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Assets Endowments and Profitability of Rice Farmers in Kano River Irrigation Project (KRIP) Kano, Nigeria: A Comparative Analysis between Project Beneficiaries and Non-Beneficiaries

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Abstract: Rice is the fourth most-produced cereal in Nigeria after maize, sorghum, and millet. This study aimed to estimate asset possession and the economics of rice production in the Kano River Irrigation Project, Kano State, Nigeria, by comparing beneficiaries and non-project beneficiaries. Using a multi-stage random sampling technique, primary data from 267 beneficiaries and 165 non-beneficiaries were collected. Data were analyzed using economic and statistical methods such as profitability, T-test, Effect size statistics, Benefit-cost ratio, Net farm ratio, Return on the asset, and frequency distribution. It was found that the beneficiaries received a profit of 182,600/acre compared to 143,345/ acre of non-beneficiaries. The beneficiaries' BCR, NFR, and ROA were 2.13, 53.99%, and 9.17 as against 1.74, 46.99, and 1.77 for non-beneficiaries. The T-test result showed that the mean value of some beneficiaries' assets endowment(cars, televisions, and refrigerators) was statistically different from that of non-beneficiaries. In addition, the mean value of the water pump and cell phone of the non-beneficiaries was statistically higher than that of the beneficiaries. The effect size statistics show that the magnitude of the changes ranges from very small to medium. The most critical issue faced by the beneficiaries was high input cost, inadequate training on water use, poor water supply, especially in the tail end, and insufficient credit. For the non-beneficiaries, the most pressing constraints were poor marketing channels, low water table, low level of education, inadequate extension services, and typhoid fever. It is suggested that the government provide subsidies for production input as well as training on water efficiency. Furthermore, relevant authorities should be conducting periodic cost-effectiveness evaluations of rice production to determine farmers' market positions.

1.1 Introduction

Nigeria is Africa's largest economy and the world's seventh most populous country(Adekola et al., 2016). In 2019, the country's estimated population was 203 million people, with a rural population of 51.4 percent and a population density of 212 persons per square kilometre(Oluwatayo et al., 2019). According to (Akoteyon et al., 2018),the agricultural sector was the country's largest employer in 2017, employing 36.55 percent of the country's economically active people. However, low-input technologies and small landholdings of between 0.5 and 2.5 hectares characterize the farming system (Olarinre and Omonona, 2018). Nigeria is afflicted by extreme poverty and food insecurity(Adebayo and Ojo, 2012; Otaha, 2013)

Rice is the fourth major cereal crop after (maize, sorghum, and millet) cultivated in Nigeria regarding output and developed land area (Babafada, 2003; Ohaka et al., 2013). The country's Rice consumption has risen steadily during the last couple of decades at an annual rate of 4.7 percent per annum, nearly four times the rate of world consumption growth. The yearly consumption rate jumped from less than 1.0 million metric tons (M.T.) in the 1960s to more than 6 million MT in 2017, with an average per capita consumption of 32kg.The total annual consumption in 2018 was estimated at 7.4 million tons, approximately 20 percent of Africa's total consumption. In 2019 rice demand increased to 7.6 million M.T., more than a 15% increment from 2017. Oyedepo and Adekanmbi (2018) reported that the demand for rice in Nigeria will increase to 35 million tons by 2050. The authorities have given increasing rice cultivation greater attention during the last ten years. However, irrespective of this development, average outputs do not generally exceed 2 tons per hectare for rain fed and 3 to 3.5 tons per hectare in the irrigated field, lower than the potential yield of 6 and 8 tones for rain fed irrigated respectively.

Due to the erratic nature of the rainfall and the drought of 1970, in 1972, three prototypes of public irrigation schemes, namely: Kano River Irrigation Project (KRIP), Bakolori, and the Chad Basin scheme, were established (Ugalahi et al., 2016). These projects aimed to; increase the production and productivity of major crops and vegetables, increase farmers' income, and Generate employment and food security. Since the project's establishment, most of the studies conducted on the profitability of crops produced focused only on the beneficiaries of the project(Yusuf, 2018; Sa'ad and Gomina, 2019) in this perspective, the researchers could not conclude whether the observed changes are a result of the project or other external factors. Secondly, understanding the significance of assets in determining rural livelihoods has yet to be translated into determining the link between irrigation projects and asset accumulation. To bridge these gaps, this study used the "with and without" approach due to a lack of baseline survey data, to analyze the comparative analysis of the profitability of rice production between project beneficiaries and non-beneficiaries to investigate the counterfactual effect and estimate the degree to which the project is having an impact on the beneficiary's income. Therefore, this study aims to;

1. analyze the profitability of rice production between KRIP beneficiaries and non-beneficiaries
2. evaluate assets possession of the project beneficiaries and non-beneficiaries
3. describe constraints affecting rice farmers in the projects areas, and give policy recommendations for improvement.

2.0 Literature review

2.1Background

Various studies have shown that irrigated agriculture is critical to rural poverty alleviation, food security, and enhancement of the overall rural economy. According to (Smith, 2004)agricultural intensification

through irrigation is a catalyst for poverty alleviation and food security, particularly in developing countries. Similarly (Buisson and Balasubramanya, 2019; Waha et al., 2020) reported that irrigation is critical for enhancing cropping intensity and production. Another study by ((Meliko and Oni, 2011) found that non-irrigated households had a higher incidence and degree of poverty than irrigation households. Irrigation enhances equality in the poor's favour (Prasad et al., 2006).

Economic analysis is primarily concerned with the amount of profit created by any production process. It provides a comprehensive picture of the present economic conditions in the market (Tolno et al., 2015). It necessitated deciding how to utilize the best scarce resources (Bashir et al., 2021) Benefit-cost analysis is one of the methods for calculating profitability (Wilson et al., 2020). According to (Bwala and John, 2018) the inadequacy of rice harvest to meet consumer demand provides an income-enhancing opportunity for farmers and unemployed youths: Hence, the need for the promotion of the cultivation of the crop. Boubacar et al. (2016) reported that increasing rice demand resulted from population growth and urbanization.

(De Janvry and Sadoulet, 2000) suggested that focusing on assets rather than income or consumption factors alone is better to understand poverty's fundamental causes and dynamics. Additionally, (Rakodi, 1999; Anderson, 2012) opined that understanding farmers' ability to respond to shocks and produce future income and consumption requires understanding asset ownership. Carter and Barrett (2006)highlighted that a lack of access to assets impedes a household's long-term potential to escape poverty. (Ellis, 2000)believed that understanding asset endowments and interactions is crucial for livelihood analysis and modelling.

3.0 Methodology

3.1 Study Area

The Kano River Project is a large-scale, capital-intensive irrigation plan in Nigeria's Kano State.It has a total of 22,000 hectares of irrigable land. The idea began in 1971, and the first research was undertaken in 1977. The Kano River Irrigation Project is one of Nigeria's most successful irrigation projects. It is situated in Kano State's Bunkure, Kura, and Garum Malam Local Governments, with the project office at Kura. The Tiga Dam, which provides a suitable location for gravity irrigation, is its supply of water.

3.2 Materials and Methods Data and Sampling Procedure

The research utilized primary data. The data was collected using an interview method through a semi-structured questionnaire. A multi-stage sampling approach was adopted for this study. The first stage involved the purposive selection of all the three Local Governments of the project area. The second stage utilized a random sampling technique to select 24 villages, twelve from the project area and 12 from the non-project site. The third stage was the proportionate random selection of two hundred and seventeen (217) respondents from the project area and one-hundred and sixty-five (165) non-beneficiaries. Out of these numbers, 209 and 153 of the beneficiaries' and non-beneficiaries, questionnaires were retrieved and analyzed. The sample was taken from a population of about eight thousand eight hundred and forty-six (8846) rice farmers. Yamane's formula was used in determining the sample farmers used for the study. The procedure is given in equation 1:

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

Where: Where, N= Total population; n= representative sample size; and, e = error gap (0.05)

3.3 Analytical Tool

Descriptive statistics, agricultural budget analysis, and T-test were used to analyze the data.The socioeconomic features of rice-producing farmers in the research area were described using descriptive statistics. Farm budget studies were used to estimate the cost and returns of rice production in the area, which included revenue, cost, gross margin, and net farm profit. The Net Farm Income (NFI) was used in this study. The NFI is a valuable planning tool in situations where fixed capital is a component of the cost structure(Bwala and John, 2018; Shu'aib et al., 2017). The NFI model is written as follows:

$$GM = TR - TVC \quad (3)$$

$$\text{Where: } GM = \text{Gross margin}, TR = \text{Total revenue}, TVC = \text{Total Variable cost}$$

$$NFI = GM - TC \quad (4)$$

Where: T.C. = Total cost

The profitability ratio was further used to examine the costs and returns of the farmers. This is because Net farm income though necessary but is not an excellent tool to determine the profitability level of an enterprise. Furthermore, profitability ratios are a class of financial metrics used to assess an enterprise's ability to generate earnings compared to its expenses and other relevant costs incurred during a specific period (James, 2009). Hence the models are presented thus:

$$\text{GPR} = \frac{GM}{TR} X\,100; \quad NFR = \frac{NFI}{TR} X\,100; \quad ROA = \frac{NFI}{ATA}$$

Where: GM = Gross Margin, NFR = Net Farm Ratio, ROA = Return on Asset and ATA = Average Total Assets.

3.4 T-Test

The project's impact on asset possession was measured using a t-test between project beneficiaries and non-beneficiaries. Because an uneven sample size could lead to heteroscedasticity due to a breach of the assumption of homogeneity of variance. The analysis employed 153 respondents for both beneficiaries and non-beneficiaries; the test could be used as specified in an equation, according to (Zupancic et al., 2006)

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{X1X2}\sqrt{\frac{1}{n}}} \quad (5)$$

Where; $S_{X!X2} = \sqrt{S_{X1}^2 + S_{X2}^2}$

3.5 Effect Size Statistics

The effect size statistics measure the magnitude of the project interventions. The guidelines proposed by (Hemphill, 2003)for interpreting the value are 0.01= small effect, 0.06 moderate effect, .07, and above significant impact. However,(Sawilowsky, 2009) revised rules of thumb for effect sizes as (.01) = very small, d (.2) = small, d (.5) = medium, d (.8) = large, d (1.2) = very large, and d (2.0) = huge.The procedure for calculating eta squared commonly used is presented as:

$$\in ta_{squared} = \frac{t^2}{t^2 + (N-1)} \quad (6)$$

Where; t = statistics shown in the Table labelled paired sample test, N= refers to the number of respondents

4.0 Results and Discussions

4.1 Socioeconomic Characteristics of Beneficiaries and Non- beneficiaries

Household socioeconomic variables are of significant importance, specifically in behavioural studies. Table 1 shows that the mean age of the respondents was 41.8 and 41.6 years for beneficiaries and non-beneficiaries, respectively. A related study (Umar and Nasir, 2012) on the impact of HJRDA on crop

productivity and poverty reduction found the minimum and mean ages of the respondents of 18.00, and 47.00 years, respectively. This average age falls within the Food and Agriculture Organization's agricultural productive age range of 30–55 years (Barnett et al., 1995; Appleton and Balihuta, 1996). The age of the household head might be a significant factor, particularly in terms of technical decision-making and allocation of other resources for the benefit of the household's living standard. Farmer's education was measured in years. Educational attainment is a critical variable in learning new skills and acquiring production input, allocating farm resources, managing production and marketing farm output risk, and understanding farm budgetary strategies. For years of formal schooling, beneficiaries and non-beneficiaries had minimum, maximum, and mean ages of 0, 20, 8.4 and 0, 16, and 6.04. According to (Appleton and Balihuta 1996) education increased agricultural productivity in Uganda by enhancing farmers' knowledge. Maikasuwa and Ala (2013) also found that education effectively influences small-scale farmers' production decisions.

Household size is an essential variable in socioeconomic research, particularly in rural and urban household surveys. The size and makeup of a household can be interpreted in two ways. To begin with, households with a large number of individuals are likely to see an increase in household spending on food and non-food items, putting additional strain on household disposable income. The large number and composition of the household, on the other hand, might be used as a good source of labour for farms and other domestic activities in the household. This finding clearly showed that the household size for both beneficiaries and non-beneficiaries is at par above the national average of 4.7 persons (Commission, 2013). Many empirical studies affirm a positive correlation between food insecurity and household size. In other words, they attested that food insecurity increases with an increase in family size (Olayemi, 2012; Agboola and Balcilar, 2014; Jabo et al., 2017)

Table 1 also indicated that the mean total farm size for beneficiaries and non-beneficiaries was 3.95 and 2.95 ha, respectively. Similarly, for the farm size devoted to rice production, the mean was 2.54 and 1.01ha for beneficiaries and non-beneficiaries, respectively. Accessibility of farmland for households may assess crop diversification, household consumption, and asset acquirement. A study by (Ogundele and Okoruwa, 2004) revealed that farm size was an essential determinant of technical efficiency in Nigeria.

Farm experience is also an essential variable in socioeconomic study. It was based on the number of years the family had spent actively participating in agricultural pursuits. The finding of this study revealed statistics of 1, 40, and 16.3 for minimum, maximum, and mean years of experience of project beneficiaries. For non-beneficiaries, their minimum, maximum, and mean years of experience stood at 2, 40, and 14.69. The finding indicated that both beneficiaries and non-beneficiaries farmers had a good experience in farming. Farmers increasingly migrate from conventional agricultural methods to new technology to gain expertise. The present study classified household income into the farm and off-farm sources. The beneficiaries' minimum, maximum, and mean farm incomes were N50, 000, N2, 500,000, and N551,669.85, respectively. For the non-beneficiaries, the minimum, maximum, and mean were N50, 000, N3, 000,000, and N236, 390.73, respectively. The mean household non-farm income (N287, 234.45) was by far lower than the mean farm income of the beneficiaries. Wan et al. (2016)opined that income diversification is not only an excellent way to manage catastrophe risk and improve social welfare, but it could also open up new avenues for research into the vulnerability, resilience, and adaptability of rural social ecosystems.

Table 1: Socioeconomic Characteristics of Beneficiaries and Non-beneficiaries

	Beneficiaries				**Non-Beneficiaries**			
Variables	Minimum	Maximum	Mean	S.D	Minimum	Maximum	Mean	S.D
Age of the farmers	20	75	41.8	10.82	18	70	41.60	12.40
Farming experience	1	45	19.14	10.72	1	50	16.66	10.81
Number of wives	0	4	2.02	1.11	0	4	1.55	0.884
Formal education (years)	0	20	8.4	4.93	0	16	6.03	5.59
Household size	1	38	12.4	7.04	2	30	10	6.43
Farm size devoted to rice production (ha)	1	14	2. 54	2.04	1	7.00	1.01	0.75
Total Farm size (ha)	1	18	3.95	2.45	1.5	9	2.95	1.32
Irrigated rice production experience	1	40	14.31	9.71	2	40	14.69	10.5
Farm income from rice production (N)	50,000	2,500,000	551,669.85	481,504.49	50,000	3,000,000	236,390.73	252,090.37
Non-farm income (N)	0	2,550,000	287,234.45	413,347.90	0	2,030,000	279,311.25	412,124.31
Total Annual income (N)	**35000**	**4030000**	**847,133.97**	**675,508.01**	**50,000**	**3,032,000**	**515,701.98**	**466,464.21**

Source: Field survey, 2020[1]

[1] N = Naira (conversion rate at N380 to Dollar), ha = hectare

4.2Economic Analyses of Rice Production for Beneficiaries and Non-Beneficiaries

Economic analysis of agricultural production has been widely used to measure the impact of a project intervention or policy. This section presented the results of cost and benefits analysis and Benefit-Cost Ratio (BCR) of beneficiaries and non-beneficiaries to ascertain the project's impact and have the basis for measuring economic and physical water productivity.

4.2.1 Cost of production incurred on rice by the beneficiaries and non-beneficiaries

The Production Input Costs (PIC) involved in the analysis were the cost of seed, fertilizers (NPK and Urea), agrochemicals (pesticides and herbicides), cost of fuel, and labour cost. Table 2 shows an average cost of production for beneficiaries and non-beneficiaries and compares to access the project's influence on the production cost. There could be a possibility as far the direct impact on the cost of production, due to availability of the surface water; farmers in the project command area were likely to spend less on water application than their non-beneficiaries counterparts. This cost reduction will ultimately impact the respondents' gross margin or net profit margin.

The results of the cost of production in Table 2 show a total cost of production of N160, 827.97, N193, 003.14, and N170, 201.70 for beneficiaries non-beneficiaries, and pooled results, respectively. Out of the total cost incurred by the beneficiaries, 10.40 percent and 12.08 percent were used to purchase NPK and urea fertilizers, respectively. For the non-beneficiaries, it was 5.64 and 14.41 percent for NPK and Urea, respectively. The labour cost component has the most significant percentage for both beneficiaries and non-beneficiaries accounting for 57.87 percent and 52.68 percent of the total cost, respectively. Moreover, the cost of fuel to power generators was the second largest production cost for non-beneficiaries accounting for about 13.06 percent of the total cost. This cost component was only 1.24 percent in the case of beneficiaries, who pay a negligible amount of N2000 water charges initially or sometimes at the cropping season's ends. The fuel cost component of the non-beneficiaries created a substantial total cost difference between the two groups. This finding was similar to that of (Sheshi and Usman, 2018)who reported that the cost of hired labor, agrochemicals, and fertilizer constituted the significant variables cost used in rice cultivation. In addition, (Girei et al., 2018)also reported labor, fertilizer, and agrochemicals as the significant cost components in cereal production.

Table 2: Cost of Production Rice Farmers per Acre (Beneficiaries and Non-Beneficiaries)

Farm operation	Beneficiaries		Non-Beneficiaries		Pooled Result	
	Operational cost (N)	percent Total cost	Operating Cost (N)	percent Total cost	Operational Cost (N)	percent Total cost
Input cost						
Seed	3451.97	2.15	3659.868	1.90	3539.75	2.08
Fertilizer NPK	16727.16	10.40	10884.87	5.64	14260.42	8.38
Urea	19423.08	12.08	27811.18	14.41	22964.72	13.49
Agro-chemical Herbicide	4000.24	2.48	4343.67	2.25	4145.139	2.44
Pesticide	3798.08	2.36	1651.32	0.86	2891.667	1.70
Cost of fuel (acre)	-		25201.58	13.06	10640.67	6.25
Water charges	2000.00	1.24	-	0.00	1396.12	0.82
Cost of bags (acre)	3152.31	1.96	3312.63	1.72	3220.00	1.89
Rent on land	5980.577	3.72	7335.52	3.80	6552.77	3.85
Labor cost						
Land clearing	3620.67	2.25	3768.092	1.95	3682.917	2.16
Ploughing/Riding	9185.16	5.71	7273.68	3.77	8378.056	4.92
Seedbed	7142.07	4.44	6409.68	3.32	6832.861	4.01
Planting	10334.13	6.43	5409.74	2.80	8254.778	4.85
1st and 2nd thinning	20649.80	12.84	17905.92	9.28	19479.72	11.45
1st and 2nd fertilization	3050.96	1.89	2260.53	1.17	2717.222	1.60
Agro-chemical spraying	1619.23	1.00	1988.16	1.03	1775.00	1.04
Harvesting/threshing	18320.67	11.39	22899.01	11.86	20253.75	11.90
Winnowing/bagging	4061.54	2.52	4195.40	2.17	4118.056	2.42
Irrigation labor cost	15062.50	9.37	15688.16	8.13	15326.67	9.01
Transportation cost	6143.03	3.81	6301.32	3.26	6209.861	3.65
TVC	**157,723.17**	**98.07**	**178, 300.32**	**92.38**	**166,640.18**	**97.91**
Depreciation	3104.789	1.93	14702.82	7.62	3561.52	2.09
Total cost	**160,827.97**		**193,003.14**		**170,201.7**	

Source: Field survey, 2020

4.2.2 Gross margin, net farm income, and Cost-Benefit Ratio (BCR) of beneficiaries and non-beneficiaries

Table 3 presented the average price of paddy per bag, total revenue realized, gross margin, and net farm income. The profitability ratios calculated were; Cost-Benefit Ratio (BCR), Gross Profit Ratio (GPR) %, Net Profit Ratio (NPR) %, and Return on Asset (ROA). Gross margin is the difference between Total Revenue (T.R.) and Total Variable Cost (TVC). Net Farm Income (NFI) is gross margin less depreciation on capital assets. Gross margin and or net farm income were used as a performance indicator when evaluating agricultural projects or programs. Since this study was accessing the impact of KRIP on rice productivity, NFI is very relevant. However, some studies, such as those(Bakhsh et al., 2015; Ndanitsa et al., 2020). The statistics indicated that the beneficiaries had a net farm income of ₦182 003.53 per acre against non-beneficiaries with a net farm income of ₦143 380.54. This analysis revealed a difference of N38, 622.99 per acre against the non-beneficiaries, about 27 percent of their net profit margin. This difference was partly due to the absence of fuel cost for beneficiaries and the slight variation in the price of paddy per kg.

Table 3: Profitability and BCR of the beneficiaries and non-beneficiaries

Indicators	Beneficiaries	Non-beneficiaries	Pooled Result
Average Yield (kg/acre)	1970.12	2084.11	2012.5
Average Price/ kg (N)	174.006	161.404	168.24
Gross Revenue (₦/acre)	342,813.489	336,383.69	338,583.12
Gross Margin (TR-TVC)	185,108.32	158,083.37	171,942.82
Net Farm income (GM-FC)	182,003.53	143,380.54	168,381.30
BCR (NFI/TC)	**2.13**	**1.74**	**1.99**
Gross Profit Ratio (GPR) %	**53.99**	**46.99**	**50.78**
Net Profit Ratio (NPR) %	**53.08**	**42.62**	**49.73**
Return on Asset (ROA)	**9.77**	**1.77**	**7.80**

Source: Field survey, 2020

This study's finding validated the earlier results made by preceding researchers ((Odoemenem and Inakwu, 2011; Nwalieji, 2016), who found that rice production was a profitable venture. However, the finding was contrary to that of (Narayanamoorthy, 2013), who reported that farmers in Andhra Pradesh, India were incapable of recovering the cost of production from the proceeding of the output of paddy obtained. BCR, which also refers to NFI to cost of production ratio, is an indicator used to compare the return to Naira invested on the cultivated crop. The ratio of unity indicates breakeven, less than unity indicates loss and greater than unity indicates the profitability of the enterprises. This indicator has widely been used in different analyses to compare profitability between enterprises or groups (Bakhsh et al., 2015). The result in Table 4 indicated that for the beneficiaries, the BCR was 2.13, while for the non-beneficiaries, it was 1.74. This result showed that although the enterprise was more profitable among the beneficiaries, rice production was profitable both among the beneficiaries and non-beneficiaries. The Gross profit and net profit ratios confirmed that beneficiaries obtained more profit than non-beneficiaries. Return on assets (ROA) is a pointer to how well an enterprise utilizes its assets in terms of profitability. The higher the ratio, the more efficient the enterprise. From the result, the beneficiaries are more efficient in asset utilization.

4.4 Distribution of respondents by asset possession

Asset-building by the farming communities is central to food insecurity and poverty reduction. Asset ownership was also associated with improving rural communities' standard of life and economic wellbeing.

Furthermore, assessing household wealth showcase a change from income to asset accumulation (Grinstein-Weiss et al., 2007). The ability to buy more assets denotes a rise in economic status and indicates that farmers have progressed beyond basic needs such as food, clothes, and shelter (Oluyombo, 2013)

The result in Fig 1 indicated that, on average, all beneficiaries possessed at least one personal house, motorcycle, and cell phone, as shown by their respective mean (1.02, 1.01, and 1.67), respectively. Similarly, about 53, 45, 34, and 24 percent of the sampled beneficiaries have a water pump, television, car, and refrigerator, respectively. Among the sampled non-beneficiaries, the result showed that virtually all the respondents have at least one cell phone and one water pump (1.05 and 1,20), respectively. The result further showed that about 97, 86, 14, 14, and 1.4 percent of the sampled non-beneficiaries owned a personal house, motorcycle, car, television, and refrigerator, respectively.

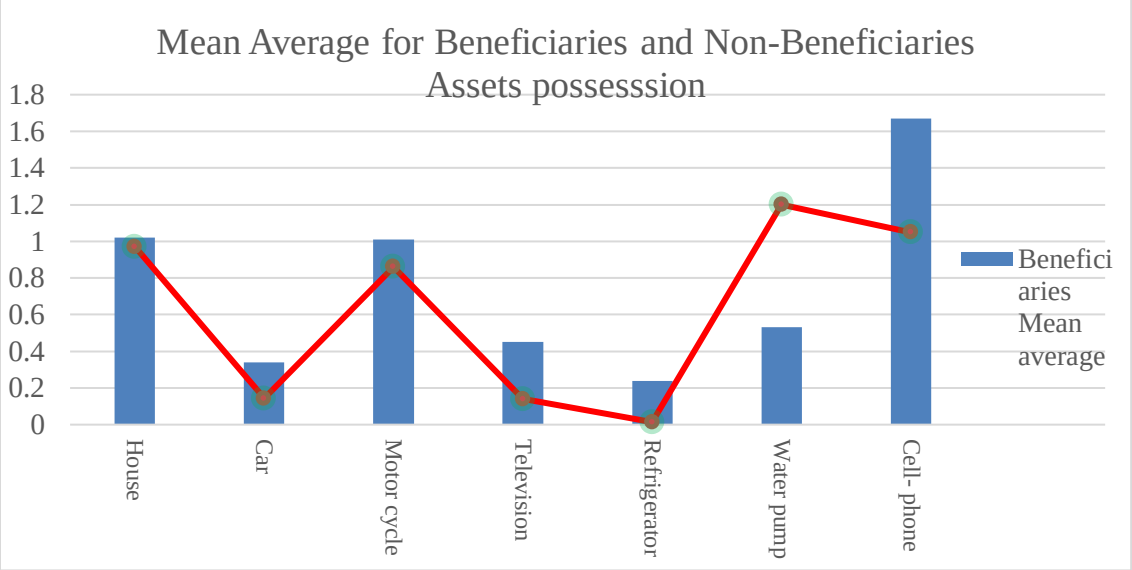

Figure 1: Mean Quantity of Asset possession

Fig 2 shows the mean value of the assets possessed by the beneficiaries and non-beneficiaries in thousand. The results show that except for water pumps and cell phones, the mean value of the beneficiaries was higher, signifying relatively better wealth of the beneficiaries than their counterpart. The result was also subjected to paired sample T-test, to confirm whether these differences are significant (Table 5).

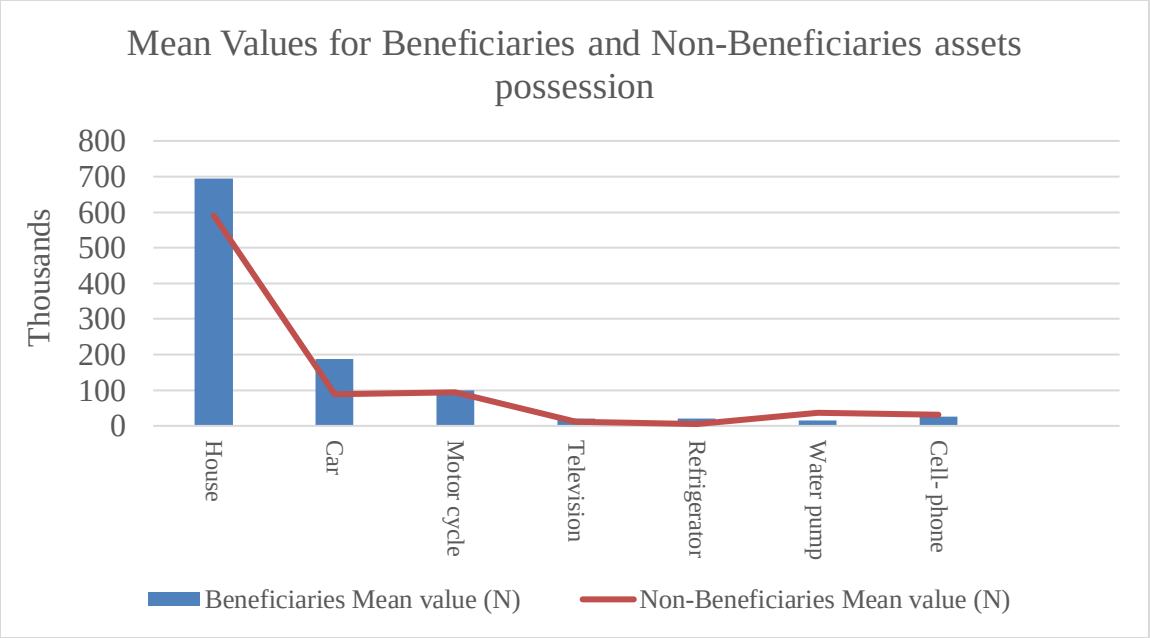

Figure 2: Value of assets possessed by beneficiaries and non-beneficiaries

4.4.1Paired T-test of Assets Endowments between Beneficiaries and Non-beneficiaries

A dependent sample T-test was performed to test whether the beneficiaries' and non- beneficiaries' means were equal. Before conducting the analysis, the assumption of normality was conducted and satisfied. Table 4 shows that the beneficiaries are better off in the mean value cars at the probability level of 5%. Similarly, the mean value of beneficiaries regarding televisions and refrigerators is higher than their counterparts at a 1% probability level. In contrast, the mean values of the water pump and cell phone of non-beneficiaries are statistically more elevated than that of beneficiaries at 5% and 1% probability levels, respectively. However, the overall mean value of the beneficiaries' and non-beneficiaries' assets was not statistically significant

Table 4: T-test Result of Assets Possession

Assets	Paired Differences					t	sig	EST
	Mean	S. D	S.E mean	Lower	Upper			
House	98.04	859741.57	69505.98	-137224.50	137420.60	.001	.999^{NS}	-
Car	-77124.18	465733.25	37652.30	-151513.60	-2734.75	-2.048	.042***	0.03^{VS}
Motor cycle	-4260.78	114753.89	9277.30	-22589.89	14068.32	-.459	.647^{NS}	-
Television	-10249.99	34504.67	2798.69	-15779.65	-4720.32	-3.662	.000***	0.08^{VS}
Refrigerator	-17342.10	38769.33	3144.60	-23555.21	-11128.99	-5.515	.000***	0.17^{SM}
Water pump	9093.46	41076.05	3320.80	2532.57	15654.35	2.738	.007**	0.05^{VS}
Cell phone	13895.22	9858.29	681.98	12550.73	15239.70	20.375	.000***	0.73^{MD}
Overall	-96417.53	975974.05	79161.95	252825.63	59990.56	-1.22	.225^{NS}	-

Source: Authors computation

*** NS= not significant, *significant at 10%, ** significant at 5%, *** significant at 1%, EST= Effect Size Statistics, VS= Very Small, SM= Small, MD= Medium

From the result, we can conclude that the project significantly changed some beneficiaries' assets endowment (cars, Televisions, and refrigerators). However, the results do not provide information about the magnitude of the project interventions' effects. Effect Size Statistics (EST) was calculated to assess the importance of the change. The EST result Table 4 also shows that the extent of the change ranges from very small for Cars, water pumps, and televisions to small refrigerators and cell phones, respectively.

4.5Constraints Affecting Rice Production among the Beneficiaries and Non-beneficiaries

Results in Table 5 showed the most severe constraints perceived by the project beneficiaries to be; high cost of input, inadequate training, unreliable water supply, water logging, and insufficient credit. The farmers perceived erosion, poor output price, low education level, high labour cost, and poor marketing channels as moderate constraints. Similarly, poor maintenance of irrigation facilities, inadequate infrastructures, malaria, weeds, and insect infestation were the minor problems rice farmers faced in the study area. (Auta et al., 2010)reported that credit was an essential factor for developing small and medium scale enterprises; its accessibility could determine the magnitude of production capability. The finding of this study was in agreement with that of(Auta et al., 2010) that identified the lack of access to micro-credit as a significant constraint to the practical sustainability of irrigated agriculture. The finding was also in line with those(SULAIMAN, 2016)who reported that inadequate training and poor marketing channels are significant constraints to wheat production in the Jibia irrigation project, Katsina state, Nigeria. Insufficient power supply and high labour costs were also reported (Ladan, 2019) as significant impediments to irrigation agriculture in the Daberam Dam site of Northern Nigeria.

The perception index was 0.50, indicating that 50 percent of the sampled farmers in the study area saw these constraints as hurdles to rice production. Furthermore, the significance of Friedman's test value indicates that the attributes assigned to the constraints by the farmers came from the statistical population, and Kendall's Coefficient of Concordance (KCC) value of 0.151 indicates that there was a weak concordance or agreement among the farmers regarding this ranking. As a result, authorities are free to ignore this ranking when addressing these issues, but they should aim to address what the farmers perceive to be the most persistent hurdles to rice farming in the study area. For the non-beneficiaries, the result reported that; poor marketing channels, low water table, low level of education, inadequate extension, and health-related problem were the severe constraints to rice productivity in the study area.

Table 5: Constraints Affecting Rice Production among the Beneficiaries and Non-beneficiaries

Constraints	Mean (Beneficiaries)	Rank (beneficiaries)	Mean(non-beneficiaries)	Rank (non-beneficiaries)
Inadequate maintenance	2.00	20	-	-
Poor infras. / access road	2.14	19	1.4305	25
Lack of functional WUA	2.15	18	-	-
High input cost	3.81	1	1.9536	18
Inadequate training	3.80	2	1.9603	17

High labor cost	2.60	9	2.4437	12
Low level of education	2.61	8	2.9735	3
Insufficient credit	2.95	5	2.5364	9
Poor marketing channel	2.63	10	3.0861	1
High use of fert/ chemical	2.63	10	2.5166	10
Poor irrigation service	2.45	13	-	-
Poor water supply	3.07	3	-	-
Head/tail reach problem	2.53	12	-	-
Poor output price	2.70	7	2.4503	11
Typoid	1.87	21	2.8808	5
Inadequate extension services	2.36	15	2.8940	4
Malaria	1.49	22	2.5828	6
Siltation	2.43	14	-	-
Water lodging	2.96	4	2.7947	8
Erosion	2.80	6	2.3974	13
Flooding	2.42	15	1.6556	22
Salinity	2.33	17	1.6689	21
Plant disease	2.59	11	1.8609	20
Insect pest	2.35	16	1.4371	24
Weed Infestation	1.65	24	2.0265	16
Birds	1.67	23	1.5828	23
Poor water quality	-	-	2.0530	15
High fuel cost	-	-	2.6026	7
Low water table	-	-	3.0265	2
Lack of government support	-	-	2.2914	14
Lack of access road	-	-	1.4305	25
Grand mean	**2.50**		**2.25**	
Perception index	**0.50**		**0.45**	
KCC	**0.151**		**0.137**	
X^2	**786.041*** **		**497.63*** **	
Friedman test (X^2)	**786.041*** **		**497.63*** **	

Source: Field survey, 2020

5.0 Conclusion and Recommendation

The promotion of rice production among farmers in the KRIP will increase the availability and affordability of the grain, enhance farmers' income generation, and improve food security at the household and national levels. The crop is an essential agricultural enterprise that farmers should be encouraged in its production, considering the profitability of the crop among the KRIP farmers, and it is valued as the primary staple food. Even though rice production is more profitable among the project beneficiaries and has relatively more asset endowments than its counterpart, there were no statistical differences in the overall asset endowments between the two groups. More needs to be done, therefore, by the project authorities to ensure the project's sustainability. It is recommended that the project authorities improve water availability in the project area and the disparity of head-tail farmers; a collaborative effort with the water users association can achieve this. Better

access to credit facilities and input supply is also essential in this regard. Extension personnel should also give regular training to farmers on the benefits of efficient water use. Farmers' knowledge and understanding of weather forecasts in terms of rainfall intensity will also help them plan for flooding.

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