Economics of Irrigation Farming Around River Niger Bank in Edu Local Government Area Of Kwara State, Nigeria

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ABSRACT

The study examined the Economics of Irrigation Farming around river Niger bank in Edu Local Government Area of Kwara State. Data was collected from 70 farmers who were randomly selected from purposively selected area, using structured questionnaires. Data was analyzed using Descriptive Statistics, Gross Margin and Production Function Analysis. The result of the analysis shows that majority of the farmers (91%) were within the age range of 30 - 50 years. The cost and returns analysis showed a high rate of positive returns; the gross margin estimated was N134,505.59. The measurement of resource use efficiency showed that only purchased inputs were relatively efficiently utilized. The returns to scale of 1.05 also showed an increasing return to scale. However, some of the constraints to irrigation farming include flooding, inadequate capital, pest and diseases, inadequate infrastructure, lack of extension education, etc. It was recommended that farmers should form cooperatives, extension education should be

INTRODUCTION

Nigeria is predominantly an agricultural country blessed with an estimated 98.3 million hectares of land, of which about 75 percent is arable, and an estimated human population of about 110 million people (World Bank, 1996). This notwithstanding, Nigeria lags far behind in its ability to grow enough food to feed its ever increasing population - Food Insecurity (World Bank, 1992).

Acute seasonality of tropical climate and random variability in their weather have significantly, hindered timely operations as well as contribute to lowering labour productivity (Ndanitsa and Umar, 2009). Oyaide (1992) revealed that the wide difference existing between wet and dry season and the changing dependability of rainfall are such that there exit a significant dependence on rainfall farming. The question that arises is, what can be done to minimize the problems of seasonality in food production. What are the possible ways of making Nigerian agriculture more developed in order to provide adequate food for the increasing population and raw materials for the industrial sector especially the agro-allied. The feasible solution lies only in economically efficient provision of irrigation water.

There is the need for agricultural policies that favour agricultural production in order to increase output substantially. Ijere (1994) reported that policy measured at agricultural development in Nigeria's drier regions have thus been predicted that the greatest threat to agriculture and hence food security in this region stems from decline and erratic as well as in periodic drought.

Recognizing that the full potentials of Nigeria's agriculture could not be realized without the development of her water resources for irrigation, governments in Nigeria have adopted various irrigation development policies. One of the most recent irrigation policy trust is small-scale Fadama (in-land valley lands which are low-lying and seasonally flooded) development. The World Bank is implementing this policy-assisted Agricultural Development Projects under the National Fadama Development Project (NFDP).

The urge for survival and the need for additional food supply are necessitating a rapid expansion of irrigation practice throughout the world. It is now becoming increasingly important (in the humid regions) because of the need for dry season production of crops especially vegetables (Ismaïl, 2004).

Irrigation essentially refers to a system of agricultural production where surface and

underground waters are harnessed to make up for deficiencies in distribution of the precipitation over time and space (Balogun, 1986). The author further argued that it is the distribution in time and space and the dependability of the rainfall that are the major problems.

Gross cropped area can be increased by ensuring double cropping in the 34 million hectares of net sown area through irrigation in the dry season apart from using irrigation to increase cultivable net cropped area. This is possible since Nigeria's annual surface water is estimated at about 193 x 109m3 with the volume of ground water estimate to be many times each surface water (Ayimodu, 1981).

The development of irrigation agriculture not only provides enhanced incomes to farmers but also makes a significant impact on the drive towards self-sufficiency in food production and self-reliant in the economy. The land with irrigated infrastructures can be cropped extensively during the rainy season, thus making the land much more productive. Off season production of various food crops and vegetables commands better prices than those produced during the traditional growing season, when the market is flooded with farm produce (Ndanitsa, 2005). Similarly, farmers who otherwise would have idle during the dry season are gainfully employed (Fatokun, 1988).

The application of water to agricultural land for the purpose of irrigation is one of the alternative uses of these natural resources in many areas. And considering the situation of wide variation in rainfall from year to year and during the year with respect to amount incidence and area distribution, it is therefore essential that water is used effectively and efficiently whether the supply is limited or excessive. And going by the available methods of irrigation today, which offer the potential (if all goes well) for doubling or even quadrupling crop yield and for considerably reducing risks of crop failure.

In addition, irrigation is often proposed as a solution to the problems of arid and semi-arid regions under the condition of rapid development and structural transformation witnessed in the region. It is not easy to maintain the fragile balance of arid ecosystems and to check the accompanying threat of desertification (Johl, 1979).

Furthermore, as a result of irrigation, the entire agricultural operation assumes a more intensive form, while productivity per unit area is substantially raised. The marked increases in productivity are clearly confirmed by several authorities including the FAO statement of the effect that although only 13 percent of the cultivated areas of the earth is irrigated, irrigation provides 25 percent of the World Food Production (Sanda, 1992).

Nigerian-economy will continue to shift towards agricultural dominance for the foreseeable future, and irrigation will definitely continue to be a pre-requisite future for our National Agricultural Development. Beside, irrigation will continue to be a key element in all agricultural programs directed at rural development and poverty alleviation.

The role of irrigation can be seen in better perspective by comparing present and better perspective production from irrigated farms with those from rainfall agriculture. Of the 90 million hectares cultivable out of which at least 9 million hectares are irrigable. To date, 2 million hectares of the irrigable land have been identified. If 25 percent of this were put under irrigation and cropped twice to maize and/or rice, at least 2,000,000 metric tones of maize and 5,000,000 metric tones of rice would be produced annually. The country's food-supply demand deficit would not only be obliterated in a short time but lot of surplus would be available for export (Ogunlana, 1988).

Problem Statement and Objectives

With the development in agronomic practices with the use of facilities and chemical fertilizers and proper understanding of soil-water relationships and management, the selection of crops best suited to local conditions and going by the extent of government investment in both large and small-scale irrigation schemes around the nation, it is expected that irrigated agriculture should be at its full potential to ensure food security, but to a large extent, this seem not to be case. Hence, the need to examine the activities of farmers around an irrigation scheme, to answer questions like how well are they doing financially? Is agricultural production under irrigation profitable in the study area? What problems are encountered by the farmers in the area, and how can their activities be improved upon. The study aims at providing answers to these and several other related questions.

The specific objectives of the study are to:-

i. highlight the socio-economic characteristics of farmers in the study area

ii. Examine the existing farming activities carried out under irrigation in the study area.
iii. Determine the cost and returns of farming activities in the study area.
iv. Determine the resource use efficiency of farmers in the study area.
v. To highlight the socio-economic and physical factors facing farmers as a result of the irrigation scheme.

These economic slides are needed to ensure the benefits and compare them with the cost (Ndanitsa and Umar, 2007). Also, production potentialities and the physical and operation constraints which affect irrigated farming becomes necessarily subjected to evaluation. It is against this background that this study was undertaken.

METHODOLOGY

The study was carried out in Edu Local Government Area (L.G.A.) of Kwara state. Edu L.G.A. is one of the 16 constitutionally recognized L.G.As existing in Kwara state. It was created in 1976 with her headquarters in Lafiagi. The L.G.A. shares boundaries with Ifelodun L.G.A. in the South, in the East with Patigi, North by river Niger and Niger state respectively. Major language spoken is Nupe. According to 2006 National Population Census, NPC (2009) Edu Local Government Area has a population of two hundred and one thousand six hundred and forty two (201,642) people. It covers an estimated land area of 252,432km2. It is located in the Guinea Savannah and lies between latitude 11O15'N and longitude 7O23'E, with annual range of rainfall from 1000 – 1500mm, and with six months wet and six months dry season. Mean Annual temperature ranges from 30OC – 35OC.

The main occupation of the people is farming especially around the banks of river Niger with irrigation. Food and cash crops are therefore produced in both seasons (wet and dry) but production is at a subsistence level. Commonest food crops cultivated in the area include; rice, maize, groundnut, sugar cane, millet, cassava, yam, guinea corn, sorghum, vegetable etc.

The selected area of study is Bacita community. Bacita is a rural community in Tsaragi district of the L.G.A. The choice of this locality was premised on the fact that Fadama farming (or small-scale irrigation) and agricultural activities is essentially a rural activity (Baba, 2004). The community has an estimated population of over 70,000 people who are predominantly farmers. The commonest crops irrigated in the area are sugar cane, rice and maize. Fishing activities are also common in the community.

In Bacita Community, 75 farmers were randomly selected, and information on the Economics of irrigation farming was received with the aid of questionnaires accompanied with interpersonal interview. Both primary and secondary data were used. The latter were obtained by consultation of relevant text books and documents (journals, proceedings, conference papers, invited papers etc.) provided by Irrigation Department of the Nigeria Sugar Company, Bacita (NISUCO) now Josepdam Sugar Company (JSC). Data was collected between December, 2008 and January, 2009.

Data Analysis

Descriptive statistics was used in the analysis of data on Socio-Economic Characteristics of the farmers (Objectives i.) and (objective iii), which is the heightening of socio-economic and physical factors affecting farmers as a result of the irrigation scheme, and existing farming activities under irrigation (objective ii). Descriptive Statistics employed include frequency distribution, means, Averages and percentages. Data on analysis of Cost and Returns were undertaken by Farm Budgeting Model (Gross Margin Analysis). The Farm Budget tool is an operation leading to the determination of costs and revenue for a given production period (Olayide and Heady, 1982). Gross Margin (GM) is expressed as:

GM = GI – TVC

Where GM = Gross Margin
GI = Gross Income and
TVC = Total Variable Cost

Objective iii was achieved by employing Production Function Model (Regression Analysis). The production function has been described as the traditional tool for analyzing problems for resource productivity and returns to scale in agriculture. Upton (1979), Baba (2007) and Tanko (2007) described production function as a technical relationship between inputs and outputs. It has been widely used to acquire information on productivities of resources, elasticity of production, return to scale by economists and econometricians. The production function in its explicit form is expressed as:

Q = F(X1, X2, X3, X4, X5 , U)

The dependent variable will be specified as a function of five (5) independent variables:

1. Land used in hectares (ha)
2. Family plus hired labour used on the irrigation scheme.

3. Purchased inputs in Naira (N)
4. Fertilizer used in Kilograms (kg) and
5. Quantity of irrigation water used in cubic metres (m3) = 102m3.

The model in its implicit form is,

Q = F(X1, X2, X3 X4, X5, U)

Where:

Q = Output in Rice grain equivalent
X1 = Land Cultivated in hectares
X2 = Labour used in man-days
X3 = Purchased Inputs in Naira (N)
X4 = Fertilizer used in Kilogram (kg)
X5 = Quantity of irrigation water
U = Error term

To determine the influence (inputs on output) in the study area, four forms of production function. Linear, Semi-log, Exponential and Double log functions were fitted to the survey data. Using statistical selection criteria and following Baba (1989), Omotesho (1991), Omotesho and Oluwale (1991), Faseyi (1994), Ndanitsa (2005 and 2009); who have worked on related studies, it was established that Cobb-Douglas (Double-log) production function gave the best fit and estimation of farming and irrigated agriculture.

The fitted functions are:

Linear function:

$Q = bo + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + U$

Semi log function:

$Q = logbo + b1\ logX1 + b2logX2 + b3logX3 + b4logX4 + b5logX5 + logU$

Exponential

$LogQ = bo + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + U$

Cobb-Douglas function:

$LogQ = logbo + b1\ logX1 + b2logX2 + b3logX3 + b4logX4 + b5logX5 + logU$

Where bO or logbO is the intercept and represent the level of output when input is zero and b1 - b5 are the regression coefficients of the level of independent variables Xi where i = 1 - 5.

In this study, the Marginal Value Productivity of factor will be derived and compared with respective unit prices in order to determine how efficient the resources were being used in the production process in the area. A resource is said to be efficiently used if its MVP is equal to its price of acquisition. For Cobb-Douglas production function, MVP for resources are estimated as MVPXi = biQ.

Where MVPXi = Marginal value Productivity of Resources
Xi = (1, 2, 3, 4, 5).
bi = Regression Coefficient of the variable Xi
Q and Xi = Values of logQ and logX when assumed their means

The Geometric Mean of output and input can be obtained thus:

GM = SN
Where GM = Geometric Mean
S = Sample size
N = Output or Input of the first respondent.

The Elasticity of production of resources in production are estimated thus:

Ep = bi (Q), X - bi
bi = Regress Coefficient
Q = Output
Xi = Resources whose-elasticity of production is been obtained

To determine the return to scale (V), the elasticity of production of resources are added together (i.e. V = b1 + b2 + b3 + b4 + b5).

If

V > 1, it indicates increasing return to scale
V < 1, it indicates decreasing return to scale
V = 1, it indicates constant return to scale

More often than not, this study is not without some problems/limitations. For instance, there was absence of farm records and most of the farmers responses were based on memory recalls. Primary information provided by these farmers were mainly based on their previous years farming operations. The data was therefore provided based on memory to answer questions relating to input supply, allocation and utilization in farming operations. Difficulty with the "memory recall" has been documented (Norman, 1973). There is therefore the possibility of errors, measurement errors, selective bias and errors due to non-response. This will certainly affect the validity and accuracy of the information pertaining to the level of inputs employed and outputs obtained by the farmers.

Similarly, the measurement of quantity of irrigation water used is inaccurate because average volumes were taken for basins, and amount of water lost during application through runoff and percolation were not accounted for, and this was a result of non-availability of operational facilities. Other limitations include lack of standard units of measurement of both outputs and other inputs.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

Socio-economic characteristics include societal factors that influence farmers' productivity. This include age, gender, marital status, household size, educational status, irrigation farming experience, main source of labour employed, sources of acquired capital by the respondents, types of crops grown etc.

Table 1 shows the socio-economic characteristics of the farmers, farming around the banks of river Niger under irrigation in the study area.

Age is the length of past life of a person. Age is a determinant of the quality of labour employed in a production process and the labour force prevalent in a given geographical boundary. Table 1 shows the age distribution of respondents. 91.4 percent of the respondents are between the age ranges of 30 – 50 years. This is an indication that most farmers fall within the active productive age or labour force. This is an indication that there is a brighter future for food production to meet the ever-expanding population and ensure food security.

Marital status determines the status of households towards their responsibilities. Married farmers with large family sizes may have readily supply of labour to work on the farm, which increases the size of hectrage cultivated. In table 1, 84.2 percent of the farmers were married couples and the rest were either single, divorced or widowed. Majority of the married farmers use their spouses running the marketing systems of their holdings. More so, married farmers have matured minds and make good decisions on efficient production system to maximize profit or any other objective.

The importance of a large family size in traditional agriculture was expressed by Olufe (1988), in his study of resource productivity in food crop production in Kwara state of Nigeria. According to the study, family labour accounted for a significant proportion of the total labour force used in traditional agriculture on the farm, thereby enabling the cultivation of large hectarage of farmlands and reducing the cost of hired labour for farm operations. Table 1 also shows the distribution of family size in the study area. 71 percent of the respondents have family sizes of between 4 – 10 members. This almost agrees with the findings of Baba and Etuk (1993), Baba and Wando (1998), Tsoho (2005) and Ndanitsa (2005). The implication of the large family size in the area was that family expenditure tends to draw more on family income, so that only a meager sum is saved and invested eventually on farming. However, the large family size implies a probable greater farm input for the farmers.

Education determines the farmers skill, his allocated abilities and show how well informed he is of the innovation and technology around him, e.g. in the acceptance and adoption levels of innovation, such as new technology and hybrid seeds. Table 1 highlights the educational background of respondents in the study area. The percentage literacy is about 60 percent which is evident in the uniformity of operations. In spite of the high level of literacy (which is predominantly due to Arabic studies), farmers have little or no records kept.

In terms of irrigation farming experience, since most farmers acquired no-education knowledge, which is of little or no use to irrigation agriculture, a sizeable number of farmers could be said to be literates who learn by doing. Hence farming experience is expected to influence their method of production. Table 1 reveals that above 37 percent of farmers have been irrigating their farms for at least 20 years. This implies that farmers would have been able to acquire a lot of experience in irrigation farming which can guide them during the course of production make them more professionalize in irrigation activities.

Furthermore, in terms of labour, we all appreciate the fact that it is very important in agricultural production because labour costs account for over 50 percent of the total farm production expenses (Baba, 1993). Less Developed countries (LDCs) rely heavily on manual labour. Table 1 in addition to other socio-economic factors, presents a distribution of the respondents according to the type of labour used on the irrigated farms. A total of 35.5 percent of farmers uses self and family labour. They also admitted the involvement of family labour in the marketing of their farm produce. The rest farmers only used hired labour and machinery as they reported having other occupation (secondary) aside farming. Similarly, respondents who do not patronize hired labour said they do not need to employ the services of anybody because of the small size of hectrage they cultivate and more so because they cannot afford paying their wages.

On the source acquired farm land by the respondents, we know that this is an important factor that also determines the extent and level to which a particular land especially the Fadama prevalent in the study area could be kept under cultivation. This is particularly important in terms

of the tenancy arrangements. In some communities, farming lands are not accessible to non-indigenes, while in others farmlands are held entirely by the community and crops or crop patterns have to be approved by the culture, norms and beliefs of the community.

Table 1 shows that majority of the farmers own their lands which they acquire through inheritance from their parents. 38.6 percent acquired their land through lease, and 2.9 percent acquired theirs through gift. No land was purchased in the study area for agricultural production due to strong value attached to the land in the area, and because there is low capital investment in agriculture in the area.

Different types of crops are cultivated under irrigation farming in the study area. In table 1, it was revealed that majority of the farmers (68.5) grow rice while 18.6 percent and 4.3 percent grow maize and sugar cane respectively. Only 8.6 percent grow both rise and maize, i.e. mixed cropping is uncommon in the study area. Farmers cultivating rice said they are encouraged to go into rice production because of its better marketing prospect especially now that the price of imported rice is sky-rocketing and Nigerians are beginning to developed interest on the local rise because it is cheaper, more nutritious and more palatable.

Farming Activities/Production Practices By The Farmers

Main production practices involves land preparation, planting and transplanting activities, management (weeds, pests and disease control), land preparation, etc It involves both primary and secondary tillage operations namely ploughing, harrowing and ridging.

Planting activities:- The method adopted in planting rice and maize is usually by direct sowing of seeds. The seed rice is dibbled in beds in a spacing of 20cm x 20cm, and 4 – 5 seeds per stand are planted. In the case of sugar cane propagation, it is usually by vegetative means through the use of stem cuttings called "sets". A set is usually about 30cm long and contains at least two nodes and they are buried horizontally.

Management Practices:- Includes Fertilizer application, disease, pest and weed control. Fertilizer materials were usually applied by broadcasting, band placement or by spot application. Weeds were controlled in two ways, either by using manual hoes or by the use of agro-chemicals called herbicides such as 2, 4 d; at 3 to 4 weeks of plant establishment. Other chemical herbicides used in the study area to eradicate weeds especially for sugar cane include Altrazine, paraquant, Dalapone, etc. There were no serious pest and diseases of irrigated crops in the study area, and therefore, few of the farmers used agrochemicals in pest and disease control, such as cypermethrin for rice and maize.

Irrigation practices:- The main method of irrigation employed in the study area is the surface irrigation, where the major conveyors of water to the plants are the furrows drawn into basins from the major water canals running through the length of the farmlands.

Harvesting and Marketing:- Harvesting is done once in a year. Harvesting of sugar cane is normally done by cutting with the aid of machetes, cutlass, or use of combine harvester. Matured sugar cane are burnt before harvesting in order to facilitate easy cutting, reduction in the amount of extraneous matter to factory mill. Rice us harvested manually with the aid of sickle or mechanically with the aid of a combine harvester.

Size of Farm Holdings

The size of farm holdings is an important factor in most agribusiness. It determines the extent to which other resources can be employed in the farm for optimum productivity and efficiency. The distribution of respondents based on the size of their farm holdings is shown in table 2; and is measured in hectares (ha).

Table 2 reveals that land cultivated in the study area ranges from 0.5 to 5.5ha. 78.6 percent of the farmers have land holding of between 0.5 to 1.5ha. 11.4 percent had between 2.5 to 3.5ha while only 10 percent had holdings of between 4.5 to 5.5. This is an indication that farmers in the study area generally had small farm holdings, which did not encourage mechanization and large scale commercial agriculture in the area. Another feature of the farm holdings in the study area and which is a general characteristic in the LDCs is the possession of small fragmented plots, located at different locations, whose consequences is the discouragement of mechanization.

Labour Input In Mandays/Hactare Of Farm Size

The size of the farm determines the labour input especially in LDCs. As the farm size increases, it is expected that labour requirement increases too. Table 3 shows the labour input in Mandays per hectares of the respondents. The labour imput range from 299.28 to 177.34

As revealed in table 3, the biggest farm size has the least labour. input per hectare, of 196.52 Mandays/ha, while the smaller farm size has 299.34 mandays/ha. This signifies higher efficiency in labour usage in larger farms than in the smaller holdings.

Irrigation Practices/Water Used By Respondents

Irrigation is the artificial application of water to the soil to supplement the natural rainfall. Farmers in the study area practice irrigation as an insurance against moisture stress and to ensure all year round farming. The water used ranges fro 47567.14 to 4568.18m3/day. This is revealed

Cost And Returns Analysis

This sub-section presents the profitability of irrigation farming in the study area. In any production process, costs are incurred in producing output and incomes or returns are earned from the sales of such outputs produced. In the Africa context, either of these could be cash or non-cash (Malomo, 2002). Table 5 present the average cost and returns to irrigation farming in the study area, and hence its Gross Margin (GM), expressed in Naira per hectare (N/ha). In terms of cost structure, this includes the costs of fertilizers, pumps, fuels, agrochemicals, transportation, farm tools, hired and family labour, etc. The costs are therefore classified as variable costs. The revenue or return structure was determined by multiplying the unit price of each product by the quantity produced. These prices varied depending on the market and location of marketing.

The cost and returns analyzed in table 5 showed a higher GM for irrigation farming in the study area. It has a GM of N134,505.59/ha, and this is not only because of the effective exploitation of the available human and material resources but also because of better marketing prospects especially for the rice growers. This finding corroborated with those of Ofojekwu, 1982; Erihabor, 1990; Palmer and Philip, 1990; Baba, 1993; Baba and Etuk, 1990; Ndanitsa, 2005 and Tsoho, 2005. All the authors recorded a high positive financial returns to irrigation farming especially under the Fadama using farm budgeting approach.

However, the income benefit was secured with a high variable cost (N51, 788.17/ha), as was also reported by Baba (1989) Baba et al (1998) and Tsoho (2005). Furthermore, among the VC, the cost of labour input alone constituted about 39 percent. The cost of labour however, dominated by the imputed cost (opportunity cost) of unpaid family labour. The cost of family labour, although not directly incurred by the farmers was imputed on the assumption that if the farmer and his family had not worked on his farm, they could have hired out their labour to other farmers at the prevailing wage rate in the study areas.

Production Function Estimation

In achieving this objective of the study, a production function was estimated economically and econometrically, and the results are presented in table 6.

Table 6 indicates that the Double log (Cobb-Douglas) is the lead equation based on the econometric consideration of apriori expectation (correct signs of coefficients). The criteria for choosing Cobb-Douglas function include; the function has the highest R2-value and the F-ratio is higher than that of semi-log function. The coefficients of multiple determination is 0.819. This shows that the independent variables explained about 81.90 percent of the total variation in output of farmers. It has an R2 value of 0.869. This implies that about 86.90% of the total variation in the output of crops is explained by the explanatory variable; X1 – X5 included in the model. The F-test which is the overall test of significance for the fitted equation is significant at 1% level. This implies a good fit of function. The variables that were found to be significant at explaining the output of crops are: X1(farm size in ha), X3(purchased inputs in N), X4(amount of fertilizer used in kg) i.e. large farm size translated into large output (Y). It shows that if farm size is increased by 1% holding, other variables held constant, output of crops will increase by 85.80%.

The coefficients of purchased inputs in Naira (X3) which is negative but statistically significant at 10%. This implies that there is a negative relationship between purchased inputs, N (X3) and output (Y). This implies that if purchased inputs are increased by 10% holding other variables constant, output of crops (Y) will decrease by 10.3%.

Also, the coefficient of fertilizer used in kg, X4 which is positive and statistically significant at 1%. This means that there is a positive relationship between fertilizer used in kg (X4) and output (Y). That is an increase in the use of fertilizer will translate into larger output (Y).

Elasticities of Production (EP)

The Elasticity of production, EP is a measure of responses of output to changes in the quantity or level of input used. It also measures how the

output changes as a change in the level of one input. It measures the percentage increase that will result in output as a result of one percent change in the level of a resource use. A unique characteristic of the Cobb-Douglas function fitted is that the elasticity of production of resources is equal to their regression coefficients. Table 7 shows the elasticity of production in the study area.

Generally, from theoretical consideration, it is expected that increase in the level of fertilizer (X4), irrigation water (X5), labour (X2) and land (X1) will evoke an increase in the level of output. This is confirmed by the positive sign in front of the elasticity. The values are however low except that of land, pointing to relative elastic response of the value of output to the increase in the variable inputs. This also implies that land or farm size is very important in determining the variations in the level of output.

Analysis Of Return To Scale

The return to scale (V) in a Cobb-Douglas (Double log) function is determined by the addition of the production elasticity variables. Hence, the return to scale of irrigation farming in the study area is given by:

$$V=0.858 + 0.029 + (-0.103) + 0.146 + 0.124$$

Thus, $V = 1.05 > 1$; this is an indication of increasing return to scale. This means that production is in stage 1 of the generalized production function, implying that if inputs are doubled, the output will be more than doubled. Hence, this represents the aggregate production elasticity of output with respect to all the inputs.

The increasing return to scale point to the fact that the resource can be generally increased to increase output and make more efficient utilization of the resources. This implies that irrigation farming is still in stage 1. Therefore, value of output should be increased by increasing the level of input until a point is reached where profit is maximized, given favourable price of inputs and output.

Productivity of Resources Used

The Marginal Value Product (MVP) is the yardstick for judging the efficiency of resources used. A given resource is said to be efficiently utilized if its marginal value product is sufficient to offset its purchased price. The purchased price is represented by the Unit Factor Cost (UFC) of the resources.

The UFC used for all the resources are their respective average market price prevailing in the study area, except land and water whose unit factor cost could not be determined. Land and water in the study area was not purchased. So the researcher could not represent the cost of land and water used.

Table 8 presents the MVP, UFC and the ratio of MVP to UFC on the irrigation farms in the study area. MVP of land:- This cannot be compared with its UFC because the farmers in the study area were small-scale producers. Land tenure system is mainly by inheritance with few farmers that lease land. However, land could be adjusted to such hecterage as to permit efficient management in order to add to revenue. Hecterage expansion is however, limited by such factors as traditional (unimproved production practices employed by the farmers as well as cost of mechanization.

MVP of labour:- MVP of labour is significantly different from UFC in the study area. This implies that labour as a factor in irrigation farming is not being efficiently used. The fact that, the MVP of labour is less than UFC of labour indicates that labour is over-utilized in the study area. Hence, less labour must be used more efficiently to improve resource use efficiency.

MVP of Purchased inputs:- MVP of purchased inputs is different from its UFC. This is an indication of sufficient utilization of purchased inputs.

MVP of Fertilizer:- MVP of fertilizer is significantly different from its UFC. This is an indication that, fertilizer is inefficiently utilized. This calls for appropriate resource adjustment. To increase farmer's income less of fertilizer should be used in order to equate MVP to UFC.

MVP of Irrigation Water:- This cannot be compared with its UFC because, as earlier stated, water is not bought in the study are nor is there any appropriate water changes for the use of this vital commodity of life. However, water could be adjusted to use more of it more efficiently to reduce its marginal value product. Furthermore, inefficiency of method of application are some of the vital limitations to the expansion or increased use of those resources in production in the study area. Other reasons could also be as a result of the method of estimation of the quality of water used. The numbers of times irrigation was carried out and size of farm were used as proxy for the quantity of water used.

Socio-Economic And Physical Factors Faced By The Farmers Engaged In Irrigation Farming

The distribution of respondents with regards to the problems militating against irrigation farming in the study area is presented in table 9.

CONCLUSION AND RECOMMENDATION

The study examined the Economics of irrigation farming around the river Niger bank in Edu L.G.A. of Kwara State. From the findings of the study, irrigation farming is beneficial to the farmers in the study area because it generated an income Gross Margin of N134,500.59/ha to the farmers. There is possibility of increased production and higher revenue if the factors highlighted as militating against increased production are alleviated or could be adequately addressed. Though, inputs were inefficiently utilized in some cases and thus requiring such resources, there is a great potential for increasing productivity. The obvious constraints to be tackled are lack of technical expertise, non-availability of inputs, and high cost of acquisition of credit facilities, etc. It was therefore, recommended that there should be training of irrigation staff at both local and international levels to acquaint them with modern irrigation facilities. Construction of embankment walls to reduce flooding, formation of farmers cooperatives for easy access to credit facilities and other inputs at reduced cost, improvement of infrastructural facilities, provision of market incentives to boost farmers revenue and stimulates increased production, provision of efficient extension services, etc. Birds are a serious problem during rice grains filing or milk stage. Both government and non-governmental organizations should assist the farmers whenever these birds are around to cause havoc.

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Table 1: Socio-economic characteristics of farmers farming around the banks of river Niger.

Characteristics	No. or respondents	Percentage
Age distribution		
11 – 20	6	8.6
21 – 30	15	21.40
31 – 40	20	28.6
41 – 50	29	41.4
TOTAL	70	100.0
Marital Status		
Single	6	8.6
Married	59	84.2
Divorced	2	2.9
Widowed	3	4.3
Total	70	100.0
Household Size		
Household range:		
0 – 3	14	20.0
4 – 6	28	40.0
7 – 10	22	31.4
>10	6	8.6
TOTAL	70	100
Educational Status		
Level of education:		
Non-formal Education	20	28.6
Primary Education	13	18.6
Secondary Education	5	7.1
No. Education	22	31.4
Tertiary Education	10	14.3
TOTAL	70	100
Characteristics		
Irrigation Farming Experience		
Experience regret (years)		
1 – 10	21	30.0
11 – 20	26	37.1
21 – 30	19	27.2
> 30	4	5.7
TOTAL	70	100.0
Main Source of labour employed		
Source of Labour:		
Self	16	22.8
Self and family	27	38.6
Hired	20	28.6
Hired and Family	7	10.0
TOTAL	70	100.0
Sources of acquired Land		
Source of Land:		
Inherited	41	58.0
Gift	2	2.9
Lease	27	38.6
Purchased	-	-
TOTAL	70	100.0

Source:- Filed Survey, 2009.

Table 2: Distribution respondents according to farm size owed

Farm Size (ha)	No of Farmers	Percentage
0.5 – 1.5	55	78.6
2.5 – 3.5	8	11.4
4.5 – 5.5	7	10.0
Total	70	100.0

Source: Field Survey, 2009.

Table 3: Labour input in Mandays/ha of farm size

Farm Size (ha)	No of Farmers	Mandays/ha
0.5 – 1.5	55	299.34
2.5 – 3.5	8	177.28
4.5 – 5.5	7	196.52
Total	70	100.0

Source: Field Survey, 2009.

Table 4: Distribution respondents according to farm size owed

Farm Size (ha)	No of Farmers	Percentage
0.5 – 1.5	55	4568.18
2.5 – 3.5	8	40410
4.5 – 5.5	7	47,567.14
Total	70	100.0

Source: Field Survey, 2009.

Table 5: Cost and Returns structure for irrigation farming in the study area.

Items	Costs	Percentage	Returns
Gross Revenue (RG)		100.00	186,293.76
Variable Cost (VC):	51,788.17	26.50	
Transportation	13721.34	16.86	
Fertilizer Used	8731.34	20.76	
Purchased inputs	10751.92	35.88	
Labour	18583.57		134,505.
Gross Margin (GM)			

(GR - VC) Source: Field Survey, 2009.

Table 6: Regression Estimation of Determinants of Economics of Irrigation Farming around River Niger bank in Edu Local Government Area of Kwara State.

Variable	Linear	Exponential	Double-log	Semi-log
Constant	-93.622(0.153)	7.490(107.960)***	7.127(9.665)***	-3889.037(0.493
Land (X1)	2904.612(11.112)***	0.399(13.467)***	0.858(7.908)**	5613.784(4.839)***
Labour (X2)	-1.858(-1.031)	1.807E-05(0.088)	0.858(7.908)***	5613.784(4.839)***
Purchased Inputs (X3)	-7.118E.02(-1.835)*	-3.162E06(0.719)	-0.103(-1.855)*	-683.062(-0.994)
Fertilizer (X4)	1.149(1.145)	8110E05(0.712)	0.146(3.104)***	1477.984(2.444)***
Irrigation (X5)	2.427E-02(2.608)**	1.7052E-06(1.615)	0.124(1.668)	1726.431(2.171)**
R2	0.819	0.856	0.869	0.781
R2 Adj	0.805	0.845	0.854	0.756
F-ratio	(58.062)***	75.968***	(58.289)***	(31.394)***

Source: Computed from filed Survey, 2009.

Table 7: Elasticity of Production

Resources	Elasticity of Production
Land (X1)	0.858
Labour (X2)	0.029
Purchased inputs (X3)	-0.103
Fertilizer used (X4)	0.146
Irrigation water (X5)	0.124

Source: Computer Printout, 2009.

Table 8: MVP, UFC ratio of MVP to UFC on irrigation farms

Resources	UFC	MVP	MVP/UFC
Land (X1)	-	0.399	-
Labour (X2)	5.74	1.807	0.314
Purchased inputs (X3)	48.23	3.162	0.066
Fertilizer used (X4)	30.33	8.110	0.267
Irrigation water (X5)	-	1.705	-

Source: Field Survey, 2009.

Table 9: Problems encountered by the farmers

Characteristics Problems	No. of farmers	Percent
Inadequate Capital	30	17.9
High Cost of inputs	28	16.8
Incidence of Pests and diseases	5	2.9
Shortage of water	15	8.9
Problem of flood	10	5.9
Inadequate and obsolete irrigation equipment	8	4.8
Inadequate infrastructures	15	8.9
Insufficient Market Outlet	10	5.9
Lack of Extension Services	6	3.6
Problems of Bird (Qulea quelea	40	23.9
Total	*167	100.0

Source: Field Survey, 2009. *Multiple responses