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ASSESSMENT OF EFFECTS OF IRRIGATION SYSTEM ON MAIZE PRODUCTION IN ORIRE LOCAL GOVERNMENT AREA, OGBOMOSO OYO SATE, NIGERIA

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ABSTRACT

The study assessed the effects of irrigation system on maize production in the study area. Multistage sampling was used to select the respondents for this study. The data for this research work was collected through administration of a well-structured questionnaire. Descriptive statistic was used to describe the socio economic characteristics of the respondents while multiple regression analysis was used to test the hypothesis for the study. The mean age was 52 years, most of them were married, most of them had formal education, with an average of 10 years of experience in primary occupation while more of male engaged in irrigated maize production in the study area. The mean farm size under cultivation was 11.5 hectares while the mean farm size under maize production was found to be 6.21hectares. Most of them engaged in surface irrigation system. The fact that irrigation provides the means for maximize production with multiple cropping was the most widely identified benefits associated with irrigation system while insufficient water resources was the most widely identified problems associated with utilization of irrigation system. The total cost of N31305.71 was spent on all the production inputs while the total was found to be N181113.57. Based on the finding, it was concluded that maize production under irrigation system is highly profitable despite some constraints such as poor access to water resources. More effort should be made by all stakeholders in agriculture and water resources management through adequate water management practices so as to allow for year round availability of water for irrigation purposes to increase yield especially during the dry season.

KEYWORDS: Assessment, Effects, Irrigation, Maize, Production

INTRODUCTION

Agriculture is the mainstay of the economy of the Nigeria National Regional State (NNRS). The sector contributes about 62% to the region's GDP and more than 90% of the labor force is engaged in Agriculture (Tewodros Bekafa, 2006). However, agriculture has become the most volatile sector mainly due to its dependence on rainfall and the seasonal shocks that are frequently occurring. Almost in all areas of the region, farmers are practicing their farming entirely under rain fed conditions. On the other hand the rainfall is usually inadequate, short in duration, poorly distributed and highly variable between and within seasons. In most areas the rainfall often fails to support economically viable farming. Consequently, agriculture in many parts of the region has become frequently subjected to recurrent drought and frequent crop failure. This in turn has predisposed about 20% of the regional population to chronic food insecurity (Kebedemulatu et al., 2006). Thus, it has become clear that without a reliable supply of water and its appropriate management, it is simply

impossible to attain sustainable development in the agriculture sector. If farming has to continue to rely on such uncertain rainfall, ensuring food security and attaining economic growth on sustainable basis would remain a futile exercise, unless and otherwise the sector receives sufficient water supply through irrigation. Irrigation provides the means to maximize production with multiple cropping, taking full advantage of modern technologies and high yielding crop varieties. Fortunately, the Oyo region is blessed with relatively abundant surface and ground water resources, which, if utilized efficiently, could entirely change the existing scenario of the sector (Ambara et al., 2006).

Recently in Oyo State where modern and traditional irrigation schemes are developed, maize is becoming an irrigated crop in the region. Nonetheless, farmers are still irrigating the crop using their traditional knowledge without any determined amount and frequency of irrigation. Thus, to efficiently utilize the scarce water resource for maize production it is essential to identify growth stages that are sensitive to water stress and also identify growth stages at which deficit irrigation could be imposed without significantly affecting maize yield. However, information on deficit irrigation on maize is scanty in the Oyo National Regional State in particular (FAO, 1986).

Statement of the Problem

Constraints to the availability of water for irrigated agriculture are increasingly evident in many countries. Shortage may be seasonal, year round, or progressively significant as demands from other users expand. Owing to the wide scale expansion of irrigation farming in the region, water has become increasingly a scarce resource. Scarcity is further complicated when water supplies are uncertain. Declining water resources and increasing food requirements require greater efficiency in water use; both in rain fed and in irrigated agriculture, based on the aforementioned facts, this study addressed the following research questions:

- What are the socio economic characteristic of the respondents?
- What are the available irrigation systems in the study area?
- What is the output of maize cultivated under irrigation practice in the study area?
- What are the benefits of applying irrigation system on maize production?
- What are the constraints to utilization of irrigation system for maize production in the study area?
- What are the cost and return from maize production?
- What are the major sources of water for irrigation farming in the study area?

Objectives of the Study

The general objective of this study is to assess the effects of irrigation system on maize production in the study area.

The Specific of the Study Are To

- Examine the socio economic characteristic of the respondents in the study area;
- Identify the available irrigation system in the study area;

- Examine the output of maize cultivated under irrigation practice in the study area;
- Identify the benefit of applying irrigation system on maize production;
- Examine the constraints to utilization of irrigation system for maize production in the study area and;
- Determine the costs and returns from maize production.
- Identify the major sources of water for irrigation farming in the study area.

Hypotheses

H_{O1}: There is no significant relationship between the types of irrigation system used for maize production and the returns from maize production under irrigation system in the study area.

H_{O2}: There is no significant relationship between the socio-economics characteristics of the respondents and returns from maize production under irrigation system in the study area.

Justification

Proper irrigation management demands application of water at the time of actual need of the crop with just enough water to wet the effective root zone soil. The importance of optimum moisture content for crops at a given stage of growth has been considered in irrigated crop production. The supply of water especially through irrigation system is necessary to allow for year round agricultural production. This study will therefore provide a policy framework on how to effectively utilize opportunities associated with irrigation system.

Theoretical Framework

Farmers using irrigation have been identified as a key source of agricultural growth and development as opposed to previous irrigation development policies according to River Basin Development, where irrigation schemes were designed and managed by government agencies for farmers. Irrigation has been long practiced in northern Nigeria where farmers have traditionally undertaken irrigation through the use of such technologies and methods as shadouf, buckets and calabash to produce high value agronomic and horticultural crops which are widely grown such as rice, sugar cane, cocoyam, leafy vegetables among others diverse cropping system. Fruits trees like citrus, mango and cashew, etc are planted on agricultural lands, this provides cash income as well as food crops to the farmers (Ohikere, 2012).

(Kirda et al, 2002). Observed that irrigation has made higher and more reliable yield possible as crops can be planted more than once in a year within the topics, apart from bigger and reliable yield as against yearly cultivation, which is often at the mercy of seasonal rainfall.

MATERIALS AND METHODS

The research work was carried out in Orire Local government area of Ogbomoso in Oyo State. The local government is bounded in the north by Irepodun Local Government. This study area was located within longitude 8.3°N and Latitude 4.5°E of the equator with a land mass of 2,040sqkm, with mean annual temperature of 26.2 C, lowest temperature of 24.3°C while the highest temperature is 28.7°C. Mean annual rainfall is 1,247mm, long wet in middle March-July, heavy rain and humidity period. Short dry in August and short wet between September - October. The

population density is 150,628 as at 2006 census.

Sampling Procedure and Data Collection

Multistage sampling was used to select the respondents for the study. First stage involved random selection of three cell due to concentration of farmers in Ikoyi Ile, Ikosi and Iluju. The name of registered maize farmers will be seemed from ADP office in the area. There was therefore random selection of 40% of maize farmers in each cell.

Method of Data Collection

The data for this research work was collected through administration well-structured questionnaire and interview schedule. The questions in the questionnaire was developed based on the objectives of the study

Method of Data Analysis

Descriptive statistical technique was used to describe the socio-economic characteristics of the respondents while multiple regression analysis was used to test the hypothesis for the study.

Model Specification

$$Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + e$$

Where

Y = Returns from maize production

X_1 = Age of head of household (years)

X_2 = Sex (male or female)

X_3 = Household size (number of household members)

X_4 = Education (number of years spent in school)

X_5 = Marital status (married or single)

X_6 = Farming experience (number of farming years)

X_7 =variable for irrigation

E = Error term

RESULTS AND DISCUSSIONS

Socio- economic characteristics

Table 1 shows the distribution of respondents by age. It was revealed that 54.3 percent of the respondents were between 51-60 years, 34.3 percent were between 41-50 years, 5.7 percent were above 60 years and another 5.7 percent were about 30 years. The mean age was 52 years. The mean age indicates that most of the respondents were still active to participate in irrigated maize production

Sex of the Respondents

The distribution of respondents based on their sex was presented in Table 2. Based on the distribution, 60.0 percent were male while 40.0 percent of the respondents were female. The result therefore revealed that more of male than female engaged in irrigated maize production in the study area.

Marital Status

Table 3 presented the distribution of respondents by marital status. Based on the distribution, 85.7 percent of the respondents were married, 4.3 percent were single, another 4.3 percent of them were widowed, while 2.9 percent were separated and divorced respectively. It was therefore revealed that most of them were married which is an indication that most of them are more likely to be responsible farmers.

Respondents Religious Affiliation

The result in Table 4 indicates that 61.4 percent of the respondents were Muslims, 20.0 percent were Christians while 18.6 percent were traditional worshippers. The three major religious co-exist in the study area. This peaceful co-existence could go a long way for production stability.

Secondary Occupation

Table 5 presented the distribution of respondents by secondary occupation. Based on the result, 62.9 percent of the respondents engaged in trading as their secondary occupation, 24.2 percent engaged in artisan activities while 12.9 percent engaged in civil service as their secondary occupation. This implies that most of them were more likely to sell what they produce.

Experience in Primary Occupation

The result in Table 6 presents the distribution of respondents by years of experience in primary occupation. Based on the distribution, 70.0 percent of the respondents had between 6-10 years of experience in primary occupation, 11.4 percent had between 11-20 years of experience in primary occupation, 8.6 percent had between 11-15 years of experience, 5.7 percent had about 5 years of experience while 4.3 percent had above 20 years of experience in their primary occupations. The mean years of experience in primary occupation was 10 years which is an indication that many of them had secure reasonable years of experience which could positively influence the usage of irrigation system with a resultant effect on production.

Years of Schooling

Table 7 presented the distribution of respondents by years of schooling. It was revealed that 27.1 percent of the respondents had between 7-12 years of schooling, 12.9 percent had above 12 years of schooling, while 8.6 percent and between 1-6 years of schooling. However, 51.4 percent of the respondents had no formal education. The result therefore indicates that most of the respondents had no formal education which could influence level of adoption of irrigation system in maize production.

Farm Size under Cultivation

Table 8 presented the distribution of respondents by farm size under cultivation. Based on the result, 71.4 percent

of the respondents cultivated an average of 10 hectares of farm size, 20.0 percent had 11-20 had between 21-30 hectares, while 5.7 percent had above 30 hectares of farm size under cultivation. The mean farm size under cultivation was 11.5 hectares.

Farm Size Under Maize Production

Based on the result in Table 9, it was revealed that 50.0 percent of the respondents had between 4-6 hectares of farm size under maize production, 25.7 percent had about 3 hectares of farm size under maize production while 24.3 percent had between 7-10 hectares of farm size under maize production. The mean farm size under maize production was found to be 6.21hectares.

Membership of Organization

Table 10 indicated that distribution of respondents by membership of organization. It was revealed that 64.3 percent of the respondents were members of organization, while 35.7 percent were non-members of organization.

Sources of Credit for Primary Occupation

The distribution of respondents based on sources of credit for primary occupation was presented in Table 11. The sources of credit for primary occupation identified included personal savings (100.0%), bank (50.0%), commercial bank (25.7%), cooperative society (25.7%), and family and friend (24.3%).

Types of Irrigation System

The result in Table 12 indicated the distribution of respondents by types of irrigation system. It was revealed that 74.3 percent of the respondents practiced surface irrigation system while 50.0 percent practiced underground irrigation system. It is therefore revealed that most of the engaged in surface irrigation system.

Benefits of Irrigation System

Result presented in Table 13 indicates benefits derived from irrigation system. The irrigation provides the means to maximize production with multiple cropping (100.0%), it allows for year round production of crop (84.3%), it gives room for efficient use of available water resources (94.3%), it increases the yield of farmers (98.6%), it also reduces incidences of crop failure due to dividing rainfall (52.9%), and it also helps in maximum utilization of land (55.7%). It was therefore revealed that the fact irrigation provides the means to maximize production with multiple cropping was the most widely identified benefits associated with irrigation system.

Constraints to Utilization of Irrigation System

Result presented in Table 14 indicates problems associated with respondents' access to agricultural production resources. The problems identified include decreasing water resources (wms=2.86), technical know-how (wms=2.40), contour of the irrigated area (wms=2.33), high cost of equipment such as pipes, pumping machine (wms=2.30), poor soil texture (wms=1.39), distance of the water source to the irrigated area (wms=1.37), breaking of pipes by miscreants (wms=1.27), problem of land tenure system (wms=1.21), and problem of bush burning (wms=0.94). It was therefore revealed that decreasing water resources was the most widely identified problems associated with utilization of irrigation system.

Cost Involved in Maize Production

Table 15 shows the distribution of respondents by average cost of maize production under irrigation system. Based on the result, an average of #26652.87 naira was spent on the usage of pipes, an average of #8818.2 naira was expended on pumping machine, #41478.76was spent on installation of irrigation equipment, #2509.045 was spent on workmanship, #131.141 was spent on rentage of water source, #16084.56 was spent on sprinklers, #10270.86 was spent on nozzles, #11071.42 was spent on transportation, while #23220.6 was spent on labour. The total cost of #31305.71 was spent on all the production inputs.

Returns from Maize Production Under Irrigation System

Table 16 shows the distribution of respondents by returns from maize production under irrigation system. An average of #129807.14 naira was realized from the sales of maize, an average of #6075.71 naira was realized from sales of corn bran, #2676.86 naira was obtained from the sales of offal's while #42553.86 naira was realized from rentage of irrigation equipment. The total was found to be #181113.57 from the sales of maize, maize by products and rentage of irrigation equipment.

Sources of Water for Irrigation

Table 17 shows the distribution of respondents by sources of water for irrigation. The sources of water for irrigation include river (81.4%), dung well (14.3%) and tap water (4.3%). The result therefore indicates that river was the major source of water for irrigation system in the study area. This development may be associated with the fact that river water is easily accessible, cheap and reliable.

Table 1: Distribution of Respondents by Age

Age	Frequency	Percentage
≤30	-	-
31-40	4	5.7
41-50	24	34.3
51-60	38	54.3
Above 60	4	5.7
Total	**70**	**100.0**

Source: Field Survey, 2015.

Mean ($\bar{X}$) = 52 years

Table 2: Distribution of Respondents by Sex

Sex	Frequency	Percentage
Male	42	60.0
Female	28	40.0
Total	**70**	**100.0**

Source: Field Survey, 2015.

Table 3: Distribution of Respondents by Their Marital Status

Marital Status	Frequency	Percentage
Married	60	85.6
Separated	2	2.9
Divorced	2	2.9
Single	3	4.3
Widowed	3	4.3
Total	**70**	**100.0**

Source: Field Survey, 2015.

Table 4: Distribution of Respondents by Religion

Religious Affiliation	Frequency	Percentage
Christianity	14	20.0
Islam	43	61.4
Traditional	13	18.6
Total	**70**	**100.0**

Source: Field Survey, 2015.

Table 5: Distribution of Respondents by Secondary Occupation

Secondary Occupation	Frequency	Percentage
Artisan activities	17	24.2
Trading	44	62.9
Civil Service	9	12.9
Total	**70**	**100.0**

Source: Field Survey, 2015.

Table 6: Distribution of Respondents by Years of Experience in Primary Occupation

Years of Experience in Primary Occupation	Frequency	Percentage
≤5	4	5.7
6-10	49	70.0
11-15	6	8.6
16-20	8	11.4
Above	3	4.3
Total	**70**	**100.0**

Mean ($\bar{X}$) = 10 years
Source: Field Survey, 2015.

Table 7: Distribution of Respondents by Their Years of Schooling

Years Schooling	Frequency	Percentage
0	36	51.4
1-6	6	8.6
7-12	19	27.1
Above 12	9	12.9
Total	**70**	**100.0**

Source: Field Survey, 2015.

Mean ($\bar{X}$) = 5 years

Table 8: Distribution of Respondents by Their Farm Size under Cultivation

Farm Size under Cultivation (Hectares)	Frequency	Percentage
≤10	50	71.4
11-20	14	20.0
21-30	4	5.7
Above 30	2	2.9
Total	**70**	**100.0**

Source: Field Survey, 2015.

Mean ($\bar{X}$) = 11.5 hectares

Table 9: Distribution of Respondents by Farm Size under Maize Production

Farm Size under Maize Production (Hectares)	Frequency	Percentage
≤3	18	25.7
4-6	35	50.0
7-10	17	24.3
Total	**70**	**100.0**

Source: Field Survey, 2015.

Mean ($\bar{X}$) = 6.21 hectares

Table 10: Distribution of Respondents by Membership of Organization

Membership of Organization	Frequency	Percentage
Member	45	64.3
Non-member	25	35.7
Total	**70**	**100.0**

Source: Field Survey, 2015.

Table 11: Distribution of Respondents by Sources of Credit for Primary Occupation

Sources of Credit for Primary Occupation	Frequency	Percentage
Personal savings	70	100.0
Bank	35	50.0
Commercial bank	18	25.7
Cooperative society	18	25.7
Family and friend	17	24.3

Source: Field Survey, 2015.

*** Multiple Responses**

Table 12: Distribution of Respondents by Types of Irrigation System

Types of Irrigation System	Frequency	Percentage
Surface irrigation	52	74.3
Underground irrigation	35	50.0
Aerial irrigation	-	-
Total	**70**	**100.0**

Source: Field Survey, 2015.

*** Multiple Responses**

Table 13: Distribution of Respondents by Benefits from Irrigation System

Benefits of Irrigation System	Frequency	Percentage
Irrigation provides the means to maximize production with multiple cropping	70	100.0
It allows for year round production of crop	59	84.3
It gives room for efficient use of available water resources	66	94.3
It increases the yield of farmers	69	98.6
It also reduces incidences of crop failure due to dividing rainfall	37	52.9
It helps in maximum utilization of land	39	55.7

Source: Field Survey, 2015

*** Multiple responses**

Table 14: Distribution of Respondents by Constraints to Utilization of Irrigation System

Constraint to Utilization of Irrigation System	Very Severe	Severe	Fairly Severe	Not a Constraint	WMS	Rank
Decreasing water resources	62(88.6)	6(8.6)	2(2.9)	0(0.0)	2.86	1st
High cost of equipment such as pipes, pumping machine, e. t. c.	26(37.1)	40(57.1)	3(4.3)	1(1.4)	2.30	4th
Technical know-how	31(44.3)	36(51.4)	3(4.3)	0(0.0)	2.40	2nd
Contour of the irrigated area	28(40.0)	38(54.3)	3(4.3)	1(1.4)	2.33	3rd
Distance of the water source to the irrigated area	0(0.0)	30(42.9)	36(51.4)	4(5.7)	1.37	6th
Breaking of pipes by miscreants	4(5.7)	28(25.7)	41(58.6)	7(10.0)	1.27	7th
Problem of land tenure system	2(2.9)	18(25.7)	43(61.4)	7(10.0)	1.21	8th
Problem of bush burning	0(0.0)	9(12.9)	20(28.6)	41(58.6)	0.94	9th
Soil texture	3(4.3)	27(38.6)	34(48.6)	6(8.6)	1.39	5th

Source: Field survey, 2015
W ms= Weighted Mean Score

Table 15: Cost Involved in Maize Production

Inputs (Items)	Unit	Cost Per Unit (N)	Total Cost (N)
Pipes	9.00	2961.43	26652.87
Pumping machine	4.26	2070.00	8818.2
Installation	5.54	7487.14	41478.76
Workmanship	2.74	915.71	2509.05
Rentage of water source	0.51	257.14	131.14
Sprinklers	2.27	7085.71	16084.56
Noozles	3.80	2702.86	10270.868
Cost of transportation	2.00	5535.71	11071.42
Cost of labour	10.14	2290.00	23220.6
Total	**40.26**	**31305.7**	**116250.6**

Source: Data analysis, 2015
Total cost = N31305.71

Table 16: Returns from Maize Production under Irrigation System

Items	Unit (Quantity)	Price/Unit (N)	Total Revenue (N)
Maize	9.149	14228.57	129807.14
Corn bran	4.29	1420.43	6075.71
Corn offals	3.093	859.29	2676.86
Rentage of irrigation equipment	1.26	822.86	42553.86

Source: Data analysis, 2015

Total revenue = N181113.57

Profitability of maize production under irrigation system

Profit = Total revenue – Total cost

Profit= #181113.57-#140237.46==== #40876.11

Table 17: Distribution of Respondents by Source of Water for Irrigation

Sources of Water for Irrigation	Frequency	Percentage
Dung well	10	14.3
Tap water	3	4.3
River	57	81.4
Total	**70**	**100.0**

Source: Field survey, 201

CONCLUSIONS

The study examined the effect of water irrigation on agricultural productivity. The optimum irrigation farming computed showed that re organization, well planned and proper irrigation application would yield more income to farmers

CONTRIBUTION TO KNOWLEDGE

This study provides a policy framework on how to effectively utilize opportunities associated with irrigation system. It was therefore revealed that irrigation provides the means to maximize production with multiple cropping. The study also provides adequate means for all stakeholders in agriculture and water resources management through adequate water management practices so as to allow for year round availability of water for irrigation purposes to increase yield especially during the during season.

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