



COSTS AND RETURN OF *FARO-44* RICE FARMERS' BENEFICIARIES OF THE FADAMA III ADDITIONAL FINANCE II IN TARABA STATE, NIGERIA

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ABSTRACT

The study was carried out to analyse the costs and return of *faro-44* rice farmers' beneficiaries of the *fadama* III additional finance II in Taraba State, Nigeria. Multi-stage sampling procedure was used to select the 500 respondents. Data were analyzed using descriptive statistics (mean, percentages and tables) and inferential statistics (farm budget techniques or cost-benefit analysis). The findings showed that in wet cropping season, average labour cost of ploughing and harrowing was ₦23,600.23 (11.84%) with t-value of 7.1268 and significant at $P \leq 0.01$. In dry and wet cropping season, cost of land clearing was ₦32,500.33 (13.18%) and ₦17,500.00 (8.78%) with t-value of 3.4534 significant at $P \leq 0.01$. Cost of planting, harvesting, threshing, winnowing, bagging and were significant at $P \leq 0.01$ with their corresponding t-values of 3.5407; 5.9132; 4.4771; 3.5463 and 5.4935, respectively. In dry season, the respondents realized ₦1,569,780.00 as total revenue from 6,156 kg of paddy rice produced compared to ₦696,795.00 as total revenue in wet season. Similarly, sale of rice straws yielded total value of ₦108,800.00 in dry season compared to ₦29,200.00 in wet season. The respondents consumed 372 bags more rice in wet season valued at ₦61,380.00 compared to 164 bags in dry season valued at ₦41,820.00. The results further disclosed that dry season *faro-44* rice farmers incurred total cost of ₦304,738.91 compared to wet season total cost of ₦225,840.33. Realizable revenue of ₦1,720,400.00 in dry season and ₦787,375.00 in wet season with net farm income of ₦1,415,661.09 and ₦561,534.67 in dry and wet seasons, respectively. With profit index of 5.74 and 2.82 in dry and wet seasons, respectively, the *faro-44* rice farmers realized more profits in dry season as it is also glaring from the rate of returns on investment (RRI) of 4.65 (dry season) and 2.49 RRI in wet season. These results indicated that *faro-44* rice farming is profitable in Taraba State meaning that for every ₦1 invested in *faro-44* rice production, the farmers realized ₦4.65 and ₦2.49 in dry and wet seasons, respectively. The study concluded that *faro-44* rice productivity is profitable in Taraba State; and that ploughing and harrowing was major on-farm rice activity carried out in wet season while land clearing was majorly an activity of dry season. It was recommended that *faro-44* rice farmers in Taraba State should be given more cash-for-work supports; advisory services; supports for non-farm activities and capacity building on agribusiness, enterprise of farmers' choice, record keeping.

Keywords: Costs components, Profit index, Return on investment, Sampling, Taraba.

INTRODUCTION

Rice has been an important staple food crop in Nigeria virtually consumed daily by households. In Nigeria, rice is one of the few food items whose consumption has no cultural, religious, ethnic, or geographical boundary. It is available in five-star hotels in the big cities and towns as well as in the remotest villages throughout the country. It is highly priced and widely accepted for festivities (Omofonmwan and Kadiri, 2012).

Banseka (2015) reported that most farmers are in dire need of farm inputs, but, very often, the inputs are not available to them. The farmers in some circumstances are not aware of the advantage of using these farm inputs. This could also be attributed to weak linkage between farmers, extension agent, research institutes and market forces.

According to NFCO (2018) documents, the *Fadama* III AF II provided support for restoration of agricultural production activities through provision of starter packages to affected households, including required agricultural inputs and on-farm and post-harvest productive assets, which supported economic opportunities with specific focus on women and youth. It also financed the related advisory and extension services; including provision of food assistance to cope with the lean period while awaiting the first harvest, rehabilitation and investment on rural infrastructure (fences, markets, post-harvest equipment, storage facilities including aggregation centers, production of pens and houses for livestock, rural network of roads); this was done through cash-for-work approach to dispense cash in exchange for labor and participation in construction of community infrastructure, social mobilization and capacity building of farmers and local communities through the locally based indigenous organizations through training, peer learning and mentoring by more established organizations. The conceptual framework of *faro-44* rice productivity enhancement variables is presented in Figure 1.

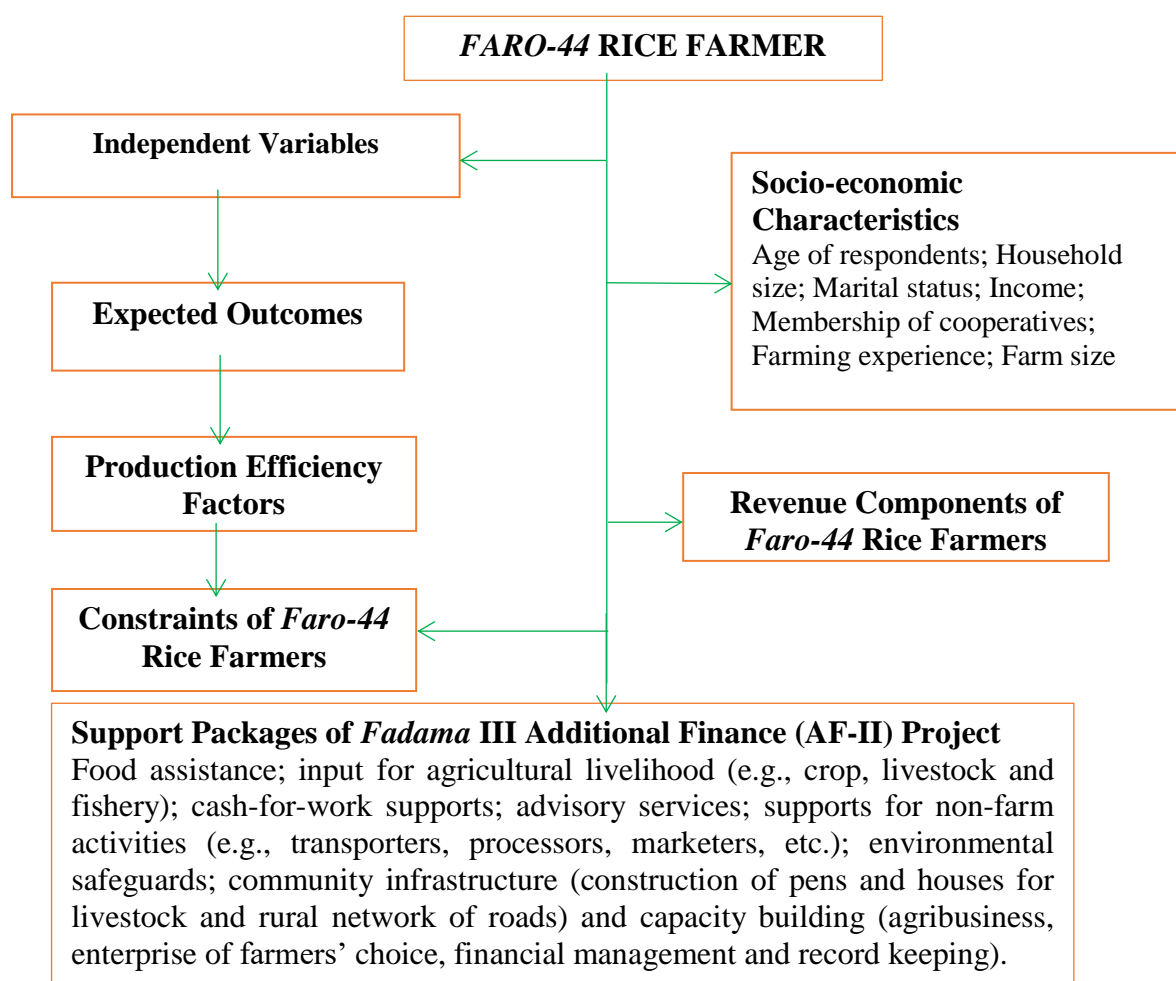


Figure 1: *Faro-44* rice productivity enhancement variables

Source: Reconnaissance survey (2022)



For optimal rice production in Nigeria to guarantee self-sufficiency, there is need for its increasing mechanization rate from 0.3 hp/ha to 0.8 hp/ha in the next 5 years, which can double rice production to 7.2 million tonnes. To achieve this, we estimate that Nigeria will need to at least triple its current stock of machinery over the same period. In addition to raising production, adequately increasing mechanization has the capacity to raise yields, increase labour productivity, reduce post-harvest losses, increase income generated by farmers and deepen import substitution to the extent that import bill, rice production and cultural heritage jointly explain 89% of heterogeneity (WARDA, 2019). The findings of Ereinstein *et al.* (2004) and Duvvuru and Mature (2013) shows that rice production is labour intensive and relies on a significant usage of paid labour in most cases.

Ayedun and Adeniyi (2019) disclosed in their studies disclosed that under gross margin analysis (GM), mono-cropping was a more profitable investment than intercropping. The result shows that all other things being equal, planting of improved rice variety increased rice output by 18% and that enterprises with improved rice seed adoption had the highest profitability (GM) and Benefit: Cost ratio compared to other farming enterprises. In general, yield is small (<2000 kg) despite the fact that farmers relatively had and used basic inputs and practices [improved seeds (43%), herbicides (80%), insecticides (85%), fertilizers (70%), mono-cropping (95%), literacy (65%), irrigation (0.5%) tractor (8%)] yet output is low. The study recommends the need to strengthen awareness as awareness on improve seed variety was only 57%, assist farmers to procure land hectare that will encourage commercial farming, promote the use of tractor as regression's result shows that 1 hour usage of tractor on rice field will increase output by 82%, keep encouraging mono-cropping and make irrigation facilities available in the rice production area since only 0.5% practiced irrigation; these will improve rice productivity. There are platforms: agricultural (32%), trading (25%) and credit (8%) associations through which government, non-governmental organization can come in and assist.

Labour alone accounted for more than 50% of the total variable cost meaning that swamp rice production was highly labour intensive. The gross margin per hectare was ₦56740.60. The gross margin per Naira invested (gross margin divided by total variable cost) in the swap rice production was ₦0.97. The coefficient of variation of revenue and total variable cost was found to be 53.16% and 73.30% which implies high level of variability in revenue and total variable cost among swamp rice farmers in the study area (Angulu, 2012).

Ben-Chendo *et al.* (2017) disclosed an average variable cost rice farming incurred per hectare of \$866.3 (₦172,400) while the total cost of production was put at \$1002 (₦199,400) and a gross revenue of \$1768.84 (₦352,000). Paddy rice production in the study area was estimated to have a gross profit \$902.51 (₦179,600) and a net return of \$766.83 (₦152,600). The benefit cost ratio amounted to 1.77; which implies that for every ₦1 in costs, the farmer can expect a benefit of ₦1.77 while the gross margin ratio was estimated to be 0.51. This result implies that for every ₦1 generated in sales of paddy rice, the farmer has ₦0.51 left over to cover basic operating costs and profit. Ben-Chendo *et al.* (2017) in a study on cost and returns of paddy rice production in Kaduna State, reported that as a result of increasing population growth and urbanization, there is a high and increasing demand for rice, this necessitates the high attention for its production.

The findings of this study in addition to contributing to the body of literature on the production function of *faro-44* rice farmers in *fadama* III additional finance (AF-II) project would be of benefit to the Government, policy makers, funding agencies, lecturers/future researchers, and students.



MATERIALS AND METHODS

The Study Area

Taraba State lies between Latitude 8°30" North and 9°30" North of the Equator and Longitude 8°30" East and 10°30" East of the Greenwich meridian. The State covers landmass of 14,099km². The State had 2,300,736 people (National Population Commission [NPC], 2006) and a projected 3,552,344 people as at 2023 based on 3.2% annual population growth of the State. The State has annual rainfall of between 1,000 mm to 1,250 mm and maximum temperature ranges of between 21.1⁰C to 26.7⁰C. The mean annual rainfall ranges from 800mm to over 1800mm in the southern Taraba. The State shares boundary with Nasarawa and Plateau State to the North-west, Benue State to the South-west and Republic of Cameroun to the Southeast (Taraba Agricultural Development Programme [TADP], 2010; TADP, 2019). The zone has a tropical climate marked by dry and rainy seasons. The rainy season starts in April and ends in October. The wettest months are August and September. The dry season starts in November and ends in April. The mean minimum daily temperature recorded is 14.8°C and the mean maximum daily temperature recorded is 34.4°C (TADP, 2010). The vegetation of the zone is Guinea savannah type. The study area is predominantly agrarian with about 80% of its inhabitants depending on subsistence agriculture practices mainly in food and cash crops like rice, cassava, yams, benni seed and maize (TADP, 2010; TADP, 2019).

The vegetation of Taraba State is the Guinea Savannah type with the State being predominantly agrarian and some of the major crop produced are cassava, yam, maize, rice, soybeans, oil palm, cocoa, coffee, mangoes, citrus, and banana, dry season production of maize, rice sugarcane and vegetable. Other economic activities include: livestock rearing, fishing, trading and tailoring. Taraba State (Figure 1) is predominantly agrarian in nature with about 50% of its inhabitants depending on subsistence agricultural practices mainly in food crops. The soil type in the study area was predominantly alluvial and sandy light loamy soil with occasional laterite out-grouped here and there. There are rugged hills and mountains with fertile plains and valleys intervening within the northern part of the local government area (Taraba State Government (2015). The ethnic groups include: Chambas, Mambilas, Mumuyes, Jukuns, Wukums, Fulani, Jenjo and the Tivs among others (Taraba diary, 2014). TADP (2019) revealed that as at 2019, the number of farm families in Taraba State was 230, 000 and is projected 0.5% annual growth to be 1,265,000 as at 2021 (Taraba diary, 2014). The index map of Taraba State showing locations of sampled areas is presented in Figure 1.

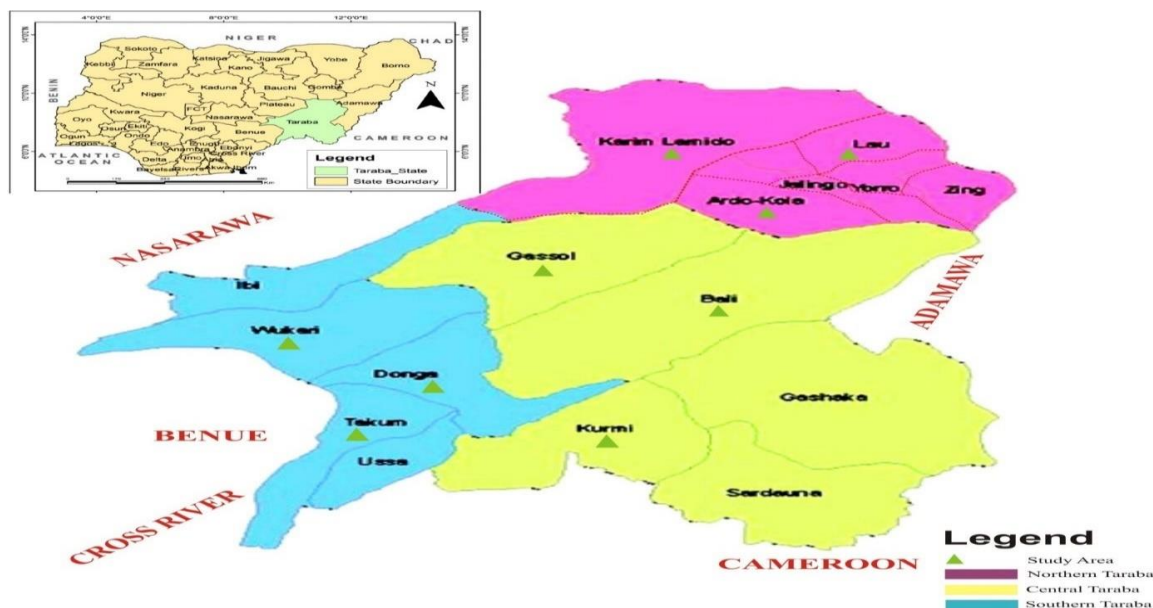


Figure 2: Map of Taraba State showing study areas

Source: Department of Survey and Geoinformatics, ATBU, Bauchi, 2021

Sampling Procedure and Sample Size

A sample size of 500 out of 5,000 sample frames was used for this study. Multi-stage random sampling procedure was used in the selection of Local Government Areas (LGAs) and *fadama* Community Associations (FCAs) of the beneficiary farmers of the *fadama* III additional finance II (AF-II) project from the study area. In stage one, three LGAs were randomly selected from each of the three Agricultural zones (Northern Taraba, Central Taraba and Southern Taraba) making a total of nine LGAs that participated in the project. In stage two, 22 FCAs (communities) based on their wards were randomly selected from the nine selected LGAs. In stage three, purposive sampling technique was used to select the 500 beneficiary farmers from the study area as presented in Table 1. In the final stage, from the selected FUGs (communities) at the districts and wards level, 10% of 5,020 registered farmers (sample frame) with *fadama* III AF-II project in each ward were randomly selected making 500 sample size for the study as presented in Table 1. This is in line with Eboh (2009) who proposed 10% for 2000-5000 sampling frame in social science research.



Table 1: Sample size selection procedure of the study

LGA	District	Ward	Sample frame	Sample size (10% of sampling frame)
Northern Taraba:				
Ardo Kola	Ardo Kola	Ardo Kola	191	19
		Mayorenewo	25	3
		Mayorenewo	92	9
		Tau	92	9
Karim Lamido	Sunkani	Mallum	30	3
	Bachama	Darofoi	585	59
		Kwanchi	177	18
	Wurkum	Jen Ardido	176	18
		Karim A	600	60
		Karim B	520	52
Lau	Garin Dogo	Garin Dogo	222	22
	Lau A	Lau A	388	39
	Lau B	Lau B	130	13
	Mayo Lope	Mayo Lope	105	11
Sub-total			3,333	335
Central Taraba:				
Bali	Bakundi	1. Bali A	120	12
		2. Bali B	75	8
		3. Maihula	100	10
Gassol	Gassol	Gassol	245	25
	Mutum Biyu	Mutum Biyu	420	42
		Namnai	180	18
		Sansani	60	6
Kurmi	Abong	Ashuku/Eneme	40	4
		Asha	60	6
	Ndaforo	Ndaforo	25	3
Sub-total			1,325	134
Southern Taraba:				
Donga	Akate	Akate	40	4
	Benye	Asibiti	10	1
	Donga	Mararraba	52	5
	Nyita	Nyita	25	3
Takum	Chanchaji	Chanchaji	40	4
		Dutse	10	1
		Kuru	45	5
Wukari	Nwonko	Bantaje	45	5
	Tsokundi	Tsokundi	75	8
Sub-total			342	36
Grand total			5,000	500

Source: Field data (2022)



Method of Data Collection

Primary data were collected from 500 using structured questionnaire and interview schedule with the aid of properly trained enumerators to generate data for the study in 2021. Information collected was on the costs and return components of the *faro-44* rice farmers under *fadama* III additional finance II project.

Method of Data Analysis

Data were analyzed using descriptive statistics (mean, percentages and tables) and inferential statistics (farm budget techniques or cost-benefit analysis). The mean scores specified as:

$$\text{Mean score} = \frac{(f_1x_1 + f_2x_2 + f_3x_3 + f_4x_4)}{(f_1 + f_2 + f_3 + f_4)} \quad \dots(1)$$

where;

$F_1 \dots f_4$ = total frequency for each category of item.

$x_1 \dots x_4$ = observed variables.

Farm budget techniques used involves the use of gross margin analysis to achieve objective of the study. The gross margin is the difference between gross farm income and the total variable cost of production (Olukosi and Erhabor, 2013; Sani, 2015). The choice of gross margin analysis in this study was based on the fact that fixed costs components are negligible in rice production in the study area. This is specified as:

$$GM = GI - TVC \quad \dots(2)$$

$$NFI = TGM - TFC \quad \dots(3)$$

where;

GM = Gross margin (Naira/ha)

TVC = Total variable cost/ha

TGM = Total gross margin (Naira/ha)

TFC = Total fixed cost (Naira/ha).

Total variable costs (TVC) of any enterprise include components like total cost of labour, herbicides, fertilizer, and seedlings. The total fixed cost includes the depreciation on fixed cost items like building, irrigation equipment and the cost of renting land. The budgetary technique used was the gross margin analysis as well as the net farm income models are specified as:

$$NFI = GM - TFC \quad \dots(4)$$

where;

NFI = Net farm income.

GM = Gross margin.

TFC = Total fixed cost.

Net farm income can also be expressed by the equation form as:

$$NFI = \sum_{i=1}^n P_{yi} Y_i - \sum_{j=1}^n P_{xj} Y_{ij} - \sum_{k=1}^k F_k \quad \dots(5)$$

where;

Y_i = Enterprise's product

P_{yi} = Unit price of the product

X_j = Quantity of the variable inputs

P_{xj} = Price per unit of variable inputs.

F_k = Cost of fixed inputs

\sum = Summation (addition) sign.



To determine the gross margin of the rice farmers in the study area, the costs and revenue components were given with their unit of measurement. The costs components used include labour (man days), seeds (kg), fertilizers (kg), land size (ha), weeding (herbicides/liters) and transportation (distance to farm). The revenue components include sales of the paddy and rice straw.

RESULTS AND DISCUSSION

Average Costs of Labour Per Hectare of *Faro-44* Rice Production

Table 2 shows the average cost of labour per hectare of *faro-44* rice production (man-days) in Taraba State, Nigeria. The results show that in wet cropping season, average labour cost of ploughing and harrowing was ₦23,600.23 (11.84%) with t-value of 7.1268 significant at $P \leq 0.01$ implying that ploughing and harrowing are the major on-farm rice activity carried out in wet season. Table 2 shows that in dry and wet cropping season, cost of land clearing was ₦32,500.33 (13.18%) and ₦17,500.00 (8.78%) with t-value of 3.4534 significant at $P \leq 0.01$ implying that land clearing is majorly an activity of dry season. Also, cost of planting, harvesting, threshing, winnowing, bagging and were significant at $P \leq 0.01$ with their corresponding t-values of 3.5407; 5.9132; 4.4771; 3.5463 and 5.4935, respectively. Cost of weeding and fertilizer application with t-values of 2.2423 and 2.2627 are significant at $P \leq 0.05$, respectively. Loading and off-loading with t-value of 1.9508 and transportation cost have t-value of 1.8165 and both significant at $P \leq 0.1$. Average cost of insecticide application (dry season = ₦1,300.26; wet season = ₦1,300.45) and herbicides application (dry season = ₦3,800.53; wet season = ₦4,000.33) were not significant. in Table 2, out of the 13 explanatory cost variables, 11 were significant, thus, totaling cost in dry season (₦246,596.55) and wet season (₦199,296.33) significant at $P \leq 0.05$. the implication of this findings is that as the *faro-44* rice farmers in Taraba State income increases there is likelihood for a positive and significant improvement in farm production technologies adoption.

Table 2: Average cost of labour per hectare (man-days) of *faro-44* rice production (n = 500)

Farm operations	Dry season		Wet season		T-test
	Cost (₦)	Percentage	Cost (₦)	Percentage	
Cost of land clearing	32,500.33	13.18	17,500.00	8.78	3.4534***
Ploughing and harrowing	-	-	23,600.23	11.84	7.1268***
Planting	40,700.72	16.50	10,500.72	5.27	3.5407***
Weeding	25,900.14	10.50	33,100.50	16.61	2.2423**
Fertilizer application	13,900.20	5.64	19,500.89	9.78	2.2627**
Insecticide application	1,300.26	0.53	1,300.45	0.65	0.9499 ^{NS}
Herbicides application	3,800.53	1.54	4,000.33	2.01	0.7328 ^{NS}
Harvesting	27,700.94	11.23	30,500.97	15.30	5.9132***
Threshing	31,200.07	12.65	17,400.26	8.73	4.4771***
Winnowing	21,900.97	8.88	10,800.41	5.42	3.5463***
Bagging	16,700.66	6.77	10,600.91	5.32	5.4935***
Loading and off-loading	12,400.42	5.03	9,907.53	4.97	1.9508*
Transportation	18,591.31	7.54	10,583.13	5.31	1.8165*
Total	246,596.55	100.00	199,296.33	100.00	2.7367**

Note: *, ** and *** significant at 10%; 5% and 1%, respectively, and NS = Not significant.

Source: Field survey, 2022



Average Revenue from *Faro-44* Rice Production in Taraba State

The return realized from farm operations is referred to as revenue which is the product of *faro-44* rice output and price. Table 3 reveals the results of the average revenue from *faro-44* rice production per ha. In dry season, the respondents realized ₦1,569,780.00 (₦3,139.56/farmer) as average revenue from 6,156 kg of paddy rice produced compared to 4,223 kg at ₦696,795.00 (₦1,393.59/farmer) as average revenue in wet season. Similarly, sale of rice straws yielded total value of ₦108,800.00 (₦217.60/farmer) in dry season compared to ₦29,200.00 (₦58.40/farmer) in wet season. Furthermore, the respondents consumed 372 bags more rice in wet season valued at ₦61,380.00 (₦122.6/farmer) compared to 164 bags in dry season valued at ₦41,820.00 (₦83.64/farmer). The implication of these results is that *faro-44* rice production in Taraba State was profitable in both dry and wet seasons which is an indication of food security contributing to enhanced farmers welfare. This is in agreement with Ben-Chendo *et al.* (2017) reported that for every ₦1 generated in sales of paddy rice, the farmer has ₦0.51 left over to cover basic operating costs and profit.

Table 3: Average revenue from *faro-44* rice production per ha in dry and wet season (n = 500)

Item	Quantity (kg)	Unit price (₦)	Average value (₦)
Dry paddy rice (kg)	6,156	255.21	3,139.56
Wet paddy rice (kg)	4,223	165.54	1,393.59
Dry sales of straws (bags)	128	850.00	217.60
Wet sales of straws (bags)	73	400.00	58.40
Dry rice consumed (bags)	164	255.21	83.64
Wet rice consumed (bags)	372	165.54	122.6

Average Costs and Return/per Hectare for *Faro-44* Rice Farmers in Taraba State

This section presents the results of the average costs and return/per hectare for *faro-44* rice farmers in Taraba State, Nigeria. Table 4 shows that dry season *faro-44* rice farmers incurred average total cost of ₦304,738.91 compared to wet season total cost of ₦225,840.33. Realizable revenue of ₦1,720,400.00 in dry season and ₦787,375.00 in wet season with net farm income of ₦1,415,661.09 and ₦561,534.67 in dry and wet seasons, respectively. With profit index of 5.74 and 2.82 in dry and wet seasons, respectively, the *faro-44* rice farmers realized more profits in dry season as it is also glaring from the rate of returns on investment (RRI) of 4.65 (dry season) and 2.49 RRI in wet season. These results indicate that *faro-44* rice farming is profitable meaning that for every ₦1 invested in *faro-44* rice production in the study area, the farmers realized ₦4.65 and ₦2.49 in dry and wet seasons, respectively. This finding is in agreement with Ben-Chendo *et al.* (2017) that for every ₦1 invested in paddy rice, the farmer obtains ₦0.51 as returns on investment. The implications of these finding in Table 4 were that *faro-44* rice farmers in Taraba State can produce in both wet and dry season and break-even or make more profit in order to support their livelihood and food security.



Table 4: Average costs and return/per hectare for *faro-44* rice farmers

Item	Dry season (n = 250)		Wet season (n = 250)	
	Value (₦)	Percentage	Value (₦)	Percentage
Total variable cost	246,596.55	80.92	199,296.33	88.25
Total fixed cost	58,142.36	19.08	26,544	11.75
Total cost (A)	304,738.91	100.00	225,840.33	100.00
Revenue (B)	1,720,400.00		787,375.00	
Net farm income C = (B-A)	1,415,661.09		561,534.67	
Profit index = C/TVC	5.74		2.82	
RRI = C/A	4.65		2.49	

Source: Field survey, 2022

CONCLUSION AND RECOMMENDATIONS

From the results, it was concluded that *faro-44* rice farming is profitable in the study area in view of the fact that for every ₦1 invested in *faro-44* rice production, the farmers realized ₦4.65 in dry and ₦2.49 in wet seasons. The following recommendations are given:

1. The government should provide the farmers with more ploughing and harrowing; and land clearing equipments since these constituted majors on-farm rice activity carried out in wet and dry seasons.
2. The *faro-44* rice farmers in Taraba State should be given more cash-for-work supports; advisory services; supports for non-farm activities and capacity building on agribusiness, enterprise of farmers' choice, record keeping.

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