze the survey data elicited. The result suggests that a rise in the price of food negatively and significantly affect weight-for-height measures of nutritional outcomes. The effect of food policy on households and nutritional outcome varies across food groups. Findings indicate that well-targeted, inflation-adjusted, and locally sourced school feeding programmes can play a pivotal role in mitigating the adverse effects of food inflation on child nutrition and educational attainment. The study concludes with policy proposals aimed at reinforcing the effectiveness and sustainability of the NSFP in Nigeria and similar contexts.

1. Introduction

There is global hike in food prices with social and economic implications. The rise in food prices may adversely affect the nutritional intake of households. Given the high prevalence of under nutrition, a rise in food prices may worsen families' nutritional intake and outcome. For example, under nutrition can cause stunting and wasting of children under five. Juarez-Torres (2015) posited that the burden of food price increases is borne more by the poor and vulnerable households who spend up to 80% or more of their earnings on foodstuffs. When households face massive negative price or income shocks, reduction in food budget is often their most immediate response. This manifests in compromised dietary intakes in terms of quantity and quality, which ultimately engender higher vulnerability to food insecurity, malnutrition, poverty and related issues. It has also been found that a large proportion of households in the country consume less varied and low-quality foods (Efayena & Olele, 2024; Agada & Igbokwe, 2015).

Another effect of food inflation is malnutrition among children. Malnutrition at the early age of child development has a long-lasting effect on children's education and health outcomes. Arndt et al. (2016) examined the effect of food price shock on child malnutrition using a household level data from Mozambique. The study finds that

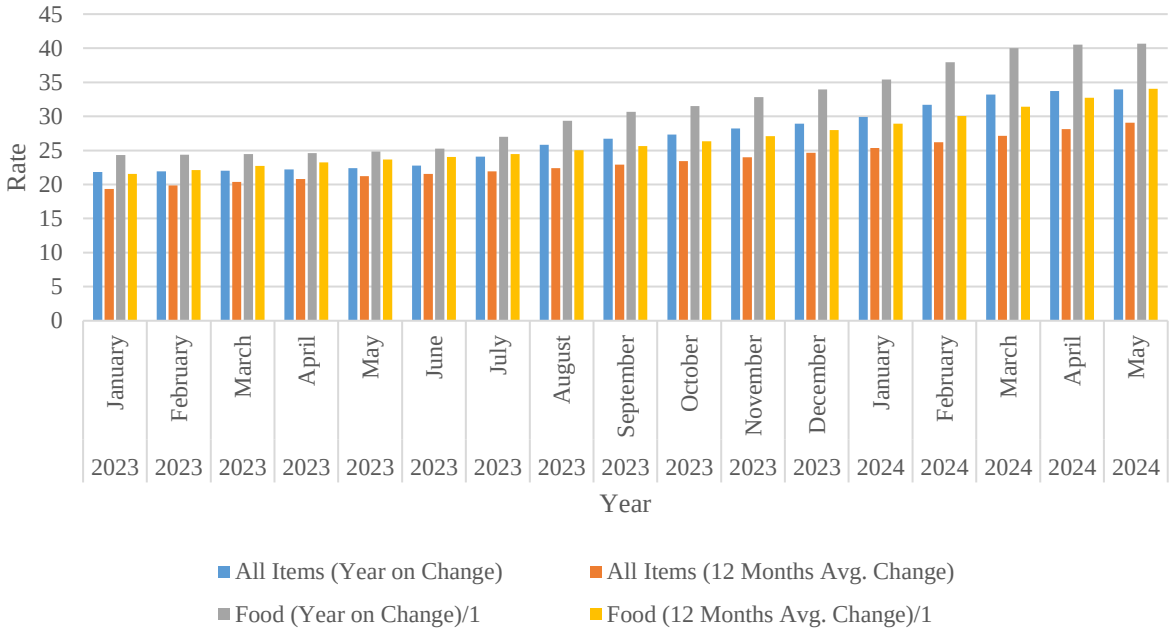
weight-for-height and weight-for-age measure of nutritional status deteriorate due to food price inflation. Their finding suggests that food price rises results in a substantial increase in malnutrition among under five children. A study by Hou et al. (2016) found that rising food price has a negative effect on school enrollment and it differs by gender, economic status and the presence of siblings. Households may respond to the rising food price by substituting across foods. Nutritional intake may not be affected if households are able to substitute from expensive to cheaper food that contain the same nutrients. The challenge for poor households is that they are already consuming low cost and low-quality foods. This implies that the effect of food price rise on poor households is severe.

The potential costs of malnutrition include death, high risk of impaired child development, and fall in productivity and economic growth. Moreover, it directly increased the cost of health care and indirectly affect productivity and maybe leading to a fall in adult wage. Given the high prevalence of malnutrition in Nigeria, rising food prices will negatively impact families' nutritional intake and outcomes, in addition to their health status (Efayena & Ichoku, 2024). There is need to investigate this crucial issue especially among rural and coastal households, who are mainly vulnerable and economically excluded.

Nigerians are experiencing the worst food inflation in decades amid a weakening naira, insufficient domestic agricultural production, and an over-reliance on expensive imported food. Rising inflation and slow growth have caused the number of impoverished Nigerians to rise from 89.8 million at the beginning of 2023 to 104 million (World Bank, 2023). In recent years, food prices have been on the rise across Nigeria. The situation deteriorated due to the impact of government policies such as the removal of subsidies on petrol, among others. Data from the National Bureau of Statistics reveal that the annual inflation rate for imported food in Nigeria increased from 18.49% in January 2023 to 26.29% in January 2024 (see Figure 1). Food imports have increased in price as a result of the Russia-Ukraine war, supply chain disruptions in the aftermath of Covid-19, and border closures introduced by the previous Nigerian government. The country imports a significant amount of wheat, milk, and fish. The food inflation rate in February 2024 quickened to 37.92 per cent on a year-on-year basis, which was 13.57 per cent points higher than the rate recorded in February 2023 (24.35 per cent).

At the state level, the food inflation rate was the highest in Kogi (44.18%), Kwara (40.87%), and Rivers (40.08%), while the lowest annual rates of food inflation were recorded in Bauchi (28.83%) Adamawa (29.80%), and Kano (30.08%). It is clear, however, that food inflation is a country-wide phenomenon.

Figure 1. Nigeria's inflation trajectory



The upward trend in the prices of these staples and other products has weakened the purchasing power of many citizens, making it difficult for many households in the country to afford daily meals. The Food inflation rate in February 2024 was 37.92 per cent on a year-on-year basis, which was 13.57 per cent points higher compared to the rate recorded in February 2023 (24.35 per cent). The bureau said the rise in food inflation yearly was caused by increased prices of bread and cereals, potatoes, yam and other tubers, fish, oil and fat, meat, fruit, coffee, tea, and cocoa. On a month-on-month basis, the Food inflation rate in February 2024 was 3.79 per cent this was 0.58 per cent higher compared to the rate recorded in January 2024 (3.21 per cent). It explained that the rise in food inflation on a Month-on-Month basis was caused by a rise in the rate of increase in the average prices of bread and cereals, potatoes, yam & other tubers, fish, coffee, tea, and cocoa. The average annual rate of Food inflation for the twelve months ending February 2024 over the previous twelve-month average was 30.07 per cent, which was a 7.95 per cent points increase from the average annual rate of change recorded in February 2023 (22.12 per cent).

In Nigeria, a few studies have been done in this area. For instance, Shittu et al. (2018) examined the welfare effects of food price spikes among households in the country. They found that higher spike in the price of cereals consistently has negative effect on food quantities (including calories) consumed, dietary diversity, and economic welfare of households, spikes of price of other staples such as animal proteins, fats and oils, fruits and vegetables exert heterogeneous influence.

Conversely, little is known about the potential impacts of food price spikes on nutritional outcomes of households in Nigeria. Such information is crucial for the development of policies and programmes targeted at the improvement of well-being of households in the country. The highlighted concerns provide the motivation for this

study. The study therefore seeks to address the following specific questions: How do food commodity price spikes affect the nutritional outcomes of households in Nigeria? Findings from this study can provide useful information for redesigning existing policy actions and programmes or for the introduction of new ones for improved living conditions of farm households in Nigeria. However, the economic evidence of food price increases and poverty is inconclusive, with simulation studies finding that poverty increases as food prices rise, and survey evidence finding the opposite, at least in rural areas (Headey & Hirvonen 2023).

This study, specifically, will examine the effect of rising food prices on households' nutritional outcomes. The study will also investigate household's responsiveness to the change in food prices. Specifically, is there a shift from high price food item to low price food item? If so, what is the impact on nutritional outcomes of households? Given the nature of the data, one can see the dynamics over time, by region, and different socioeconomic groups. This will be done by estimating a seemingly unrelated regression for the quadratic almost ideal demand system (QUAIDS) for the seven food groups (cereals, fruits and vegetables, meat, milk, salt and sugar, tuber and stem, and pulses) in Delta State. Furthermore, a fixed effect model will be estimated to examine the effect of food price rise on households' nutrition outcomes. Such households' studies have more policy implications and relevance for economic development (Efayena & Buzugbe, 2020).

2. Literature Review

A range of studies examined the effect of food price increase on household welfare and nutritional outcomes. The effect of food price rise varies by region. For instance, Ferreira et al. (2013) examined the effect of food price rises on household welfare in Brazil using a spatially disaggregated monthly data. The study found that a rise in food price increases extreme and moderate poverty in Brazil. The magnitude of the effect of food price rise in reducing welfare is higher in urban areas than rural areas due to the income effect of food price rise in rural areas. The study examined the effect of food price rise by controlling for market income effect, the expenditure effect, and the transfer income effect.

Jensen and Miller (2008) found that the impact of global food price rise on two Chinese provinces is small because households were able to substitute to cheaper domestic staple foods. Domestic food prices were low because of government intervention in the grain market. Moreover, the effect of food price rise on rural households depends on whether the households are net buyers or net sellers. Net seller households benefit from the rising food prices whereas net buyer households lose. For net seller of labor, a higher wage increases the welfare of the landless while reducing the welfare of net buyer of labor. The elasticity of food expenditure share with respect to the change in the price of food can be negative or positive depending on whether the substitution effect dominates the income effect or not. If the positive income effect dominates the negative substitution effect, an increase in food prices will increase food expenditure. The final effect of a change in the price of food depends on the marketed surplus. Marketed surplus is positive for net sellers of food and negative for net buyers. This means an increase in food price maybe leading to a fall in consumption for net buyers.

The responsiveness of food consumption expenditure to an increase in food price can be positive if the positive marketed surplus is large enough.

Vu and Glewwe (2011) found that the overall effect of food price rise on average Vietnamese household welfare is positive because the average welfare loss of net buyers was smaller than the average welfare gains by net sellers. According to Lee et al. (2013), high food prices can be an immediate threat to household food security, undermining population health, retarding human development, and lowering labor productivity for the economy in the long term. The study employs a panel dataset covering 63 developing countries from 2001 to 2010 to make a comprehensive assessment of the effects of food price inflation and volatility on population health measured by infant mortality rate, child mortality rate, and the prevalence of undernourishment. The study found that rising food prices have a significant and adverse effect on all three health indicators in developing countries. Furthermore, the impact of food prices is severer in the least developing countries although the effect is moderated in countries with a greater share of agriculture in gross domestic product.

Ivanic and Martin (2008) argued that the short run impact of rising food price on poverty in nine developing countries vary by country and by commodity. Similarly, Levin and Vimefall (2015) examined the effect of higher maize prices on different socioeconomic groups and regions in Kenya. The study found that a rise in maize price reduce household's welfare. It also found that poor households lose a larger proportion of their welfare than relatively wealthy households and rural landless households lose. But households that owns five acres or more land gain from price increase.

Attanasio et al. (2013) analyzed the welfare effect of food prices rise in Mexico. The study evaluated the effect of conditional cash transfer program and subsidy policy as a means of mitigating food price rise. The result suggests that food price rise results in welfare loss and the loss is not uniform among different groups of households. Shimeles and Woldemichael (2013) opined that rising food prices negatively affect the welfare of urban households and rural landless households, whereas it benefits land rich rural households.

Hadley et al. (2012) conducted a qualitative study on rising food prices and food insecurity in Jimma town in Ethiopia. The result shows that the rising food prices negatively affect different community level support systems. The rising food prices and food insecurity leads to poor mental health, stress, and deteriorating physical health. Woldemichael et al. (2017) also found that food price inflation has a negative effect on child weight and height in Ethiopia. Woldehanna and Tafere (2015) pointed out that price control measures may exacerbate the rising food prices by reducing supply while consumer associations help to stabilize food prices.

Adekunle et al. (2020) examined the effects of food price spikes on the quantity and quality of the dietary composition of farm households in Nigeria using the 2010/2011, 2012/2013 and 2015/2016 household survey panel data. The fixed effects models were estimated while controlling for participation in non-farm livelihood activities. Analysis indicated that seasonal comparisons of the average per capita daily calorie intake is lowest in the post-harvest season of 2011 (2511.44 kilocalories), which is higher than the average recommended intake. The results also showed that rural

households had lower per capita calorie intake and dietary diversity than urban households, which may be an indication of a shift in the calorie inadequacy from urban to rural farm households' setting in Nigeria.

Obiora et al. (2023) examined inflation's effects on Nigeria's food security, using comprehensive literature review to scrutinize their relationship. The study focuses on its effects on food costs, purchasing power, production, distribution, and household consumption patterns in Nigeria. The research underscored that inflation escalates food prices, diminishing consumer purchasing power, especially among low-income individuals, resulting in inadequate nutrition and health issues.

Anugwa and Ugwu (2022) examined the perceived effects of food price inflation on the food security status of rural farming households in Enugu state, Nigeria. The 18-item USDA household food security survey module was used in determining the food security status of the respondents. Mean scores were used to analyze the perceived causes and effects of food price inflation, respectively. The results showed that the majority of the households were food insecure, and the cost of production of major crops and prices of major stable foods had been on the increase. The major cause of food price inflation identified was climate change while its major effects on household food insecurity were reduction in caloric intake, among others. In addition, eating foods that are less preferred were the most frequently used coping strategy in cushioning the effects of food insecurity.

A review of the literature revealed a huge gap in empirics especially as regards studies at rural and other vulnerable groups who are at most times excluded from government palliative programmes to alleviate the ravaging effects of food inflation. This study seeks to investigate this in Delta State of Nigeria.

3. Methodology

3.1. Empirical model

A quadratic almost ideal demand system (QUAIDS) will be estimated in this study. This model is an extension of the almost ideal demand system (AIDS). This method has several desirable properties. The AIDS model satisfies the aggregation restriction, it is simple to estimate, and with simple parametric restrictions, homogeneity and symmetry can be imposed. The AIDS is derived from the indirect utility (Deaton & Muellbauer, 1980). Banks et al. (1997) suggested the quadratic almost ideal demand system (QUAIDS) which allows expenditure shares to respond more flexibly with respect to total expenditure.

Specifically, the quadratic term implies goods can be luxurious at low levels of total expenditure and necessities at higher levels. The QUAIDS is given as:

$$v_{it} = \alpha_i + \sum_i \varphi_{ij} \ln(p_{jt}) + \beta_i ln\left(\frac{X_t}{x(P)}\right) + \frac{\gamma_i}{y(P)}\left[ln\left(\frac{X_t}{x(P)}\right)\right]^2 \quad (1)$$

where v_{it} is the expenditure share of food group i at time t; p_{jt} is the price of food group j at time t; X_t is the total food expenditure at time t, and P is a translog price

index. In order to examine substitution possibilities due to the rising food price, the empirical strategy is estimating a system of demand equation of the form (1) including household size, and age. A seemingly unrelated regression (SUR) will be estimated. Since the error terms are contemporaneously correlated, we cannot estimate each equation separately, and the own and cross price elasticities will be calculated. The elasticities are calculated for the seven food groups. The QUADS model will be used to generate the predicted value of expenditure share for the seven food groups, which will be utilized as a proxy for households' nutritional status. The study will, therefore, estimate the following model:

$$\hat{v}_{it} = \alpha_0 + \alpha_1 HS_{it} + \alpha_2 AGE_{it} + \alpha_3 FMHEAD_{it} + \alpha_4 PRICE_{it} + d_i + \varepsilon_{it} \quad (2)$$

Where $\hat{v}_{it}$ is predicted value of the expenditure share of food group i at time t; *HS* is the household size; *AGE* is the age of the household head; *FMHEAD* =1 if household head is female, 0 = otherwise; *PRICE* is the log of food group *i* price at time *t*; d_i is the individual time invariant fixed effect, and ε_{it} is the error term. Food price rise may not immediately affect household's nutritional outcome. To control for the effect lag, the lag of all the food prices and policy variables is used in all the regressions.

Household size is expected have a negative effect on its nutritional outcome. Female headed households are expected to have lower expenditure share and nutritional intake relative to male headed households. Food price will be generated from amount the household spends on food items the data as follows. Information is available about the amount of money spent on 25 purchased food items and their respective quantities. First, the study generated the median price for the 25 food items by dividing the total amount of money spent with the total quantity consumed. The average of the median price for a given enumerating area is used as a food group price. Second, using the quantity of food consumed from own production, gift and other sources; the value of food consumed from own production and gift is generated. Total food consumption is the sum of purchased food, own production, gift and other sources. The expenditure share for each food group is calculated based on this information. The food group includes cereals, fruits and vegetables, meat, milk, salt and sugar, tuber and stem, and pulses. Own and cross elasticities are calculated for each food group.

3.2. Data and Sources

A questionnaire will be constructed following the structure of that of the General Households Survey (GHS) of the World Bank. The questionnaire will include all the variables of interest.

4. Findings and Discussion

4.1. Summary statistics

The data used in the analysis is collected from rural and coastal communities in Delta State as utilized in Buzugbe & Efayena (2019). The data shows that the average household size is 5.1. The average age of the household head is 42. The average real annual consumption expenditure is N19,458.

Table 1. Household Demographics

Item	Value
Household size	5.05
No. of adults in the household	3.08
No. of working age in the household	2.43
No. of elderly persons in the household	0.15
No. of females in the household	2.09
No. of children under 15 in the household	1.67
No. of working age female in the household	1.36
Age of household head	42.18
Real annual consumption expenditure (in naira)	19458.50

Source: Field survey (2025)

From Table 2, on average, 35.18% of the household's face food price shock. Households used different coping mechanisms in the face of food price shock. To mitigate the effect of price shock households reported using personal saving, helps from different sources, change their eating pattern, work more, family member migration, reduce their spending on health and education, and obtain credit.

Table 2. Response to Price increase

Item	Value
Proportion of households facing price increase	0.3518
Response to price increase	
Savings	0.291
Other financial sources (e.g thrives, osusu, etc)	0.116
Changes in eating pattern	0.065
More work	0.174
migration	0.018
Reduction in health and education expenditure	0.106
Borrowing	0.201

Source: Field survey (2025)

4.2. Empirical Analysis

The data is collected for three rounds. Based on this data, a seemingly unrelated regression for the QUAIDS model (equation 1) is estimated. The model is estimated by including demographic variables. The seven food group shares are used as a dependent variable.

As discussed in the methodology section, the study estimated the panel data model using the predicted value of weight-for-height z scores as a function of predicted expenditure share and other controls. As we can see in Table 3 below, the result shows that the price of cereals, oil seeds, and tuber are negatively and significantly related with weight-for-height z-score. This suggests that the increase in the price of those food groups deteriorates the weight-for-height measure of nutritional status. The price of meat is positive and significant indicating weight-for-height index is improving.

Table 3. Effects of food price and policy on weight-for-height (WHZ)

Dependent variable: Predicted WHZ	Cereals	Fruits & Vegetables	Meat	Milk	Salt & Sugar	Tuber & Stem	Pulses
Predicted expenditure share	4.312***	0.158	-4.193***	-2.137**	-0.734***	-2.067**	-0.535**
	(0.718)	(0.156)	(1.075)	(0.734)	(0.131)	(0.781)	(0.197)
Household size	0.159***	0.081**	0.131**	0.087***	0.117***	0.251**	0.132**
	(0.053)	(0.028)	(0.046)	(0.022)	(0.032)	(0.088)	(0.047)
Age	-0.052**	-0.073***	-0.116**	-0.081**	-0.019**	-0.096**	-0.128***
	(0.019)	(0.024)	(0.043)	(0.029)	(0.007)	(0.034)	(0.041)
Age squared	-0.000	0.000	-0.000	0.000	0.001	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head female	-0.117*	-0.027	0.031***	-0.119**	0.027***	-0.101**	0.312***
	(0.063)	(0.026)	(0.007)	(0.041)	(0.007)	(0.036)	(0.071)
No. of Observations	2,429	2,429	2,429	2,429	2,429	2,429	2,429
R-square	0.316	0.285	0.291	0.405	0.322	0.295	0.317

Source: Field survey (2025)

Note: ***, **, *and* * *denote statistical significance at 1%, 5%, and 10% level of significance; standard errors in parenthesis*

Predicted expenditure share significantly affect weight-for-height z score. The sign varies from food group to food group. It is negative for tuber, pulses, milk, sugar and salt and meat but positive and significant for cereals, and fruit and vegetables. This suggests that the higher the expenditure share of these food groups improve nutritional outcome (the weight-for-height z score).

4.3. Policy Implementations for the National School Feeding Programme.

This study has policy implementations for the national school feeding programme in Nigeria. In the context of Nigeria's current economic challenges—particularly persistent food inflation driven by exchange rate volatility, insecurity in food-producing regions, and rising logistics costs—there is a pressing need to strengthen the National Home-Grown School Feeding Programme (NHGSFP) as a social protection and nutritional intervention. One essential policy response is to institutionalize *inflation-indexed budgeting* for the programme. This would involve adjusting federal and state-level allocations in line with official inflation figures released by the National Bureau of Statistics (NBS), allowing the programme to maintain the nutritional quality and adequacy of meals served to primary school pupils despite rising food prices.

To reduce the programme's vulnerability to market fluctuations and external supply shocks, greater emphasis should be placed on *local food procurement strategies*. By sourcing food from local smallholder farmers and aggregators within the communities where schools are located, the NHGSFP can reduce reliance on distant supply chains, cut down on transportation costs exacerbated by high fuel prices, and stimulate rural agricultural economies. This approach aligns with Nigeria's broader objectives of enhancing food security and promoting inclusive economic growth under frameworks like the Agricultural Transformation Agenda and the National Poverty Reduction with Growth Strategy (NPRGS).

Another critical component is the regular revision and enforcement of *nutritional standards* tailored to the Nigerian context. Meals should reflect the diverse dietary needs of growing children, incorporating locally available staples and micronutrient-rich foods such as vegetables, legumes, and fortified cereals. Monitoring frameworks led by the Ministries of Health, Education, and Agriculture should be strengthened to assess compliance, dietary adequacy, and child health outcomes.

Additionally, *digital payment systems* should be scaled up across states to improve the timeliness and transparency of fund disbursements to vendors and cooks. Leveraging platforms such as the Government Integrated Financial Management Information System (GIFMIS) or mobile money services can reduce leakages and bureaucratic delays, especially in rural and hard-to-reach areas. At the same time, *community and stakeholder engagement*—through Parent-Teacher Associations (PTAs), school-based management committees, and local traditional institutions—should be institutionalized to provide real-time feedback and promote accountability.

Given Nigeria's frequent exposure to supply chain disruptions, flooding, and other shocks, the establishment of *emergency food reserves* at local government or zonal levels would provide a buffer to sustain meal provision during crisis periods. Schools can also be encouraged to develop school gardens, supported by agricultural extension services, to supplement food supplies while also educating children on nutrition and farming.

Furthermore, integrating *nutrition education and health interventions* into the school feeding framework—such as periodic deworming, health screenings, and hygiene promotion—can amplify the developmental benefits of the programme. These efforts support national goals of improving child health and learning outcomes, in line with the Universal Basic Education objectives.

A dedicated *food inflation monitoring taskforce* within the Federal Ministry of Humanitarian Affairs and Poverty Alleviation, in collaboration with the Central Bank of Nigeria (CBN) and NBS, can help track inflationary trends and their impact on programme costs and coverage. This will allow for timely adjustments and more resilient planning.

Finally, fostering *public-private partnerships (PPPs)* is key to enhancing programme sustainability. The private sector—through agribusinesses, food processing companies, logistics firms, and technology providers—can contribute innovations and resources to improve food quality, reduce wastage, and support last-mile delivery systems.

By embedding these policy measures within Nigeria's federal governance and economic development frameworks, the NHGSFP can serve not only as a tool for child welfare but also as a lever for local economic empowerment, food system resilience, and long-term human capital development.

5. Conclusion

This study evaluates the effects of food inflation on households' nutritional outcomes. This study is conducted based on a data collected from rural and coastal communities in Delta State. A seemingly unrelated regression model of the quadratic almost ideal demand system is estimated for the whole sample, year by year and for rural and urban sample. The predicted expenditure share of the seven food groups, weight-for-age z scores are used as a dependent variable. A simulation exercise is conducted by generating the predicted expenditure share of all the food groups and the weight-for-height nutritional outcome indicators. The result suggests that an increase in the price food negatively and significantly affect nutritional outcome. Several policy implementations for the national school feeding programme in Nigeria were highlighted.

It is thus imperative for the Nigerian government to adopt projects and programmes targeted at improving food production and accessibility especially to individuals in rural and coastal communities. There is need to boost agricultural production through

utilization of modern technologies in the production process. In addition, farmers should be encouraged through the incentivization of financing options. Government interventions at curbing food inflation through public-private partnership should be encouraged.

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