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# FACTORS AFFECTING FARMERS' PARTICIPATION IN IRRIGATION SCHEMES OF THE LOWER NIGER RIVER BASIN AND RURAL DEVELOPMENT AUTHORITY, KWARA STATE, NIGERIA

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***ABSTRACT***

*In Nigeria the performances of many governments owned irrigation schemes have fallen short of expectation. Management issues and steps required to ensure sustainable growth in irrigated agriculture were not given proper attention. This study therefore examined those factors affecting farmers' participation in irrigated agriculture at the Lower Niger River Basin Development Authority (LNRBDA) in Kwara State, Nigeria. One hundred and sixty (160) respondents were selected from communities around LNRBDA site at Oke Oyi for this study through a two-stage sampling procedures. Data collected were analyzed using descriptive statistics and logistic regression model. The result showed that majority of respondents were farmers within the economic active age and relatively literate. They identified factors affecting farmers' participation in the scheme to include poor knowledge of irrigation techniques(78.3%), Insufficient water for irrigation during the dry season (80.5%), high cost of labour (75.8%), Lack of access to credit facility (76.6%), poor response to farmers' needs by the Authority (85.2%), Irregular pumping of water (86.7),. Consequently, the study recommended encouragement of participatory irrigation scheme (PIM) in which farmers would take charge of daily allocation of water while the authority serves as supervisory body and stepping up of extension activities within the surrounding villages.*

**Key words:** Irrigation, Water, Participatory Irrigation Management, LNRBDA.

## 1 INTRODUCTION

In Nigeria, agricultural production is mainly rainfed and farming systems depend largely on the broad ecological zones resulting from disparity in rainfall and the response to this constraint. Different farming systems have been identified in Nigeria based on vegetation types and land use practices, and different cropping patterns have also been identified within these farming systems (Ukeje, 2005). Although the majority of cropping in Nigeria is rainfed agriculture, there are four major categories of productive use of water in agricultural production in the country. These are: 'rainfed agriculture'; 'supplementary irrigation'; 'irrigated agriculture' and 'livestock'. Currently only about 5 percent of the cultivated land area is irrigated, yet more than 10 percent of agricultural production comes from these fields (NIPC, 2004). Due to lack of water storage and large spatial and temporal variations in rainfall, there is not enough water for most farmers to produce more than one crop per year . This is attributed to inadequacy of rainfall, variability in the timing of its start and ending or the occurrence of dry spells during dry seasons (FAO, 2000).

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Traditionally, many farm families in Nigeria cultivated small areas in Fadamas during dry season, using water drawn manually from shallow wells or streams. Nevertheless, during the oil boom of the 1970s, an investment programme in support of public irrigation was launched. Public irrigation in Nigeria context means schemes run either by River Basin and Rural Development Authorities (RBRDAs) or by the States through the Agricultural Development Programmes (ADPs).

These programmes included the construction of large dams and pumping stations, especially in the drier northern parts and the middle belt of the country. The promotion of pumps and tube wells, which allow for the extraction of greatly increased amount of water, began in 1980s through the ADPs. By 1990, 162 dams had been constructed with a total storage capacity sufficient to irrigate 725,000 hectares (ha) if developed. Similarly, by 1992 ending, more than 80,000 pumps each irrigating 0.5 and 1.0 ha had been distributed (FAO, 2005). From 1993 onwards, the National Fadama Development Project (NFDP) funded by the World Bank built on the ADPs achievements and by the end of the project in 1999, Over 55,000 pump sets had been distributed with an equipped area of about 1ha per pump. They use cheap techniques for extracting shallow groundwater, which permitted high valued vegetable crop production. (World Bank/ IEG, 2003).

The Lower Niger Basin Development Authority (LNRBDA) was established as one of the twelve River Basin Development Authorities nationwide. It was originally established by Decree No 25 of June 1976 under the name Niger River Basin Development Authority with the Headquarters in Ilorin. In 1984, the authority was split into two namely, the Upper Niger River Basin Development Authority and the Lower Niger River Basin Development Authority with Headquarters in Minna, Niger State and Ilorin, Kwara State respectively. In 1987, the two autonomous establishments were merged again into one Authority with the Headquarters based in Minna, Niger State. However, in 1994 the authority was split again and the Lower Niger River Basin Development Authority was re-established with its headquarters back in Ilorin, Kwara State. The areas of operations of the Authority now cover the entire geographical boundary of Kwara State and part of Kogi State, West of the River Niger. The Authority has remained in the forefront of ensuring a sustainable development in the area of irrigated agriculture, rural and urban water supply, construction of dams, weirs, flood and erosion control (LNRBDA, 2002)

In spite of the efforts of the River Basin and Rural Development Authorities (RBRDAs) and other stakeholder in harnessing the water bodies of the country, through construction of large dams, canal development, wash boring technique, and provision of irrigation schemes for increase food production, Nigeria has not yet reached food sufficiency level. One of the reasons attributed for this shortcoming is the low level of participation of farmers in the dry season irrigation for farm production by the small scale farmers, who constitute the major food producers for the local consumers in this country. It is on this premise that this study sought to identify those factors that are affecting farmers' participation in the project area.

The objective of this study was to investigate the factors affecting farmers' participation in RBRDA's irrigation scheme at Oke-Oyi in Ilorin East LGA. The specific objectives were to:

i. describe the demographic characteristics of the crop farmers around RBRDA irrigation scheme in Oke-Oyi, Ilorin East LGA;
ii. assess the farmers' level of participation in irrigation farming;
iii. identify the factors that are affecting farmers' participation in the scheme.

## 2 METHODOLOGY

### 2.1 The Study Area

The study was carried out in Oke-Oyi in Ilorin East Local Government Area (LGA) of Kwara State, which is located between latitudes $7^0$45'N and $9^0$30'N and longitudes $2^0$30'E and $6^0$25'E. Oke-Oyi has an estimated land area of 490,000 square kilometers (NPC, 2006). The vegetation of the area is characterized by isolated trees such as *Parkia biglobossa*, *Vitellaria paradoxa*, *Adansonia digitata*, *Daniellia oliveri* as well as grasses such as elephant grass, guinea grass and various shrubs and herbs which are typical of the Guinea Savannah region. There are definite wet and dry seasons within the region with rainfall ranging from 250mm – 1000mm at the peak of the rainy season. Mean annual rainfall is between 1000mm and 1500mm. The temperature generally ranges between $25^0$c and $27^0$c but may be as high as $32^0$c at the peak of the dry season. Humidity generally ranges between 70% in the dry period to over 95% at the peak of rainfall. The local population comprises Yoruba, Hausa, Fulani and Nupe ethnic groups. Other tribes like Tiv, Igala and Gara are also found. The major occupations of the people are farming, cattle rearing, weaving and butchery. Others include hunting, leatherwork, poultry enterprise, pottery, mat making and blacksmithing. The major crops grown in the area are Cassava (*Manihot esculentus*), Maize (*Zea mays*), Guinea corn (*Sorghum spp.*), Groundnut (*Arachy hypogaea*), Cowpea (*Vigna ungucuilata*), Okro (A*belmoschus esculentus*) and various leafy vegetables.

The irrigation scheme within Oke-Oyi is located along the Osin River, with a scope of about 500 hectare (ha) of irrigable farmland. However, only about 200 hectare of the total area is being put into use for both rainfed and irrigated agriculture. A 47m concrete weir has been constructed on the project by direct labour to impound a total of 10MCM of water for irrigation activities. Crop produced on the project include maize, okro, onion, vegetable and rice (LNRBDA, 2002).

### 2.2 Data Collection Procedure

The data for this study were obtained from a sample survey conducted in 2014 amongst the local farmers who were participating in Lower Niger River Basin Development Authority irrigation scheme at Oshin in Ilorin East Local Government Area, Oke Oyi, Kwara State. A two stage sampling procedures was used to select the sample for the study. In the first stage, purposive sampling technique was used to select four (4) from ten (10) villages that are located around the Oke-Oyi RBRDA irrigation scheme. The selected villages are: Oke-Oyi, Badi, Adelu and Panada. In the second stage, random sampling technique was used in selecting Forty (40) respondents in each of the villages to give a total of one hundred and sixty (160) respondents for the study. Data were obtained through a well structured interview schedule with both open and close ended questions. The questions directed at the farmers were meant to obtain information on demographic characteristics, farmers' level of participation in irrigation activities, factors affecting their participation and other issues that are pertinent to the focus of the study. The farmers were asked to identify those factors that affect their participation in the scheme based on 3 point likert – type scale of; no effect, little effect, and great effect with the symbols 1, 2 and 3 respectively. However, for brevity of explanation and presentation, little and great effects have been pooled. Therefore we have only the symbols 1 and 2. There are four (4) factors in all with some components.

### 2.3 Data Analysis

The tools of analysis for the study were descriptive statistics such as frequency, percentages and logistic regression model. The descriptive statistics was used to analyse the socio-economic characteristics of the respondents, factors affecting farmers' participation etc. On the other hand, logistic regression was used to test the hypotheses set up for the study. Logistic model was adopted because of its ability to deal with dichotomous dependent variables. According to Roopa (2000), logistic regression is a technique which allows for estimating the probability that an event will occur or not through prediction of a binary dependent outcome from a set of independent variables. Mathematically, the logistic regression Model is depicted thus:

$$P_i=E\ (Y_i=1/x_i) = e^{(\beta_o+\beta_1 X_1+\beta_2 X_2 \ldots\ldots\ldots \beta_i X_i)} \Big/ 1+e^{(\beta_o+\beta_1 X_1+\beta_2 X_2 \ldots\ldots \beta_i X_i)}$$

*Where $P_i$ is a probability that dependent variable $Y_i=1$ if the factor affects farmer's participation and 0 if otherwise. $\beta_o$ is the intercept which is constant, $\beta_1$ is the coefficient of the factors that affect farmer's participation in Oke-Oyi irrigation scheme.*

## 3 RESULTS AND DISCUSSION

### 3.1 Demographic characteristics of the respondents

The study reveals (Table 1) that both male (72%) and female (28%) farmers were participating in the irrigation scheme. However, it should be noted that more female were now involved in this project which suggest that women are now given opportunity to own farm and contribute to household food security. The study also reveals that (74%) of the respondents' age range between 25-53 years. This means that they were within the economic active age. It could be deduced that the youth were been attracted into irrigation farming and given the right working conditions more output can come from the scheme through expansion of farm size and adequate supply of inputs. The study also shows that (68%) of respondents had a form of western education. This implies that information on new technology can be easily disseminated with little effort. Similarly, (11%) and (59%) were family leader and household leaders respectfully. The important of these is that in terms of decision making at the site decision can be easily reached through the identified leaders and information on the decision can be passed successfully.

**Table 1:** Distribution of Respondents' Demographic Characteristics

| Characteristics | Frequency | Percentage | Cumulative Percentage |
|---|---|---|---|
| **Age** | | | |
| 25 – 34 | 18 | 11.0 | 11.0 |
| 35 – 44 | 53 | 33.2 | 44.2 |
| 45 – 54 | 48 | 30.0 | 74.2 |
| 55 – 64 | 32 | 20.0 | 94.2 |
| 65 – 74 | 9 | 5.8 | 100.0 |
| **Total** | **160** | **100** | **100** |
| **Gender** | | | |
| Male | 115 | 71.8 | 71.8 |
| Female | 45 | 28.2 | 100 |
| **Total** | **160** | **100** | **100** |
| **Education** | | | |
| No formal Education | 40 | 25.0 | 25.0 |
| Primary Education | 50 | 31.2 | 56.2 |
| Arabic Education | 11 | 6.9 | 63.1 |
| Secondary Education | 59 | 36.9 | 100 |
| **Total** | **160** | **100** | **100** |
| **Leadership position** | | | |
| Community Leader | 05 | 3.1 | 3.1 |
| Family Leader | 17 | 10.6 | 13.7 |
| Household Leader | 95 | 59.4 | 73.1 |
| Traditional Chief | 01 | 0.6 | 73.7 |
| Elder | 10 | 6.3 | 80.0 |
| Others | 32 | 20.0 | 100 |
| **Total** | **160** | **100** | **100** |

Source: Field Survey, 2014

### 3.2 Participation in Dry Season Irrigation at the Scheme Site and Involvement in Water Distribution

The study shows (Table 2) that majority of the respondents (80.0%) participated in dry season irrigation farming at the Oke-Oyi scheme within the period. The remaining (20%) was practicing irrigation along the river bank, on their own during the dry season. Also majority of respondents (93.7%) have practiced or participated in irrigation farming at the site within the past 5 – 20yrs either as farm owner or as family labour.

**Table 2:** Distribution of Respondents based on Participation in Dry Season farming and participation in Water Distribution Decision

| Variable | Frequency | Percentage | Cumulative Percentage |
|---|---|---|---|
| **Participation in dry season farming at the site?** | | | |
| Yes | 128 | 80.0 | 80.0 |
| No | 32 | 20.0 | 100 |
| **Total** | **160** | **100** | **100** |
| **Years (number) of participation** | | | |
| <5yrs | 8 | 6.3 | 6.3 |
| 5 – 10 yrs | 46 | 35.9 | 42.2 |
| 11 – 15yrs | 54 | 42.2 | 84.4 |
| 16 – 20 yrs | 20 | 15.6 | 100 |
| **Total** | **128** | **100** | **100** |
| **Participation in water distribution** | | | |
| Yes | 61 | 47.7 | 47.7 |
| No | 67 | 52.3 | 100 |
| **Total** | **128** | **100** | **100** |

Source: Field Survey, 2014

Furthermore, the study reveals that (48%) participated in water distribution while the rest did not participate. This suggests that most participating farmers might not understand the responsibilities involved in water distribution because during the survey it was discovered that there was no Water Users Association in the project area but a farmer co-operators

### 3.3 Factors Affecting Farmers' Participation in Irrigation Scheme

The following factors (Table 3) were identified as affecting farmers' participation in irrigation schemes at Oke Oyi Lower Niger River Basin Development Authority, Kwara State, Nigeria.

**Table 3:** Distribution of Respondents Rating of Factors Affecting their Participation

| **Factors by category** | **Relative frequency /percentage** | |
|---|---|---|
| **Psychological/Technical Factors** | **No Effect (1)** | **Great Effect (2)** |
| Lack of interest in farming | 87 (68%) | 41 (32.0%) |
| Poor knowledge on irrigation techniques | 28(21.9%) | 100(78.1%) |
| **Natural/Ecological Factors** | **No Effect (1)** | **Big Effect (2)** |
| Soil fertility | 113 (88.3%) | 15 (11.7%) |
| Disease outbreak | 117(91.4%) | 11(8.6%) |
| Insufficient water for irrigation during the dry season | 25(19.5%) | 103(80.5%) |
| **Economic Factors** | **No Effect (1)** | **Great Effect (2)** |
| Inability to sell farm produce | 118 (92.2%) | 10(7.8) |
| High cost of labour | 31(24.2) | 97(75.8) |
| Inability to access to credit facility | 30(23.4) | 98(76.6) |
| High cost of Operation and Maintenance | 42(32.8) | 86(67.2) |
| Inability to purchase pumping machine | 16(12.5) | 112(87.5) |
| Inability to purchase planting materials | 109 (85.2) | 19(14.8) |
| **Administrative factors** | **No Effect (1)** | **Great Effect (2)** |
| Planting Operations | 116(90.6) | 12(9.2) |
| Poor response to farmers' need by the officials | 19(14.8) | 109(85.2) |
| Irregular pumping of water | 17(13.3) | 111(86.7) |
| Phasing off of sprinkler system | 28(21.9) | 100(78.1) |
| Inability to channel water to my plot | 20(15.6) | 108(84.4) |

Source: Field Survey, 2014

### 3.4 Psychological/Social factors

The study revealed (Table 3) that poor knowledge on irrigation techniques (78.3%) greatly affects farmers' participation in irrigation scheme. This implies that farmers in this area need training on the irrigation techniques especially on water channel construction since irrigation farming is highly dependent on water supply and inability to get it resulted to loss of crops and income for the farmers.

### 3.5 Natural/Ecological Factors

Insufficient water for irrigation during the dry season (80.5%) is the only factor in the natural factors that is affecting farmers' participation. This is logical, since water availability in terms of equitability, adequacy and timeliness would be the motivating factor for farmers to participate in irrigation farming. Similar finding was reported by Oriola, (2006) that unreliable supply and distribution irrigation water leave many farmers dissatisfied and unwilling to participate.

### 3.6 Economic Factors

High cost of labour (75.8%); Access to credit facilities (76.6%); high cost of farm operation and maintenance (67.2%) and Inability to purchase pumping machine (87.5%) are all having great effect on farmers' participation in the scheme. This indicates that these factors are negatively affecting farmers to participate in the scheme. The implication of these is that cost of labour and operation and maintenance affect the overall return to investment because more money was been spent on these two activities while inability to access credit prevents farmers from investing and expanding their farm size. However, it was found that inability to sell farm produce (92.2%) and inability to purchase planting materials (85.2%) do not affect farmers' participation in the scheme. This implies that there was market for their farm produce and they can purchase their planting materials easily and cheaply.

### 3.7 Managerial / Administrative Factors

The result indicates that poor response to farmers' need by officials (85.2%); irregular pumping of water (86.7); phasing off of sprinkler system (78.1%); and inability to channel water to the plot (54.4%) are all major factors affecting farmers' participation in the scheme. The irregular pumping of water and inability to channel water to the farm plot affect the crop yields which discouraged participation, also inability to get access to professional information/advice at a critical time of need acts as limiting factor to production demoralized farmers and left them helpless. Similarly phasing off of sprinkler system discouraged participation since most of the respondents did not know much about water channel construction, they spent more money on labour.

### 3.8 Relationship between Identified Factors Affecting Farmers' Participation and Actual Participation in Irrigation Scheme

The results of logistic regression model for probing the relationship between identified factors affecting farmers' participation and actual participation in irrigation scheme are summarized in Table 4. The study shows that after adding more variables and removing some the logistic model explains 70% of the total variables in the factors affecting respondents' participation in irrigation farming. At 5% level of significant, lack of interest in farming (0.006), poor knowledge on irrigation faming (0.040), insufficient water for irrigation during the dry season (0.003), high cost of labour (0.000), access to credit facility (0.000),poor response to farmers' need by officials (0.004), irregular pumping of water (0.025) and phasing off of sprinkler system (0.017) were all jointly affected the participation in irrigation scheme. Expected β statistics suggests that the odds of participation in irrigation decreases for lack of interest in farming, poor knowledge on irrigation techniques, insufficient water for irrigation during the dry season, high cost of labour, access to credit facility, inability to purchase pumping machine as well as poor response to farmers' need by officials of the agency by 0.034, 0.069, 0.179, 0.134 and 0.011 respectively. This indicates that effort towards improving participation in irrigation should be directed towards these factors because of their significant negative effects. However, high cost of operation and maintenance, irregular pumping of water and phasing off of sprinkler system suggests that the odds of participation in irrigation increases by 0.049, 0.119, and 0.096 despite the effects. This indicates that if other variables/factors were addressed properly, farmers would be able to pay for operation and maintenance, use their pumping machine in case of failure by authority to pump water and still able to make profit from irrigation farming. Since irrigation farming is largely dependent on water supply and distribution, any policy reform that focuses on timeliness, adequacy and equitability of water will surely lead to increased participation.

**Table 4:** Regression analysis of Selected Factors and Participation in Irrigation

| Variables | B | S.E | Sig | Exp β |
|---|---|---|---|---|
| **Psychological/Technical Factors** | | | | |
| Lack of interest in farming | -0.059 | 0.058 | 0.006* | 0.034 |
| Poor knowledge on irrigation techniques | -0.179 | 0.041 | 0.040* | 0.069 |
| **Natural/Ecological Factors** | | | | |
| Insufficient water for irrigation during the dry season | -0.308 | 0.048 | 0.003* | 0.128 |
| **Economic Factors** | | | | |
| High cost of labour | -0.377 | 0.043 | 0.000* | 0.179 |
| Access to credit facility | -0.374 | 0.031 | 0.000* | 0.134 |
| High cost of O & M | 0.100 | 0.042 | 0.253 | 0.049 |
| Inability to purchase pumping machine | -0.034 | 0.049 | 0.702 | 0.019 |
| **Administrative Factors** | | | | |
| Poor response to farmers' need by the officials | -0.016 | 0.063 | 0.004* | 0.011 |
| Irregular pumping of water | 0.138 | 0.088 | 0.025* | 0.119 |
| Phasing off of sprinkler system | 0.174 | 0.051 | 0.017* | 0.096 |
| Inability to channel water to the plot | -0.161 | 0.046 | 0.164 | 0.125 |

Source: Field Survey, 2014

## 4 CONCLUSION

This study shows that, given their experience, farmers can adequately identify their problems on the scheme as they were able to rank the factors affecting their participation in the irrigation scheme. Economic and Managerial factors were the major factors that were affecting their participation in the scheme.

Participation of farmers in irrigation is so much dependent on the availability of water in terms of adequacy, timeliness and equitability. Farmers were discouraged from participating in the scheme due to failure of the authority to pump water into their plots especially at the critical growth stage of the crops which resulted into economic loss for the farmers. Therefore, prior to the beginning of planting season, farmers should be trained especially by other trained farmers on some rudiments of irrigation techniques. They should be linked to the source of finance where loans can be easily accessed for production purposes. There were no Water Users Association (WUA) that will represent farmers' interest in any decision making process, therefore decisions were mainly top-down approach.

Water Users Association (WUA) should be established in communities within the scheme area for effective communication between farmers and the Authority. The Authority (LNRBDA) should encourage Participatory Irrigation Management (PIM) that would give farmers opportunity to share in decision making regarding irrigation development at the site.

Decision on water allocation should be given to WUA while the authority serves as supervisory and advisory body.

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