



**ASSESSMENT OF THE IMPACT OF FUEL SUBSIDY REMOVAL ON IRRIGATION-BASED RICE PRODUCTION IN NORTH-EASTERN STATE, NIGERIA**

<sup>1</sup>Hamidu, B., <sup>1</sup>Sale, I., <sup>1</sup>Usman, A. B., <sup>1</sup>Daiyabu, M. L and <sup>2</sup>Musa, A. U

Department of Agricultural Economics, Faculty of Agriculture and Agricultural Technology,  
Abubakar Tafawa Balewa University, Bauchi, Nigeria.

<sup>2</sup>Department of Agricultural Economics, Faculty of Agriculture Joseph Sarwuan Tarka University  
Makurdi, Benue State, Nigeria.

**Corresponding Author's E-mail:** babangidahamidu123@gmail.com, **GSM:** +2347030177073

**ABSTRACT**

The study examined the impact of fuel subsidy removal on irrigation-based rice production in Bauchi and Gombe States, Nigeria. A multistage sampling procedure was used to select seven hundred and seventeen farmers in the study area. Data were collected through the use of structured questionnaire. The data were analyzed using descriptive statistics and budgeting model. The results revealed that almost all (92.19%) of the respondents in Bauchi and Gombe State were male with majority (68.90%) of them being married. The result also revealed the mean household size, mean farm size, farming experience and mean monthly income of; 9 persons per household for both States, 3ha, 9 years for Bauchi and 15 years for Gombe, ₦115,355.43 for Bauchi and ₦70,454.36 for Gombe respectively. The result of the budgeting model revealed the mean total cost, mean total revenue, mean gross margin, mean net income and return per Naira invested before the removal of fuel subsidy in Bauchi State as ₦227,965.623, ₦1,735,630.3, ₦1,552,610.6, ₦1,507,664.7 and ₦8.48 respectively. While after the removal of fuel subsidy the mean total cost, mean total revenue, mean gross margin, mean net income and return per Naira invested in Bauchi State was found as ₦342,032.523, ₦2,442,184.8, ₦2,166,717.2, ₦2,100,152.3 and ₦7.8 respectively. The result also revealed the mean total cost, mean total revenue, mean gross margin, mean net income and return per Naira invested before the removal of fuel subsidy in Gombe State as ₦177,716.51, ₦1,800,000, ₦1,667,229.43, ₦1,622,283.49 and ₦12.55 respectively. The result of the findings further indicated that majority (70.20%, 68.55%, 64.89% and 66.43%) of respondents in Bauchi and Gombe States strongly agreed that subsidy removal had negatively affected their livelihood by bringing about high cost of transportation and increase in the price of basic food stuff. The study concluded that irrigated rice farming was profitable before and after the removal of the fuel subsidy in Bauchi and Gombe States. However, it was discovered that the constraints to irrigated rice farming in the two States were high cost of fertilizer, high fuel cost and low price of paddy rice. It was therefore recommended that, alternative irrigation systems such as solar powered irrigation systems should be encouraged, provision of adequate palliative measures, providing subsidy to farmers particularly on fertilizer and other inputs by the federal /State Government as well as discouraging the importation of rice into the country to encourage local production.

**Keywords:** Fuel, Subsidy, Impact, Irrigation, Rice

**INTRODUCTION**

Agriculture remains a cornerstone of Nigeria's economy, providing employment to over 70% of the rural population and contributing significantly to food security and poverty alleviation (Nuhu, 2023). Rice, being a staple food crop, holds particular importance in the agricultural landscape (Adikwu *et al.*, 2025). The Nigerian government has historically subsidized fuel prices to ease the cost of agricultural production and transportation. However, in recent years, the government has initiated the removal of fuel subsidies as part of broader economic reforms aimed at reducing fiscal deficits and promoting economic sustainability (Nuhu, 2023). This policy shift has led to increased fuel prices, which have had far-reaching implications for various sectors, including agriculture (Yahaya *et al.*, 2025). In North-Eastern States of Nigeria, where irrigation is crucial for rice cultivation, the removal of fuel subsidies has raised concerns about its impact on production costs, farm income, and overall agricultural productivity (Ochimana *et al.*, 2025). Given the states' reliance on fuel-powered irrigation



systems, the increased cost of fuel directly affects the affordability and efficiency of water pumping, which is vital during the dry season. Additionally, the rise in transportation costs due to higher fuel prices affects the cost of inputs and the marketing of harvested rice, potentially reducing farmers' profitability and food security (Adikwu *et al.*, 2025). The North-Eastern region of Nigeria, irrigated rice farming has been a key agricultural activity, especially in States like Bauchi and Gombe States, which are known for their extensive irrigation schemes (Yahaya *et al.*, 2025). The removal of fuel subsidies in Nigeria has led to a significant increase in fuel prices, which, in turn, has escalated the cost of agricultural production, particularly in fuel-dependent irrigation systems (Yahaya *et al.*, 2025).

Gwandi *et al.*, (2023) used descriptive statistics and budgeting model to analyze the profitability of Maize production in Adamawa State, Nigeria. In North-Eastern States, where irrigated rice farming is prevalent, this policy change poses a threat to the sustainability of rice production (Ochimana *et al.*, 2025). Farmers are confronted with higher operational costs, reduced profit margins, and potential declines in production levels (Adikwu *et al.*, 2025). It is obvious that fuel subsidy removals have worsened the country's already inflation rate. In fact, they have resulted in hyper- inflation as prices of goods and services have skyrocketed beyond reaches of many Luis, C. (2012). Accordingly, this has affected welfare of household through inflation which in turn lead to diversion of resources from savings and investment to meet the day-today needs Remy, U. (2012). A search through literature shows that limited researches were conducted on the effect of fuel subsidy removal particularly on rice production. Hence the need to assess the specific impacts of fuel subsidy removal on irrigated rice-based production to inform policy decisions and support strategies that can mitigate adverse effects on farmers and ensure food security (Nuhu, 2023). These are gaps that need to be addressed.

The broad objective of the study is to assess the impact of fuel subsidy removal on irrigated rice-based production in North- Eastern States of Nigeria while the specific objectives were to:

- i. Describe the socio-economic characteristics of small scale- irrigated rice-based farmers in the study area;
- ii. Evaluate profitability of small-scale irrigated rice-based farmers in North-Eastern Nigeria.
- iii. Assess the impact of fuel subsidy removal on the productivity and livelihood of small-scale irrigated rice-based farmers
- iv. Find out the constraint to irrigated rice production

## **METHODOLOGY**

The study was carried out in North-Eastern States of Bauchi, Gombe and Taraba. Bauchi State is located in the Sudan Savannah and some parts of northern guinea savannah zones of Nigeria. It is situated between latitudes  $9^{\circ}3'$  and  $12^{\circ}30'$  North of equator and longitudes  $8^{\circ}50'$  and  $11^{\circ}$  East of the Greenwich Meridian. It occupies a land mass of about  $49,235\text{km}^2$  representing about 5.3% of Nigeria's total land mass, encompassing about 42 million hectares of cultivable land while Gombe State is located in the Sudan Savannah zone of Nigeria. It is situated between latitudes  $10.2897^{\circ}$  N and longitudes  $11.1673^{\circ}$  E. It occupies a land mass of about  $18,768\text{km}^2$  representing about 2.03% of Nigeria's total land mass, with about  $13,100 - 14,100 \text{ km}^2$  of cultivable land (BSADP, 2010, GSADP, 2025). According to the National Population Commission [NPC] (2006); Bauchi State had a population of 4,653,066, with a rate of population growth of (3.5% per annum); Bauchi has a total population of 8.98 million (NBS, 2025). Gombe State; the National Population Commission [NPC] (2006) put the population at 2,365,040, with a rate of population growth of (3.5% per annum), Gombe State has a projected total population of 4,533,000 who are mostly peasants (NBS, 2025). These large population of the States are engaged in crop production, livestock production, mixed farming or specifics among others as their dependable occupation.

### **Sampling Procedure**

A multi-stage sampling technique was used in the selection of respondents. Purposive sampling techniques was used in selecting Bauchi, Gombe and Adamawa States out of the seven States in North eastern Nigeria because of the predominance of irrigated rice farmers in the selected States. The States were further divided into 3 agricultural zones according to the Agricultural Development programmes (BSADP and GSADP) classification. In stage 2, four Local Government Areas (LGAs) were



purposively selected from each State, making a total of 8 LGAs. In stage 3, two wards and 4 villages were randomly selected from each of the selected wards of the LGAs, making a total of 16 wards and 64 villages. Final stage involved a random selection of 12 small scale irrigated rice- based farmers from each of the selected villages in proportion to the size. Thus, making a sample size of 850 small scale irrigated rice-based farmers.

**Method of Data Collection**

Data were collected using structured questionnaires in 2024/25 cropping seasons from 717 farmers out of 850 administered questionnaires recording a default of 133.

The questionnaires were administered by well-trained enumerators. Information was collected on sex, marital status, age, household size, education level, occupation, and income of the farmers, production cost and returns of the farmers before and after the implementation of the fuel subsidy, impact of fuel subsidy removal on livelihood of farmers as well as constraints. The techniques for data analysis adopted included descriptive statistics and budgeting model.

**Model Specification:**

**Net Farm Income (NFI) Model:** The Net Farm Income model was employed to determine the profitability of irrigated-rice production in Bauchi and Gombe States. It is expressed as:

$$NFI = TR - TC \dots\dots\dots 1$$

*Where:*

NFI = Net Farm Income (₦)

TR = Total Revenue (₦)

TC = Total Cost of Production (₦)

The total cost (TC) comprises both variable and fixed costs, given as:

$$TC = TVC + TFC \dots\dots\dots 2$$

*Where:*

TVC = Total Variable Cost (₦)

TFC = Total Fixed Cost (₦)

$$\text{Gross margin} = TR - TVC \dots\dots\dots 3$$

$$\text{Net income} = TR - TC \dots\dots\dots 4$$

$$\text{Rate of Return} = GM/TVC \dots\dots\dots 5$$

**RESULTS AND DISCUSSION**

**Socio-Economic Characteristics of Irrigated Rice Farmers**

Table 1 showed the distribution of the respondents according to sex, marital status, educational level and occupation. The result shows that all (100%) of the respondents were male in Bauchi State while in Gombe State majority (80.28%) of the respondents were male while about 19.72 % were female with majority (73.94% and 65.59%) of the farmers in Gombe and Bauchi being married. The higher proportion male headed households suggests dominance of male gender as household heads in the study area. More so, the males dominate farming activities due to the cultural factors that encourages them to go out to purchase material needs of the family (Akinleye, 2009). Sani *et al.*, (2017) observed that over 90% of the rice farmers in their study were men, indicating that rice production in the region is a male-dominated occupation. It can be seen that most of the respondents were married. The marital status of a person is expected to determine the extent of responsibility of that person and the manner in which he or she will allocate scarce resources at his or her disposal. This implies that majority of the respondents may require high quantity of fuel and hence the effect of subsidy removal on the products demanded for livelihood sustenance. This finding conforms to the findings of Abdulkadir *et al.*, (2020) who found out that majority (69.7% and 61.3%) of his respondents in Borno were male and married. Single households’ holders are more likely to demand less of the fuel energy due to the small size of their dwelling compared to those who are married with many dependents to take care of.

Marital status also plays a significant role in the socio-economic profile of these farmers. The result revealed that about 41.80% of the respondents in Bauchi State had secondary education while about 27.82% of the respondents in Gombe State had tertiary Education. The result is in consonant with



the findings of Mudashir *et al.*, (2025) who reported that about 41% of the rice farmers in Abuja had secondary education.

**Table 1:** Distribution of the Respondents according to Sex, Marital Status, Educational Level and Occupation

Variable	Bauchi State		Gombe State		Pooled	
Sex	Frequency	%	Frequency	Percentage %	Frequency	Percentage %
Male	433	100.00	228	80.28	661	92.19
Female	-	-	56	19.72	56	7.81
Total	433	100	284	100	717	100
<b>Marital status</b>						
Single	149	34.41	45	15.85	194	27.05
Married	284	65.59	210	73.94	494	68.90
Widow/Widower	-	-	18	6.34	18	2.51
Divorce	-	-	11	3.87	11	1.53
Total	433	100	284	100	717	100
<b>Educational level</b>						
No formal education	53	12.24	6	2.11	59	8.22
Koranic education	33	7.62	73	25.70	106	14.78
Adult education			2	0.70	2	0.27
Primary education	43	9.93	51	17.96	94	13.11
Secondary education	181	41.80	73	25.70	254	35.42
Tertiary education	123	28.41	79	27.82	202	28.17
Total	433	100	284	100	717	100
<b>Secondary occupation</b>						
Farming	208	48.03	192	67.61	400	55.78
Trading	90	20.78	49	17.25	139	19.38
Artisans	13	3.00			13	1.81
Civil service	122	28.17	23	8.10	145	20.22
Business			20	7.04	20	2.79
Total	433	100	284	100		

**Source:** Field survey (2025)

The findings agreed with that of Zongoma *et al.*, (2024) who also found that approximately 55.4% of small-scale rice farmers in Bauchi State had completed secondary education, while 19.6% had tertiary education.

The Table further showed the distribution of respondents according to secondary occupation; the result reveals that majority (67.61%) of the respondents in Gombe State and about 48.03% in Bauchi State were farmers. The result also indicates that 28.81% and 8.10% of the respondents in Bauchi and Gombe State considered civil service work as a secondary occupation, respectively.

**Distribution of the Respondents based on Age, Household Size, Farming Experience, Monthly Income, Farm Size before and after Fuel Subsidy Removal in Bauchi and Gombe States**

Results in Table 2 presented the distribution of respondents according to age, household size, farming experience, household monthly income, farm size before and after the fuel subsidy in Bauchi and Gombe States. The results revealed the mean age, mean household size, mean farming experience, mean household head income, farm size before and after the fuel subsidy in Bauchi State as 39 years, 9 persons per household, ₦115, 355.43, 2.8ha and 2.1ha respectively. It also shows the distribution of respondents according to age, household size, farming experience, household monthly income, farm size before and after the fuel subsidy in Gombe State. The results reveal the mean age, mean household size, mean farming experience, mean household head income, farm size before and after the fuel subsidy in Gombe State as 45 years, 15 years, 9 persons per household, ₦ 70, 454.36, 3.7 ha and 2.26 ha respectively. The result agrees with findings of Abdulkadir *et al.*, (2020) who found out



about 41.1% of the respondents in his study in Borno State fell within the age bracket of between 30-39 years, only about 5.6% were 50 years and above. This implies that the respondents are in active age and are engaged in various activities that involve the use of fuel in the study area. The findings also align with Ogunniyi *et al.* (2021), who noted that rice farming in Nigeria is dominated by middle-aged farmers with both energy and experience.

The findings however, go contrary to the findings of Hamidu *et al.*, (2022) and Zongoma *et al.*, (2024) who reported that the average age of meat consumers and small-scale rice farmers in Bauchi State was approximately 40 years with an average household size of 8 persons per household.

**Table 2:** Distribution of Respondents according to Age, Household Size, Farming Experience, Monthly Income, Farm Size before and after Fuel Subsidy Removal in Bauchi and Gombe States

State	Variable	No.	Min	Max	Mean	Std. Dev.
<b>Bauchi</b>	Age	433	20	63.4	38.939	12.448
	Household size	433	3	25	9.021	5.946
	Farming exp. (years)	433	2	27	9.092	6.994
	Monthly Income (₦)	433	41,200	300,000	115,355.43	61,462.918
	Farm size before (ha)	433	1	7	2.849	1.698
	Farm size after (ha)	433	1	4	2.104	1.03
	<b>Gombe State</b>	Age	284	19	72	45.299
Household size		284	0	56	9.132	7.141
Farming exp. (years)		284	3	46	15.114	9.597
Monthly Income (₦)		284	0	300,000	70,454.366	53,039.28
Farm size before (ha)		284	0.5	25	3.716	3.032
Farm size after (ha)		284	0.5	11	2.26	1.527

Source: Field Survey, 2025

**Profitability Analysis of Irrigated Rice Production Before and After Fuel Subsidy Removal in Bauchi State**

Table 3 showed the result of cost and returns on irrigated rice farming before and after the removal of fuel subsidy in Bauchi State. The result reveals the average cost before and after, percentage share of the average cost before and after the removal of fuel subsidy. From the findings, it was discovered that fueling, ploughing and weeding accounted for about 19.76%, 17.83% and 17.20% of the total percentage share of cost before the removal of fuel subsidy by the Federal Government in Bauchi State.

**Table 3.** Costs and Returns of Irrigated Rice Production before and after Fuel Subsidy Removal in Bauchi State (n =433)

A. Variable Inputs	Avg. cost (₦) before	% share of total cost before	Avg. cost (₦) After	% share of total cost After
Land clearing	11,403.7	5.00	17,568.13	5.13
Ploughing	40,652.54	<b>17.83</b>	40,734.41	<b>11.90</b>
Seed	865.681	0.37	1,524.018	0.44
Planting	1,951.095	0.85	4,268.212	1.24
Weeding	39,230.023	<b>17.20</b>	49,286.37	<b>14.40</b>
Herbicide used	2,943.88	1.29	5,498.845	1.60
Herbicide application	3,035.797	1.33	6,587.76	1.92
Pesticide used	887.806	0.38	1,149.076	0.33
Pesticide application	5,503.464	2.41	5,719.861	1.67
Fertilizer used	14,240.88	6.24	39,020.323	<b>11.40</b>
Fertilizer application	9,282.91	4.07	14,880.831	4.35
Thinning	3,786.374	1.66	8,672.517	2.53
Transportation	4,172.697	1.83	5,690.3	1.66
Fueling	45,062.818	<b>19.76</b>	74,866.975	<b>21.88</b>
<b>Total variable cost</b>	<b>183,019.665</b>		<b>275,467.628</b>	
<b>B. Fixed cost</b>				
Land hiring	11,403.695	5.00	17,568.129	5.13
Irrigation pump	19,001.155	8.33	26,434.41	7.72
Maintenance pump	11,989.145	5.25	18,983.834	5.55
Tax	2,551.963	1.11	3,578.522	1.04
		<b>100</b>		<b>100</b>
<b>C. Total fixed cost</b>	<b>44,945.958</b>		<b>66,564.895</b>	
<b>Total Cost (TC)</b>	<b>227,965.623</b>		<b>342,032.523</b>	
<b>D. Revenue</b>				
Rice output in bag of 100kg	<b>50</b>		<b>50</b>	
Unit price/bag	<b>34,712.61</b>		<b>48,843.70</b>	
<b>E. Total Revenue (TR)</b>	<b>1,735,630.3</b>		<b>2,442,184.8</b>	
<b>Gross margin</b>	<b>1,552,610.6</b>		<b>2,166,717.2</b>	
<b>Net income</b>	<b>1,507,664.7</b>		<b>2,100,152.3</b>	
<b>RNI</b>	<b>8.48</b>		<b>7.8</b>	

**Source:** Field survey (2025)

After the introduction of the fuel subsidy removal, the result indicated that cost of fuel, cost of weeding, cost of ploughing and cost of fertilizer accounted for about 21.88%, 14.40%, 11.90% and 11.40% of the total percentage share of variable cost in Bauchi State. The result also revealed the mean total cost, mean total revenue, mean gross margin, mean net income and return per Naira invested before the removal of fuel subsidy in Bauchi State as ₦227, 965.623, ₦ 1,735,630.3, ₦ 1,552,610.6, ₦ 1,507,664.7 and ₦ 8.48 respectively. The result further reveals the mean total cost, mean total revenue, mean gross margin, mean net income and return per Naira invested after the removal of fuel subsidy in Bauchi State as ₦ 342,032.523, ₦ 2,442,184.8, ₦ 2,166,717.2, ₦ 2,100,152.3 and ₦ 7.8 respectively. Based on the findings of the result it was however, discovered that irrigated rice farming was more profitable before the introduction of the fuel subsidy in Bauchi State going by the high rate of returns of the farmers.

#### **Profitability Analysis of Irrigated Rice Production Before and After Fuel Subsidy Removal in Gombe State**

Table 4 showed the result of cost and returns on irrigated rice farming in before and after the removal of fuel subsidy in Gombe State. The result reveals the average cost before and after, percentage share of the average cost before and after the removal of fuel subsidy. From the findings, it is discovered that fueling, ploughing, weeding and fertilizer used accounts for about 17.01%, 15.40%, 14.77% and 11% of the total percentage share of cost before the removal of fuel subsidy by the Federal Government

in Gombe State. After the introduction of the fuel subsidy removal, the result indicated that cost of fuel, cost of fertilizer used, cost of thinning and cost of planting accounted for about 21.30%, 14.25%, 11.10% and 10.62% of the total percentage share of cost in Gombe State. The result also reveals the mean total cost, mean total revenue, mean gross margin, mean net income and return per Naira invested before the removal of fuel subsidy in Gombe State as ₦ 177,716.51, ₦ 1,800,000, ₦ 1,667,229.43, ₦ 1,622,283.49 and ₦ 12.55 respectively. The result further reveals the mean total cost, mean total revenue, mean gross margin, mean net income and return per Naira invested after the removal of fuel subsidy in Gombe State as ₦ 491,203.77, ₦ 2,750,000, ₦ 2,367,269.16, ₦ 2,258,796.23 and ₦ 6.18 respectively. Based on the findings of the result it was discovered that irrigated rice farming was more profitable before the introduction of the fuel subsidy in Gombe State going by the high rate of returns of the farmers.

**Table 4.** Costs and Returns of Irrigated Rice Production before and after Fuel Subsidy Removal in Gombe State (n =284)

A.	Variable Input	Avg. Variable cost (₦) before	% share of total variable cost before	Avg. Variable cost (₦) After	% share of total variable cost After
	Land clearing	7,630.25	4.3	12,132.126	2.46
	Ploughing	27,361.31	15.40	24,960.179	5.08
	Seed	580.47	0.32	12,679.423	2.58
	Planting	1,316.35	0.74	52,182.476	10.62
	Weeding	26,256.56	14.77	16,462.256	3.35
	Herbicide used	1,976.10	1.11	28,997.759	5.90
	Herbicide application	2,041.89	1.14	26,381.321	5.37
	Pesticide used	593.79	0.33	6,674.845	1.35
	Pesticide application	3,669.32	2.06	9,635.563	1.96
	Fertilizer used	19,553.00	11	70,037.83	14.25
	Fertilizer application	6,219.55	3.50	14,729.672	3.00
	Thinning	2,545.10	1.43	54,558.249	11.10
	Transportation	2,810.09	1.58	18,670.311	3.80
	Fueling	30,236.79	17.01	104,666.67	21.30
B.	Total variable cost	132,770.57		382,730.844	
C.	Fixed cost				
	Land hiring	11,403.695	6.41	38,595.984	7.85
	Irrigation pump	19,001.155	10.70	42,029.794	8.55
	Maintenance pump	11,989.145	6.74	19,196.331	3.90
	Tax	2,551.963	1.43	8,650.822	1.76
			100		100
D.	Total fixed cost	44,945.94		108,472.931	
	Total Cost (TC)	177,716.51		491,203.77	
E.	Revenue				
	Output harvested		40 bags		50 bags
(bags)	Price/100kg bag		45,000		55,000
F.	Total Revenue (TR)		1,800,000		2,750,000
	Gross margin		1,667,229.43		2,367,269.16
	Net income		1,622,283.49		2,258,796.23
	RNI		12.55		6.18

**Source:** Field survey (2025)

### **Impact of Fuel Subsidy Removal on Household's Livelihood of Irrigated Rice Farmers in Bauchi and Gombe States**

Table 5 showed the impact of fuel subsidy removal on household's livelihood of irrigated rice farmers in Bauchi and Gombe State. The result revealed that majority (89.4% and 61.43%) of the



respondents in Gombe and Bauchi strongly agreed that fuel subsidy removal did not lead to increase in the cost of irrigation pump. The result also showed that majority (81.62% and 52.88%) of the respondents in Gombe and Bauchi States strongly agreed that increased cost of fuel had affected their household livelihood. They affirmed that their savings decreased as fuel subsidy was removed. This indicates that subsidy removal has been an additional liability to respondents in terms of reduction in the level of their savings. This could be as a result of shock that emanated from subsidy removal that has direct connection with income and savings. Saving as one of the households' livelihood components has been negatively affected as most of the respondents have experienced reduction in their savings caused by a fall in the disposable income. Price level generally increased leading to inflation, which invariably affects disposable income. The majority (75.26% and 52.88%) of the respondents in Gombe and Bauchi did not agree that they experienced a decrease in rice output as a result of fuel subsidy removal. However, (73.44%) of the respondents in Bauchi State strongly agree that fuel subsidy removal brought about increased cost of rice production as result of high cost of inputs with (71.82%) agreeing that fuel subsidy removal brought about the availability of agricultural inputs. The findings from Gombe State however, suggested that majority (65.72%) of the respondents did not agree that fuel subsidy removal brought about increased cost of rice production in the study area. The findings further showed that majority (70.20%, 68.55% 64.89% and 66.43%) of respondents in Bauchi and Gombe States strongly agreed that subsidy removal had negatively affected their livelihood by bringing about high cost of transportation and increase in the price of basic food stuff. The study discovered that increase in fuel pump price has an adverse effect on the standard of living of the people, since fuel is essential for the transportation of major Nigerian commodities, such as agricultural produce and other market products. This significant impact of the upsurge of petroleum pump price on the price of goods and transport initiated this study.



**Table 5:** Impact of Fuel Subsidy Removal on Livelihood of Irrigated Rice Farmers in Bauchi and Gombe States

Effects	*Bauchi				*Gombe				
	SA	A	DA	SD	SA	A	DA	SD	UD
Increased cost of irrigation			167(38.56)	266(61.43)		2(0.70)	26(0.70)	253(89.40)	2(0.70)
Increased cost of fueling	229(52.88)		204(47.11)		231(81.62)	4(1.41)	44(15.54)	2(0.70)	3(1.06)
Reduced rice farm output		104(24.01)	229(52.88)	100(23.09)	2(0.70)	13(4.60)	213(75.26)	53(22.47)	3(1.06)
Increased overall cost of production	318(73.44)	79(18.24)	36(8.31)		3(0.06)	6(2.12)	186(65.72)	3(1.06)	86(30.38)
Brings about the availability of agricultural inputs		311(71.82)	122(28.17)		117(41.34)	3(1.06)	12(4.24)	21(7.42)	131(46.28)
Brings about high cost of transportation	304(70.20)	44(10.16)		85(19.63)	194(68.55)	5(1.76)	3(1.06)	82(28.97)	
Increase in the price of basic food stuffs	281(64.89)	110(24.40)	42(9.70)		188(66.43)	76(2685)	11(3.88)	6(2.12)	3(1.06)

**Source:** Field survey (2025)

\*Multiple Response



**Constraints to Irrigated based - Rice Farming**

The result in Table 6 showed the distribution of respondents according to constraints faced by irrigated based – rice farmers after the removal of fuel subsidy in Bauchi and Gombe States. The results revealed that 41.9% of the respondents reported high cost of fertilizer as the major constraint to irrigated rice production in Gombe State, while price volatility (27.01%), high fuel cost (26.10%) and low price of rice (24.48%) as the most severe constraints to irrigated rice farming in Bauchi State. Other constraints identified by the farmers were high transportation cost (17.78%), lack of adequate fund and late water withdrawal from site (11.97 %). The findings agreed with Oladimeji *et al.*, (2020) who found that increased fuel prices led to higher transportation costs, which in turn raised the prices of agricultural inputs like seeds and fertilizers in Kaduna State. Okoro *et al.* (2022) found that small-scale irrigated rice farmers in Northern Nigeria experienced a significant decline in productivity, primarily due to reduced access to affordable fuel necessary for irrigation equipment operation. Moreover, the higher cost of fuel constrained farmers' ability to purchase other essential inputs such as fertilizers and agrochemicals, exacerbating yield declines (Adebayo & Oladipo, 2020).

**Table 6:** Distribution of Respondents according to Constraint to Irrigated based - Rice Farming in Bauchi and Gombe States

Constraint	Bauchi		Gombe		Pooled	
	Freq..	%	Freq.	%	Freq.	%
High fuel cost	113	26.0	28	9.86	11	19.66
low price of rice	106	24.8	20	7.04	126	17.57
high cost of irrigation pumps	20	4.62	-	-	20	2.79
high transportation cost	77	17.78	-	-	77	10.73
price volatility	117	27.2	-	-	117	16.31
High cost of fertilizer	-	-	119	41.90	119	16.60
lack of adequate fund	-	-	34	11.97	34	4.74
late water withdrawal from site	-	-	34	11.97	34	4.74
lack of farm implement	-	-	11	3.87	11	1.53
High cost of labor	-	-	38	13.38	38	5.30
Total	433	100	284	100	717	100

Source: Field Survey, (2025)

**CONCLUSION AND RECOMMENDATIONS**

It was evident from the findings of this study that irrigated rice farming was profitable before and after the introduction of the fuel subsidy in Bauchi and Gombe States going by the high rate of returns of the farmers. That respondents in Bauchi and Gombe States strongly agreed that subsidy removal had negatively affected their livelihood by bringing about high cost of transportation and increase in the price of basic food stuff. However, it was discovered that the constraints to irrigated rice farming were high cost of fertilizer, high fuel cost, and low price of paddy rice. High transportation cost and lack of adequate fund are also constraints faced by the farmers in the study. Based on the findings of this study, it is therefore recommended that the alternative irrigation systems such as solar powered irrigation systems should be encouraged, providing subsidy to farmers particularly on fertilizer and other inputs by the federal government as well as discouraging the importation of rice into the country to encourage local production.

**REFERENCES**

Abdulkadir, B. M., Funmilola, F. A and Abdulkabir, N. A. (2020) Assessment of Impact of Fuel Subsidy Removal on Socio-economic Characteristics: A Survey of Households in Maiduguri, Borno State, Nigeria. *Journal of Business and Economic Development*. **5**(1): 10-20.

Adebayo, T., & Oladipo, A. (2020). Impact of rising fuel prices on smallholder rice farmers in Nigeria. *International Journal of Agricultural Research*, **15**(3): 198–210.

Adikwu, O., Ochimana, G.A., and Babafemi, P.A. (2025). Economic Assessment of Yam Production Before and After Fuel Subsidy Removal in Okpokwu Local Government of Benue State,



- Nigeria. *Sahel Journal of Life Sciences FUDMA*, 3(1): 1-7. DOI: 10.33003/sajols-2025-0301-01.
- Akinyemi, O., Alege, P. O., Ajayi, O. O., Adediran, O. S., & Urhie, E. (2017). A simulation of the removal of fuel subsidy and the performance of the agricultural sector in Nigeria using a dynamic computable general equilibrium approach. *Covenant Journal of Business and Social Sciences*, 11(2): 207-224.
- Bauchi State Agricultural Development Programme (2010) BSAD Annual Crop Production Report Pp 4 – 5.
- Gwandi, O., Kamalvanshi, V and Samuel, J. (2023). Cost and Returns Analysis of Maize (*Zea Mays* L) Production in Adamawa State, Nigeria. *Asian Journal of Agriculture and food Sciences*, 11(1): 24-37.
- Hamidu, B., I. Mohammed, M. H. Sani. I. M. Abdullahi and M. Joseph (2022). Analysis of Beef, Mutton and Chicken Demand in Bauchi State, Nigeria. *Nigerian Journal of Agriculture and Agricultural Technology (NJAAT)* 2(2): 91- 103.
- Nuhu, R. (2023). Comparative Analysis of Fuel Subsidy Removal and the Diversification Policies for Agricultural Development in Nigeria. *International Journal of Science, Engineering and Technology*, 11(5): 1-18.
- Mudashir, A. Olaitan., Beatrice, I. O., Joseph. B., Funso, O. A. and Sennuga, S. O. (2025) Economics of Rice Production and its Effect on Household Food Security Status in Abaji Area Council of Abuja, Nigeria. *International Journal Environmental and Agriculture Research (IJOEAR)* 11(10): 1-14.
- Luis, C. (2012). Energy Supply for Sustainable Rural Livelihood, *A Multi Criteria Decision-Support System*. (44): 1. 79.
- NPC (2006). *Post Enumeration Survey*. National Population Commission, Wuse, FCT, Abuja, Nigeria
- Nwoko, I. C., Aye, G. C., & Asogwa, B. C. (2016). Effect of oil price on Nigeria's food price volatility. *Cogent Food & Agriculture*, 2(1): 230-241.
- Ochimana, G.A., Adikwu, O., and Aernyi, M.T. (2025). Effects of Fuel Subsidy Removal on Rural Farmers Production in Kwande Local Government Area, Benue State, Nigeria. *Advance Journal of Agriculture and Ecology*, 10(2):21-30. DOI: <https://aspjournals.org/Journals/index.php/ajae/article/view/994>.
- Ogunniyi, L. T., Ojo, O. T., & Ayinde, O. E. (2021). Economics of rice production and food security among smallholder farmers in Nigeria. *Nigerian Journal of Agricultural Economics*, 11(1): 120-135.
- Oladimeji, Y. U., Aminu, R., & Aminu, Z. (2020). Effect of transaction costs on rice production output and fuel hike nexus in Kaduna State, Nigeria. *Agricultural Economics and Extension Research Studies (AGEERS)*, 8(1): 45-53.
- Okoro, E., Chukwu, J., & Nwosu, K. (2022). Fuel price shocks and irrigation farming productivity: Evidence from northern Nigeria. *Journal of Development Studies*, 18(5): 75–89.
- Remy, U. (2012). The Impact of Fuel Subsidy Removal on Socioeconomic Development. *Journals of Economics, Commerce and Management*, 1(2):78-90.
- Sani, R. M., Malumfashi, A. I., Daneji, M. I., & Alao, O. O. (2017). Economics of rice production: A case study of Bauchi LGA, Bauchi State. *Continental Journal of Agricultural Economics*, 7: 7–13.
- Yahaya, A. A., Hassan, S.A., Usman, A. M., Mohammed, I., and Yisa, E. (2025). Development of a Mathematical Model to Analyze the Impact of Fuel Subsidy on Rice Production in Niger State, Nigeria. *International Journal of Research and Innovation in Applied Science (IJRIAS)*, 10(1): 145-151. DOI: 10.51584/IJRIAS.2025.1001012.
- Zongoma, B., Gaya, H. I. M., Hassan, B. K., & Bala, H. (2024). Economics of rice production in selected LGAs of Bauchi State, Nigeria. *Journal of Agripreneurship and Sustainable Development*, 7(2): 30–36.