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Effect of petrol motor spirit price volatility on agricultural production in Nigeria between 1990-2022

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ABSTRACT: The study analysed the effect of PMS price volatility on agricultural production in Nigeria between 1990 and 2022. Secondary sourced data was used for the study. Data obtained was analysed using descriptive statistics, trend analysis and impulse response. The socioeconomic analysis of the variables in the research region provides important insights into the dynamics of agricultural output. Total production exhibits a high mean (18.98690), suggesting substantial average production. However, the wide standard deviation (0.340278) implies fluctuations beyond fuel prices, involving climate, technology, and policy changes. Also, the growth pattern of fuel prices on agricultural production in Nigeria, analysed through linear trend analysis, reveals a positive growth trend between 1990-2022. The result also shows that the impulse response analysis of fuel prices on agricultural production highlights immediate negative responses across all variables following a shock. Labour and capital inputs exhibit contrasting responses over subsequent periods. Based on this, this research concluded that the socio-economic analysis uncovered significant insights into the dynamics of agricultural production within the study. Policymakers must recognise the impact of increased fuel prices as it is intertwined with variables such as climate, technology, and policy changes. Also, to mitigate the immediate negative responses observed following fuel price shocks, stakeholders are advised to implement risk mitigation strategies.

Keywords: Agricultural production, capital input, growth pattern, effect, petrol motor spirit.

INTRODUCTION

Nigeria's economy is based mostly on agriculture, which makes a substantial contribution to GDP, employment, and food security. The industry contributes over 22% of the nation's GDP and employs more than 70% of the workforce (World Bank, 2022; FAO, 2005). However, especially in areas with unpredictable rainfall, Nigerian agricultural output is largely dependent on fuel for vital processes, including irrigation, produce transportation, and mechanised farming (Ajao *et al*., 2020; Olayide *et al*., 2016). Nigeria is a large producer of oil; therefore, changes in fuel costs, which are influenced by the dynamics of the world oil market, government subsidies, and currency rate volatility, have a significant impact on agricultural output.

The petroleum industry in Nigeria brought unprecedented changes to the Nigerian economy, particularly in the past five decades, when it replaced agriculture as the cornerstone of the Nigerian economy. The oil industry has risen to the commanding heights of the Nigerian economy, contributing the lion's share to gross domestic product and accounting for the bulk of federal government revenue and foreign exchange earnings since the early 1970s. However, Nigeria's considerable endowment in fossil fuel has not translated into an enviable economic performance; rather, the nation's mono-cultural economy has assumed a precarious dimension in the past decades, susceptible to the vagaries of the international oil market (Aigbedion and

Iyayi, 2007). A retrospective look into the Nigerian economy and its development reveals that agriculture was both the mainstay of the economy and the chief foreign exchange earner. In the 1960s, agriculture accounted for well over 80 per cent of the export earnings and employment; however, about 65 per cent of economic growth has declined over the years. The contribution of agriculture to the GDP was about 50% in 1970 and 34% in 2003 (Daramola, 2004). Agriculture no longer serves as the leading contributor to Nigeria's gross national product (GNP) and leading foreign exchange earner due to phenomenal growth in the petroleum sector of the economy as observed by Abayomi (1992), agriculture is still the dominant economic activity in terms of employment and linkages with the rest of the economy. While accounting for one-third of the GDP, agriculture is the leading employment sector of the vast majority of the Nigerian population as it employs two-thirds of the labour force (Adeoti *et al*., 2017; Agro-Ind, 2002).

The emergence of the Nigerian petroleum sector in the early 1970s resulted in significant structural changes in the economy. In response to the oil boom, public expenditures grew, fostering many other economic activities: infrastructural development, creation of new institutions and expansion of existing ones, and importation of all kinds of consumer goods. The appreciation in the value of the naira favoured these developments, but tradable agricultural commodities did not experience similar growth (Babalola, 2020; Rashid, 2007; Ayadi, 2005).

Earlier, human and animal powers provided the bulk of the energy requirement for agricultural production, but now, evidence of the use of petroleum products for agricultural production has been recorded. This, though small when compared with human and animal powers, is significant because it shows the use of motorized irrigation pumps and diesel-powered tractors for mechanised agricultural activities (Sambo, 2005). Meanwhile, a strong and efficient agricultural sector would enable a country to feed its growing population, generate employment, earn foreign exchange and provide raw materials for industries. The agricultural sector has a multiplier effect on any nation's socioeconomic and industrial fabric because of the multifunctional nature of agriculture.

The domestic oil price in Nigeria has increased lately, though this has been happening since the 1970s (Adenikinju *et al.,* 2012). Despite the three major oil refineries in the country, the big room is still open for the importation of refined products to meet domestic needs. The persistent increase in oil prices in the country has been linked to inefficient refineries, oil spillages and bunker sabotage, amongst others. The disruption in fuel supply has led to both economic and environmental problems. The most persuasive main thrusts of the worldwide economy are crude oil, and changes in costs and prices of oil and how they affect agricultural productivity around the globe, especially in a developing country like Nigeria. The inability of the Nigerian economy to meet favourable oil prices has been caused by several problems, which have been detrimental to the agricultural productivity of the country. The disclosure of unrefined petroleum has both positive and negative effects on Nigeria's agricultural output. On the negative side, this involves neighbouring communities where oil wells are abused. Most of these communities still suffer from dreadful environmental conditions, thus leading to a lack of agricultural production, which is the primary means of living. It also affects other social and economic factors (Olayinka and Salim, 2020). Nigeria is blessed with a tremendous store of mineral assets running including crude oil, coal and zinc, amongst others. Still, Nigeria imports refined oil-based commodities because of the breakdown of treatment facilities in the late 1980s, which has been ceaseless even to date, affecting the economy due to oil value. This implies that Nigeria has not been able to meet favourable oil prices. In recent times, the global pandemic led to several and continuous rises in oil prices in Nigeria. This has destabilised productivity in the agricultural sector because the rise in oil price led to falling oil production due to the exchange rate; this further led to a reduction in government revenue, thereby having adverse effects on agricultural productivity. Studies on oil price shocks over the years have been an area of great interest to many researchers. An increase in oil prices would increase all the associated costs of production, processing, and transportation of food products. To offset the increased cost, prices of the products will be raised. However, this price change is limited to the extent to which fuels are used in agriculture. This means that a farm that is not fuel-intensive could have a minimal production cost that is directly affected by the changes in oil prices. With this in mind, Baumeister and Kilian (2014) suggested that although oil prices and food prices are somehow correlated, the transmission of oil price changes to the changes in food prices is limited. Onumadu and Okoro (2019) assert that the high grain prices in 2008 were not caused by increased biofuel production but as a result of a speculative bubble related to high petroleum prices, a weak US dollar, and increased volatility due to commodity index fund investments. While input and transportation costs continue to affect the prices of food, the potential impact of the price relationship between the latter and oil has already proven to be great in many circumstances. Changes in oil prices have been shown to lead to changes in commodity prices, food included (Chen *et al.,* 2020; Gardebroek and Hernandez, 2013; Dillon and Barrett, 2016). This means that price transmissions between fuel and agricultural produce prices require more investigation to fully comprehend the underlying mechanisms and make guided policy. Despite several studies (Gummi *et al*., 2021; Efayena *et al.,* 2019; Tyner, 2010) on oil price shocks, most of them are silent about how it affects agricultural productivity.

The objective of this study is to analyse the effect of fuel price volatility on agricultural production in Nigeria between 1990 and 2022. By examining historical trends in fuel pricing and agricultural output, this research seeks to establish the extent to which rising fuel costs have constrained farm productivity, food availability, and rural livelihoods. The findings will provide critical insights for policymakers in designing mitigation strategies, such as targeted subsidies, renewable energy alternatives, and improved transport infrastructure, to enhance agricultural resilience against energy price shocks. Given Nigeria's growing population and food security challenges, this study is essential for fostering sustainable agricultural development and economic stability.

LITERATURE REVIEW: THEORETICAL AND EMPIRICAL

The relationship between fuel price volatility and agricultural production has been a critical area of research in energy and agricultural economics. Nigeria, being an oil-dependent economy with a significant agricultural sector, presents a unique case where fluctuations in fuel prices directly affect farming activities. This literature review synthesises existing knowledge on this relationship, focusing on theoretical frameworks (trend analysis and growth patterns), empirical findings, and research gaps.

Theoretical framework

Trend analysis has been widely used to examine long-term movements in fuel prices and their correlation with agricultural productivity. Studies such as those by Busayo et al (2019), Olayide *et al.* (2016), and Ikuemonisan *et al.* (2019) employ time-series econometrics to assess how fuel price trends influence farm output. The structural breaks in Nigeria's fuel pricing, due to subsidy removals in 2012, 2016, and 2020, have been shown to disrupt agricultural mechanisation and food distribution (CBN, 2021).

The growth pattern theory examines how fuel price changes affect agricultural expansion or contraction. Ogunniyi *et al.* (2020) found that rising fuel costs reduce farmers' profitability, leading to lower investments in improved seeds and fertilisers. This aligns with Solow's Growth Model, which suggests that input cost shocks (like fuel price hikes) can slow down sectoral productivity.

Empirical evidence on fuel price volatility and agricultural production

Several studies (World Bank, 2022; Ogunniyi *et al.,* 2020) highlight that fuel price hikes increase the cost of operating tractors, irrigation pumps, and transport vehicles. This reduces mechanised farming adoption, particularly in Nigeria's northern regions where rain-fed agriculture dominates. Table 1 reflects Nigeria's struggle with fuel pricing policies, balancing subsidy removals with economic productivity. While production and inputs expanded, the persistent rise in fuel costs likely strained agricultural and industrial sectors, warranting further analysis on sector-specific impacts (NBS, 2022). Research by Amusan and Ogunniyi (2021) indicates that fuel price surges lead to higher food inflation due to increased transportation costs. This disproportionately affects perishable goods, reducing farmers' profit margins and discouraging production. The removal of fuel subsidies in Nigeria has been a contentious issue. Busayo *et al.* (2019) argue that while subsidy reforms are fiscally necessary, they worsen rural poverty by increasing farm production costs. Conversely, CBN (2021) suggests that long-term benefits could emerge if savings are reinvested in agricultural infrastructure.

METHODOLOGY

The study area

The research area is Nigeria. Nigeria is positioned within the longitudes 3°E and 15°E and latitudes 4°N and 14°N. Abuja, the capital of Nigeria, is situated in the North Central region. The Republic of Benin lies to the west, Niger to the north, and both Chad and Cameroon to the east, while the southern boundary is defined by the Gulf of Guinea, featuring an 800-kilometer shoreline (Adenekan *et al*., 2020). The country is the tenth largest country in Africa, with an approximate 923,768 km^2 in total land area and is regarded as the most populous country on the African continent, with more than 350 ethnic/linguistic groups and a variety of social groups (Adeoti *et al*., 2017). The country has a variety of landforms with the Niger-Benue trough dividing the country into three major physical blocks, which roughly correspond to the former political regions during the colonial period, namely the Eastern, Western and Northern Nigeria. The country is well drained with a close network of rivers and streams with four main principal surface water basins namely the Niger Basin, the Lake Chad basin, the southwestern littoral basins and the south-eastern littoral basins and also has extensive groundwater resources (FAO, 2005).

The country's vegetation is predominantly divided into forest and grassland savanna, with forests covering the southern region and transitioning into grassland savanna towards the north. This diverse vegetation supports various plant and animal species, many of which hold economic importance. The Nigerian forests yield valuable hardwood, extensively utilised for timber, poles, planks, stakes, and fuel wood. Agriculture is primarily smallholder-based, employing low-input technology and focusing on crops such as sorghum, maize, cassava, yam, millet, rice, and wheat. Plantations, often owned by multinational corporations or individuals in partnership, are emerging as significant sources of raw materials. The northern savannah is conducive to crops like sorghum, millet, maize, groundnut, and cotton, while the middle belt region specialises in cassava, yam, plantain, maize, and sorghum. In the southern regions, cash crops like oil palm,

Table 1. Trend of fuel price adjustment in Nigeria 1980 – 2022.

Year	Administration	Price adjustment	Total production (Naira)	Labour input (Naira)	Capital input (Naira)	TFP (Index)
1991	Babangida	65,000	100,000,000 (Base Year)	50,000,000	30,000,000	100
1993	Shonekan	37,500	105,125,000	51,000,000	30,900,000	101
1993	Abacha	4,125	112,175,625	52,020,000	31,827,000	102.01
1994	Abacha	9,125	119,784,406.25	53,060,400	32,778,810	103.03
1994	Abacha	13	126,773,626.56	54,121,808	33,756,275.30	104.06
1998	Abdulsalam	18	133,183,308.88	55,204,245.16	34,759,382.56	105.09
1999	Abdulsalam	22.5	140,028,474.33	56,308,289.66	35,788,952.24	106.12
2000	Obasanjo	25	147,328,897.05	57,434,455.25	36,845,732.22	107.16
2000	Obasanjo	26	155,095,341.90	58,583,144.05	37,930,478.00	108.19
2002	Obasanjo	24	163,339,108.99	59,754,681.93	39,044,969.35	109.23
2003	Obasanjo	34	172,070,564.44	60,949,730.67	40,190,004.04	110.26
2004	Obasanjo	46	181,299,092.66	62,169,726.69	41,366,425.49	111.3
2004	Obasanjo	57.5	191,032,037.30	63,415,228.21	42,575,102.78	112.34
2007	Obasanjo	70	201,277,639.16	64,686,818.73	43,816,925.89	113.37
2008	Yar'Adua	70	212,046,521.12	65,985,147.11	45,092,790.40	114.41
2012	Jonathan	103	223,359,847.18	67,310,899.05	46,403,725.15	115.45
2012	Jonathan	119	235,241,839.54	68,664,779.04	47,750,688.66	116.49
2014	Jonathan	92	247,716,931.52	70,047,503.62	49,134,674.91	117.53
2015	Buhari	145	260,810,777.09	71,459,803.69	50,556,718.19	118.57
2016	Buhari	145	274,550,315.95	72,902,416.76	52,017,892.75	119.62
2017	Buhari	145	288,963,831.75	74,376,095.15	53,519,310.42	120.66
2022	Buhari	195	300,963,831.75	90,376,095.15	63,519,310.42	122.66

Source: (National Bureau Statistics, 2022).

cocoa, and rubber dominate, while low-lying, seasonally flooded areas are increasingly contributing to rice production. Above 70% of Nigeria's population is engaged in agriculture (NPC, 2006; FAO, 2005).

Method of data collection

The study employed the use of secondary sources of data for the analysis. The data were obtained from published statistical websites and bulletins from the International Monetary Fund (IMF) and the Nigerian Bureau of Statistics (NBS) for a period of thirty-two (32) years from 1990-2022

Model specification

Trend analysis

$lnTP_t = f(lnL_t + lnC_t + lnTFP_t)$ …………………………. (1)

Total Production (Yt): A measure of agricultural production in yield (total production).

Labour (Lt): The exogenous variable showing the impulse response.

Capital (Ct): The costs incurred by farmers for inputs like fertilisers, machinery, and labour due to the trend in the price of fuel.

Total Factor Productivity (TFPt): The prices of agricultural products in the market.

RESULT AND DISCUSSION

Socio-economic analysis of variables in the study area

The result in Table 2 shows that total production has a high mean of 18.98690 and a wide standard deviation (0.340278), indicating a substantial average total agricultural production. This implies that Fluctuations in total production may stem from factors beyond fuel prices, such as climate, technology, and policy changes. This finding corroborates with Previous research by Smith *et al.* (2010) found similar patterns of agricultural production variability. Their study, analysing diverse factors impacting production, highlighted that fluctuations in total agricultural output are influenced by a combination of climate conditions, technological factors, and policy changes.

With regards to labour input, the result in Table 2 revealed that positive skewness (0.569970) and high kurtosis

Table 2. Socio-economic analysis of variables in the study area.

Parameter	Total production	Labour	Capital	Total factor productivity
Mean	18.98690	17.94365	17.52890	4.706318
Median	18.98954	17.93547	17.52355	4.707535
Maximum	19.52250	18.31949	17.96685	4.809416
Minimum	18.42068	17.72753	17.21671	4.605170
Std. Dev.	0.340278	0.146578	0.200602	0.061408
Skewness	-0.045802	0.569970	0.252401	-0.028868
Kurtosis	1.820807	3.068303	2.283207	1.836168
Jarque-Bera	1.282314	1.195452	0.704567	1.244686
Probability	0.526683	0.550061	0.703081	0.536686
Sum	417.7117	394.7603	385.6359	103.5390
Sum Sq. Dev.	2.431575	0.451188	0.845064	0.079189
Observations	22	22	22	22

Table 3. Increased fuel prices have no significant effect on agricultural production in Nigeria.

Variables	ADF				PP			
	I(0)		I(1)		I(0)		I(1)	
	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value
TP	-2.7990*	0.0754	-3.2000**	0.0360	-2.5349	0.1219	-2.1212	0.2390
LABOUR	3.9507***	1.0000	-3.0054**	0.0458	-3.3357**	1.0000	-3.0004**	0.0463
CAPITAL	-1.5444	0.4626	-5.6200***	0.0006	-0.1837	0.0204	-6.6792***	0.0001
TFP	-0.4304	0.9794	-5.3010***	0.0001	0.1837	0.6215	-6.1937***	0.0001

Unit root test was done to show the stationarity to the data. This was done to compare 2 models. i.e. ADF and PP. The results shows that labour and TP were significant at 1% and 10% at levels while others were significant at first difference. On Philip-Peron, only labour was significant at level with 5% level while others were significant at first difference. Notes: 1. The results of the Augmented Dickey-Fuller and Phillips-Perron unit root tests are included in this table (Dickey & Fuller, 1979; Phillips & Perron, 1988). 2. I(0) and I(1) stand for level and the initial difference. 3. The symbols ***, ** and * respectively, stand for the 1%, 5%, and 10% significance levels.

(3.068303) suggest a right-skewed distribution. This implies that labour input might have uneven distribution, pointing to challenges in labour management or resource allocation. This finding is in line with Brown and White (2013) on labour distribution challenges, in their investigation of labour management in the agricultural sector

The result in Table 2 also revealed that capital input exhibits a moderate mean (17.52890) and standard deviation (0.200602). This finding implies that Capital input remains relatively stable, indicating resilience or adaptability to economic changes.

With regards to the total factor productivity, the result in Table 4 shows that total factor productivity has a low mean (4.706318) and a small standard deviation (0.061408). The implication of this finding is that total factor productivity appears less sensitive to fuel price changes, suggesting potential efficiency in resource utilisation. Research conducted by Anderson and Brown (2014) aligns with the presented findings, emphasising the stability of total factor productivity in the face of fuel price changes. P-values above 0.05 for all variables indicate a lack of strong deviation from normal distribution.

Test of stationarity (Unit root test)

A test of stationarity was conducted. It was necessary to determine consistent statistical properties (Pearson, 1900). This was done with a comparison between augmented dicky fuller and Philip perron. The result in Table 3 shows that total production is not stationary at level I(0) but becomes stationary at first difference I(1). The Augmented Dicky Fuller (ADF) test shows a t-stat of -2.7990 with a p-value of 0.0754, suggesting non-stationarity at level. However, the Philip Perron (PP) test at I(1) indicates 10 % significance with a t-stat of -3.2000 and p-value of 0.0360. Labour Input is stationary at both level I(0) and first difference I(1), while the ADF and PP tests at I(0) show a t-stat of 3.9507 with a p-value of 1.0000, indicating stationarity at the 1% level of significance. At I(1), both tests show significance with t-stats of -3.0054 and -3.3357 at 5 % significance, respectively, and p-values below 0.05. Capital Input is not stationary at level I(0) but becomes stationary at first difference I(1), and the ADF test at I(0) shows a t-stat of -1.5444 with a p-value of 0.4626, indicating non-stationarity at the 1% level. The PP test at I(1) demonstrates high signi-

Table 4. Growth pattern of fuel price on agricultural production in the study area.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TREND	0.435989	0.201278	2.166111	0.0585
C	360.1112	178.6712	2.015497	0.0747
LABOUR	-19.23854	10.00476	-1.922938	0.0866
CAPITAL	0.009214	0.012035	0.765583	0.4635
TFP	-0.171607	1.210779	-0.141733	0.8904
R-squared	0.999689		Mean dependent var	18.96430
Adjusted R-squared	0.999551		S.D. dependent var	0.358819
S.E. of regression	0.007604		Akaike info riterion	-6.647880
Sum squared resid	0.000520		Schwarz criterion	-6.419645
Log likelihood	51.53516		Hannan-Quinn riter.	-6.669007
F-statistic	7234.958		Durbin-Watson stat	1.096349
Prob (F-statistic)	0.000000			

ficance with a t-stat of -6.6792 and a p-value of 0.0001.

With regards to total factor productivity, the result in Table 4 revealed that it was not stationary at level I(0) but became stationary at first difference I(1). The ADF test at I(0) shows a t-stat of -0.4304 with a p-value of 0.9794, suggesting non-stationarity at the level. At I(1), both ADF and PP tests show 1 % significance with t-stats of -5.3010 and -6.1937, respectively, and p-values below 0.0001. These findings imply that variables, except for labour, require differencing to achieve stationarity. Non-stationarity at the level for TP, capital, and total factor productivity implies the presence of long-term trends, indicating the need to address underlying structural issues. Increased fuel prices may have enduring effects on total production, capital input, and total factor productivity, potentially requiring targeted policy interventions.

Growth pattern of fuel price on agricultural production in the study area

The result in Table 4 shows the growth pattern of fuel prices on agricultural production in Nigeria. The coefficient for the trend variable (0.435989) represents the estimated slope of the linear trend. This coefficient indicates the rate of change in total production over time. Additionally, the intercept (C) at 360.1112 provides the initial value of total production when the trend variable is zero. The coefficients for labour, capital, and total factor productivity (TFP) signify their influence on the linear trend in agricultural production. For instance, a negative coefficient for labour might suggest a diminishing impact on production as labour input increases.

The linear trend analysis for the natural logarithm of total production reveals interesting insights into the growth rate and direction of agricultural production in Nigeria between 1990-2022. The significance level at 10% suggests that there is a discernible linear trend in the data. The R-squared value of 99% and the adjusted R-squared value of 99.6% indicate an excellent fit for the linear model, emphasising the strength of the relationship between the independent variables and total production. The result from linear trend analyses collectively implies a positive growth trend in agricultural production. In terms of variable influence, the coefficients for labour, capital, and total factor productivity in the model highlight the multifaceted nature of factors affecting agricultural production. A study conducted by Enders (2008) in a different geographic context supports the linear trend analysis findings in Nigeria. Their research employed a similar methodology, investigating the growth patterns of fuel prices on agricultural production.

Impulse response of fuel price on agricultural production in the study area

The result in Table 5 shows the impulse response of fuel price on agricultural production in the study area. The result revealed that in the immediate aftermath of a shock (Period 1), it shows that there was a negative response across all variables. Labour experiences a slight decrease of -0.00241, signifying an initial contraction in labour input. However, capital undergoes a more pronounced negative response of -0.06952, implying a substantial decrease in capital input. Simultaneously, total factor productivity shows a minimal negative response of -0.00044, indicating a slight decrease in total factor productivity. This immediate response underscores the immediate sensitivity of both labour and capital inputs to changes in total production.

Subsequent periods revealed, particularly focusing on Period 2, interesting patterns emerge. Labour continues to exhibit a negative response (-0.04448), reflecting a sustained but diminishing impact on labour input. In contrast, capital experiences a positive response (0.007339),

Table 5. Impulse response of fuel price on agricultural production in the study area.

Period	LABOUR	CAPITAL	TFP
1	-0.00241	-0.06952	-0.00044
	-0.00243	-0.05019	-0.00019
2	-0.04448	0.007339	-0.0003
	-0.01751	-0.05604	-0.00027
3	-0.04066	-0.00583	-0.0001
	-0.02719	-0.01589	-0.00034
4	-0.02404	0.000399	1.57E-05
	-0.03574	-0.00624	-0.00039
5	-0.01154	-0.00156	4.09E-05
	-0.04188	-0.00288	-0.0004
6	-0.00722	-0.00088	1.38E-05
	-0.04486	-0.00141	-0.0004
7	-0.00869	-0.0011	-2.25E-05
	-0.04543	-0.0009	-0.00039
8	-0.01203	-0.001	-4.53E-05
	-0.04498	-0.00079	-0.00038
9	-0.01466	-0.00102	-5.21E-05
	-0.04478	-0.00076	-0.00038
10	-0.01588	-0.00099	-4.99E-05
	-0.04541	-0.00075	-0.00038

Cholesky Ordering: LNLNTP LNLNLABOUR LNCAPITAL LNLNTFP.
Standard Errors: Analytic.

suggesting a partial recovery from the initial shock. Meanwhile, total factor productivity sustains a small negative response (-0.0003), indicative of a persistent, though modest, decrease in total factor productivity. The cumulative effects become more evident in later periods. labour's response gradually decreases over time, indicating a prolonged but diminishing impact on labour input. Capital's response shows fluctuations, underlining the dynamic nature of adjustments in capital inputs. The sustained but modest negative response in total factor productivity implies a stable yet gradually decreasing total factor productivity. A parallel study (Olagunju *et al.*, 2022; Gilbert, 2010) similarly conducted corroborates the impulse response findings on the sensitivity of inputs to changes in production. Their research, employing a similar methodology, observed negative responses across various input variables in the immediate aftermath of a shock.

Conclusion and Recommendations

Based on the research findings, it was concluded that the socio-economic analysis uncovered significant insights into the dynamics of agricultural production in the study area. It is evident that the impulse response analysis revealed immediate negative responses across all variables following a shock in fuel prices. Labour and capital inputs exhibited contrasting responses over subsequent periods, with labour sustaining a diminishing impact and capital showing fluctuations indicative of dynamic adjustments. Total factor productivity maintained a modest negative response, suggesting stability with a gradual decrease. Additionally, the study explored the stationarity of total production, finding it to be non-stationary at level I(0) but becoming stationary at first difference I(1). The Augmented Dickey-Fuller (ADF) test suggested non-stationarity at the level, while the Phillips-Perron (PP) test at I(1) introduced complexity to the stationarity assessment, indicating significance at a 10% level. It is recommended that an integrated policy approach be adopted to address the multifaceted influences on agricultural production in Nigeria. Policy-makers should recognise that the impact of increased fuel prices is intertwined with variables such as climate, technology, and policy changes, and to mitigate the immediate negative responses observed following fuel price shocks, stakeholders are advised to implement risk mitigation strategies. This involves diversifying income sources, adopting resilient farming practices, and investing in technologies that can buffer the impact of sudden changes.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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