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Effect Of Lower Niger River Basin Development Authority Irrigation Technologies Usage On Rice Farmers Output In Kwara State, Nigeria

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Abstract

The water crisis being experienced is not about having too little water to satisfy human needs especially in agriculture but a crisis of proper utilization. Irrigation activities in Nigeria have been put into practice on small-scale irrigation schemes and the utilization on large scale production level needs to be investigated. The study therefore, assessed the effect of Lower Niger River Basin Development Authority (LNRBDA) irrigation technologies usage on rice farmers output in Kwara State, Nigeria. A multistage sampling procedure was employed in selecting 178 respondents for the study. The data collected for the study were analyzed using descriptive statistics such as frequency counts, percentages, mean, Weighted Mean Score (WMS) and standard deviation, while Paired T-test analysis was used to test significance difference between the output of rice per hectare before and during the LNRBDA irrigation technologies. The study showed that LNRBDA irrigation technologies were beneficial to rice farmers by aiding their financial buoyancy. Also, the result of paired t-test analysis showed significance difference between the output of rice per hectare in 2016 (Pre-LNRBDA irrigation technologies) and in 2019 (during utilization of irrigation technologies) by the rice farmers ($p=0.000$, $t= 8.642$). It was concluded that LNRBDA irrigation technologies obviously led to increase in the output of rice farmers. Therefore, there is the need for concerned stakeholders such as rice farmers' groups and extension experts to collaborate with LNRBDA thereby organizing trainings to sensitize and improve their knowledge on the use of the available LNRBDA irrigation technologies, as this is expected to enhance their production level.

Key Words:

Introduction

To achieve improvement in food security and respond to menace of climate variability in the country there is necessity to look beyond rainfed agriculture in other to have all year round production of agricultural produce.This study is significantly tailored to assess the technologies transferred on rice prodction. Nigeria has a high population growth rate, and the demand for food is increasing rapidly. Without efficient irrigation technologies, it will be challenging to meet the food demands of the nation. Food and Agriculture Organization (FAO, 2020).

The World Bank, through its Nigeria Sustainable Rural Water Supply and Sanitation Project, has been focusing on improving access to irrigation technologies in rural areas of Nigeria. The project aims to enhance agricultural productivity and promote sustainable water management practices to alleviate poverty and boost economic growth (World Bank, 2019). According to Ugbo (2020), irrigation technologies in Nigeria is a necessity to combat the negative impacts of climate change because drought and unpredictable rainfall patterns are becoming more prevalent, making irrigation crucial for ensuring a stable food supply.

The Nigerian Irrigation and Drainage Society (NIDS) highlights the significant potential of irrigation technologies to boost agricultural production in Nigeria. They emphasize that about 20% of the land suitable for irrigation in Nigeria is currently being utilized, indicating the need for increased adoption of irrigation technologies to maximize productivity. (NIDS, 2018). Similarly, Nigerian Investment Promotion Commission (NIPC) recognizes the importance of irrigation technologies as a means of diversifying Nigeria's economy and reducing dependence on oil. They encourage both local and foreign investors to explore irrigation investment opportunities in the country (NIPC, 2019).

However, financial constraint is one of the major barrier to the utilization of irrigation technologies in Nigeria. Small holders farmers mostly lack the necessary capital to invest in irrigation equipment and infrastructure (Adewumi, 2021 *et al*). Similarlry, the absence of adequate extension services hinders the effective adoption and utilization of irrigation technologies in Nigeria. Farmers often lack technical knowledge and skills required for proper operation and maintenance of irrigation systems. In a study conducted by Omoteso *et al.* (2020), it was found that the lack of extension services was a vital constraint to the adoption of irrigation technologies in North Central Nigeria.

Considering that Nigeria is well endowed with water and land resources for irrigation farming, utilization of these resources can close the demand supply gap of rice in the country. A considerable increase in production is essential for Nigeria to meet up with the growing demand considering its fast growing population. The utilization of the

irrigation facilities and participation of farmers with the parastatal have been low due to wrong perception or inadequate information of their activities. (Alalade *et al*, 2017). Limited infrastructure such as water storage facilities, reservoirs, and distribution networks pose problems to the use of irrigation technologies in Nigeria. According to Usman *et al* (2019), poor infrastructure development was identified as a significant constraint to the adoption and expansion of irrigation technologies in Northwestern Nigeria.

There are numerous irrigation schemes or projects in Kwara State, Nigeria and majority of them are under the supervision of Lower Niger River Basin Development Authority (LNRBDA), examples are the Oke-Oyi Irrigation Scheme, Tada Shonga irrigation Project, Oyun irrigation Project, Rogun irrigation Project, Erin-Ile Water Supply and Irrigation Project.

Despite the efforts of the River Basin and Rural Development Authorities (RBRDAs) and other stakeholder in utilizing the water bodies of the country, through construction of large dams, canal development, introduction of various irrigation technologies, providing extension services on use of irrigation services and provision of irrigation schemes in order to increase food production, Nigeria is yet to reach food sufficiency level. One of the reasons ascribed for this inadequacy is the low level of utilization of farmers in the dry season irrigation for farm production by the small scale farmers, who are majorly the food producers for the local consumers in this country. This study therefore broadly analyse the effect of the utilization of Lower Niger River Basin Development Authority (LNRBDA) irrigation technologies on rice farmers output in Kwara State, Nigeria. Specifically, the study identified the irrigation technologies used by LNRBDA rice farmers; ascertained the frequency of utilization of the identified irrigation technologies used for rice cultivation; ascertained the output of rice farmers before and during the utilization of LNRBDA irrigation technologie and determined the benefit derived from the utilization of irrigation technologies by LNRBDA rice farmers.

Methodology

This research was carried out in Kwara State, Nigeria. Kwara State is located on latitude of 8.5' and 8^0 30' 00''N and longitude of 5' and 5^0 00' 0" E of the equator. Kwara State is bounded in the north by Niger State and naturally by River Niger to the East is Kogi State, while it shares boundary with Oyo, Ekiti, Osun State in the south Agriculture is the main source of the economy and the principal cash crops are: cotton, coffee, tobacco, beniseed and palm produce. (Kwara State Government, 2017).The state is blessed with a river basin named lower niger River Basin Authority and this aids irrigation farming in the study area.

Lower Niger River Basin has one area office located in Ilorin, Ilorin area office have about ten functional project offices. Abati, Erin-Ile, Okuta, Oke-Oyi, Kaima, Ilala, Mosagada, Yashika, Omu-Aran and Asa.From the LNRBDA ten functional project offices, simple random sampling technique was used to select 50% functional project offices which includes: Oke-oyi, Kiama, Okuta, Mosagada and Asa. In addition. Also, simple random sampling technique was used in the selection of 50% of registered rice farmers with LNRBDA. Therefore, a total number of one hundred and seventy-eight registered rice farmers with LNRBDA were used for this study (LNRBDA, 2020).

The instrument used to elicit information from the rice farmers is a well-structured interview schedule which involved personal interview with the respondents. The variable for the study includes both the dependent and independent variables. The dependent variable is the effect of utilization of LNRBDA irrigation technologies. This is the output of rice per hectare which is measured at ratio level in kilogram. Data collected for the study were coded using Paired T-test analysis to determine significant difference between output of rice before and during the use of LNRBDA irrigation technologies

LNRBDA Irrigation Technologies Available

The result in Table 1 reveals the available LNRBDA irrigation technologies by rice farmers All (100.0%) of the respondents indicated the availablity of tillage operation (ploughing and harrowing); 99.4% indicated the availability of LNRBDA irrigation technologies such as fertilizer application (NPK 15:15:15 and Urea); 98.9% indicated transplanting seedlings; 98.3% indicated seeded planting and use of perdimethadin; 97.8% and 97.2% indicated measuring the water use efficiences and uniformity co-efficiences while 96.6% indicated tillering and supplying, application of efficiency and water storage efficiency as LNRBDA irrigation technologies available to the rice farmers in the study area.

Also, 94.4% of the respondents indicated use of both propanil +2, 4-D amine and cover large acres in smaller time as available LNRBDA irrigation technologies; 93.9% indicated application of pesticides and fertilizer while 91.6% indicated conveying water to the surface of soil as available LNRBDA irrigation technologies in the study area. In addition, 88.8%, 83.6%, 83.2% indicated the availability of water test, use of reaper machine and use of robot gun as LNRBDA irrigation technologies in the study area. Meanwhile, 78.2%, 76.5%, 76.0% and 74.9% indicated use of hand sickle, developed to conserve water, FARO 52 and allowing percolation with run-off as available LNRBDA technologies respectively in the study area.

Furthermore, almost 70.0% of the respondents indicated development of similar rainfall and water drop into smaller droplet as available LNRBDA irrigation technologies while 32.4% and 39.2% indicated FARO 61 and FARO 44 respectively as LNRBDA irrigation technologies available in the study area. Lastly, 21.8% and 19.0% indicated use of ringing bell and use of combine harvester as LNRBDA irrigation technologies available in the study area for use by the rice farmers. Generally, this result implies that LNRBDA as an agnecy has made available different irrigation technologies to aid rice cultivation in the study area, and this is expected to improve rice production if well utilized. The result is in tandem with the findings of Alalade *et al.*, (2017) where majority (92.5%) of the respondents had prior knowledge of irrigation technologies. They affirm that irrigation technoligies has increased their productivity.

Table 1. Distribution of respondents according to available LNRBDA irrigation technologies

LNRBDA irrigation technologies*	Availability	
	Frequency	Percentage
Check basin		
Water conservation technology	137	76.5
Percolation with run-off technology	134	74.9
Sprinkler		
Similar to rainfall technology	122	68.2
Smaller droplets of water technology	121	67.6
Center Pivot		
Fast spraying with smaller time technology	169	94.4
Pesticides and fertilizer application technology	168	93.9
Furrow		
Surface water target technology	164	91.6
Agronomic practices		
Ploughing and Harrowing)	179	100.0
Seeded planting	176	98.3
Transplanting seedlings	177	98.9
Tillering and Supplying	173	96.6
Fertilizer application(NPK 15:15:15 and Urea)	178	99.4
Weed control		
Perdimethadin	176	98.3
Propanil +2,4-D amine	169	94.4
Pest control		
Use of Robot gun	149	83.2
Ringing bell	39	21.8
Rice varieties		
FARO 44	54	30.2
FARO 52	136	76.0
FARO 61	58	32.4
Water management		
Water use efficiency measurement	175	97.8
Water storage efficiency	173	96.6
Uniformity co-efficiencies	173	96.6
Water test	174	97.2
Harvesting		
Use of hand sickle	140	78.2
Use of reaper machine	150	83.6
Use of combine harvester	34	19.0

Source: Field survey, 2022, * Multiple response

Benefits derived from the utilization of LNRBDA irrigation technologies

Table 2 revealed the various benefits derived by the rice farmers from the utilization of LNRBDA irrigation technologies in the study area. All (100.0%) the respondents indicated improvement on financial bouyancy and improvement in skills/knowledge about hybrid rice cultivation as benefits derived from the utilization of LNRBDA irrigation technologies while 99.4% indicated help in all year round cultivation, increase social status of rice farmers, reduced in pest and disease infestation on the rice farm, improved in awareness about technologies in rice production, brought about good relationship with extension contact, aids increment in the size of rice farmland cultivated and motivated fellow farmers interest in cultivation of rice respectively.

Furthermore, 98.9% of the respondents indicated increased frequency of access to LNRBDA officials; 98.3% indicated access to government provision of rice farm input while 97.8% indicated provision of opportunity to access credit facilities as benefits derived from the utilization of LNRBDA irrigation technologies respectively.
Generally, this result implies that rice farmers in the study area have benefitted immensely from the utilization of LNRBDA irrigation technologies, an indication that LNRBDA has contributed to the development of the rice farmers, rice cultivation and the economy of the study area due to the introduction of the irrigation technologies to the rice farmers. This result is in consonance with the findings of Alalade *et al.,* (2017) who noted increase in standard of living of the rice farmers and increase in their social status as major benefit farmers derived from the use of irrigation technologies.

Table 2. Distribution of respondents according to benefits derived from the Utilization of LNRBDA Irrigation technologies

Benefits derived*	Frequency	Percentage
It aids all year round cultivation	178	99.4
It aids rice farmers financial buoyancy	179	100.0
It increase social status of rice farmers	178	99.4
Improvement in skills and knowledge about hybrid rice cultivation.	179	100.0
It has reduced pest and disease infestation on the rice farm	178	99.4
It has improved my awareness about technologies in rice production	178	99.4
It has brought about good relationship with extension contact	178	99.4
It has increased the frequency of access to LNRBDA officials	177	98.9
It has aid increment in the size of rice farmland cultivated	178	99.4
It has motivated fellow farmers interest in cultivation of rice	178	99.4
It provides opportunity to access credit facilities	175	97.8
It offers access to government provision of rice farm input	176	98.3

Source: Field survey, 2022, * Multiple response

Distribution of respondents according to the output of rice farmers before the year 2016 and during 2019 production cycle utilization of LNRBDA technologies

LNRBDA agency allocated same size of farmland to rice farmers in the study area per area office, hence this ensures that farmers were given access to LNRBDA irrigation technologies used for rice cultivation. This was done to ensure easier comparison of the output of the farmers and to reveal the level of expertise of the farmers on the use of irrigation technologies made available to them. The result gotten from the farmland as indicated by the respective rice farmers is discussed

Almost 60.0% of the respondents indicated they harvested not more than 2000kg per production cycle; 41.9% indicated they harvest above 4000kg while 0.6% indicated they harvest between 2001-4000kg of rice per production cycle respectively. The mean rice output harvested per production cycle by rice farmers before the year 2016 in the study area was revealed to be 2333.0kg. This result affirms that rice cultivation is dominated in the study area and produced for commercial bases, though on a low scale level of production.

Meanwhile, output gotten from the respondents for during the use of LNRBDA irrigation technologies in the year 2019 indicates that there is improvement in the yield of rice farmers. The result reveals that 67.1% of the respondents indicated they harvest above 4000kg of rice during the use of LNRBDA irrigation technologies; 28.0% indicated between 2001-4000kg of rice output per production cycle while only 5.0% indicated not more than 2000kg as rice output per production cycle during the use of LNRBDA irrigation technologies in the year 2019. The mean rice output during the use of LNRBDA irrigation technologies was revealed to be 4121.8kg. This result implies that rice farmers output increased significantly with the use of LNRBDA irrigation technologies, an indication that LNRBDA irrigation technologies are having a positive effect on the farmers and their welfare. The result is in consonance with the findings of Alalade *et al.,* (2017), where farmers have increased production rate due to the use of irrigation technology. This is expected to have effect on their financial bouyancy and ultimately improve their standard of living.

Table 3: Distribution of respondents according to rice yield per production cycle before 2016 and during 2019 utilization of LNRBDA technologies

Output (Kg)	Before use of LNRBDA in the year 2016 F (%)	During use of LNRBDA in the year 2019 F (%)
≤2000	103 (57.5)	9 (5.0)
2001-4000	1 (0.6)	50 (28.0)
Above 4000	75 (41.9)	120 (67.1)
Mean	2333.0kg	4131.8kg

Source: Field survey, 2022

Paired T-test analysis showing significance difference between output of rice before and during the use of LNRBDA irrigation technologies

The result of paired T-test in Table 4 revealed that there is significant difference between the output of rice before and during utilization of irrigation technologies by the rice farmers (t=-8.642; p=0.000). This result implies that irrigation technologies have had a direct influence on the increase in the output of rice.

Table 4 T-test analysis showing difference between output of rice before and during utilization of LNRBDA irrigation technologies

Variale	mean	t-value	df	Sig. value	Decision
Output before and during utilization of LNRBDA irrigation technologies	2115.084	8.642	178	0.000	Significant

Source: Computed Data, 2022

Conclusion and Recommendations

From the research findings, it was confirmed that rice farmers in the study area had benefitted immensely from the presence of LNRBDA in the study area, as irrigation technologies provided by the agency is being utilized to aid rice production by the rice farmers in the study area. LNRBDA irrigation technologies have obviously impacted the rice output with increase in their output.

The study recommended that rice farmers' groups should organize trainings to sensitize and improve their knowledge on the use of the provided LNRBDA irrigation technologies as governments cannot do it all, this is expected to improve their expertise in the use of the LNRBDA irrigation technologies which will enhance increased in output of rice cultivated in the study area.

Also, The LNRBDA irrigation technology has been impactful to respondents in the study area, therefore, there is need for LNRBDA authorities to spread the innovation to other areas of coverage so that more rice farmers can benefit from it.

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