Economic Impact of Galma Irrigation Scheme on the Farming Community in Dakaci, Zaria Area of Nigeria

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Abstract

Irrigation scheme is introduced for socioeconomic development of the community where it is based. One of such is the Galma Irrigation Fadama Project III around River Galma in Zaria Local Government Area of Kaduna State, Nigeria. The project provides water to surrounding communities for farming. This study was carried out with a view to determine the socioeconomic impact of the irrigation scheme on farming community in Dakaci, Zaria Area of Kaduna State. The study used data acquired from questionnaire survey, interviews and other secondary sources. Relevant data which include method of land acquisition, sources of capital, size of farmland, source of labor, major crops grown, average annual crop yield and average annual income were collected. The data were analyzed using simple descriptive statistics. The study revealed that the irrigation scheme to a large extent boosted crop yields and agricultural production in the area thereby improving the socioeconomic status of the farmers in the area. It is therefore recommended that more of such projects should be introduced to improve agricultural productivity. Moreover, there is the need for timely evaluation and assessment of such projects to maintain their proper functioning. In addition, government should refurbish the canals distributing the water to the farmlands, and also provide credit facilities to the farmers in order to improve their agricultural productivity which would help in ensuring food security for the nation at large.

Keywords: Agriculture, Irrigation farming, Galma fadama project III, Economic impact.

1. Introduction

Irrigation is the application of water to the land or soil for the purpose of supplying moisture required for plant growth or for greater crop yield. Irrigation is an approach to address inadequate rainfall for agriculture, and the combined effects of variability in the onset and duration of rainfall (Ayele, 2011).

Irrigation farming is a vital aspect of farming system of the Sahel and drier regions of the world. It is used in the growing of crops, maintenance of soils in drylands during period of inadequate rainfall. It is also used in suppressing the growth of weed in grain field, and helping to prevent soil consolidation (Snyder and Melo-Abreu, 2005).

It is an ancient agricultural practice. Basin irrigation was practiced for thousands of years in the Nile Valley and still plays a significant role in Egyptian agriculture. Egyptians have depended continuously on Nile's flooding for irrigation on a large scale over a long period of time (Ayele, 2011). It is reported that irrigation has been practiced in Egypt, China, India and other parts of Asia for a long period of time. For example, India and Far East have grown rice using irrigation for nearly 5000 years; while the Nile valley in Egypt, the plain of Euphrates and Tigris in Iraq were under irrigation for 4000 years (Zewdie *et al.*, 2007).

The first modern irrigation project in Africa is believed to have started in Gezira (Gezira Irrigation Scheme) in the year 1913 (Onward Sokoto Bulletin, 1983). It is centered on the Sudanese State of Aljazeera, south-east

confluence of the Blue and White Nile river in the city of Khartoum. The economy of Sudan was based on irrigation prior to the beginning of oil exploitation in the late 1990s. In sub-Saharan Africa, irrigation reached the Niger River regions by the first or second millennium BC and was based on wet season flooding (Snyder and Melo-Abreu, 2005).

There are different types of irrigation which include Surface irrigation (above the ground), which is the method generally adopted in all countries; Flood irrigation and Border irrigation. Others are Sprinkler irrigation and Drip irrigation (Ayele, 2011).

In the year 2000, member states of the United Nation came together to create a more prosperous world. In order to achieve this, the joint declaration set out eight goals, the Millennium Development Goals (MDGs). One of the goals is the eradication of extreme hunger and poverty amongst the member states. The problems of hunger and malnutrition cannot be addressed without paying proper attention to agriculture. In developing countries, most farmers practice rain-fed agriculture which results into low production. To improve agriculture, irrigation farming alongside the use of improved seeds, fertilizer and other relevant inputs become the best alternative. This will help in reducing hunger and malnutrition because there is direct relationship between food productivity, hunger, malnutrition and poverty (Strauss, 1986).

Tekana and Oladele (2011) examined the impact of Taung irrigation scheme on the household welfare among farmers in the North West Province of South Africa. The relationship between the household welfare and the independent variables were estimated using an ordinary least square regression estimation procedure. The results of the multiple regression analysis showed that the independent variables relate significantly to knowledge levels of the extension officers.

Bagson and Kuuder (2013) assessed the impact of a small scale irrigation scheme on household food security and leisure time of the people in Kokoligu - a subsistence-based farming community in the Nandom District of Ghana. In-depth interview (IDI) schedules and observation guides were used to source information on food security situations before and after introducing the irrigation scheme and the effects of the scheme on residents' leisure during the off farming season. The study revealed that the irrigation scheme enhanced household food security and wellbeing during the dry season but significantly reduced leisure; communal intimacy in addition to degrading the cultural heritage in the study area. According to their study, majority of the farmers irrigated vegetables, for household consumption and sale to complement the significant proportion of staple food crops cultivated during farming season to meet their nutritional needs.

Nigeria is endowed with vast agricultural land. However, in northern Nigeria, areas suitable for irrigation with ground water have not yet been assessed (Onward Sokoto Bulletin, 1983). With increasing population, more food is required to meet the increasing demand of the population. The increasing world population and the growing demand for food necessitate rapid expansion of modern irrigation throughout the world. For instance, irrigation farming in Nigeria has increased in recent times. Another reason for this is the introduction of the Fadama projects jointly funded by the World Bank, Federal Government and State governments to increase the social and economic status of the people, particularly the rural farmers and increase food productivity (Hussain and Madhusudan, 2009).

Oruonye (2011) examined the activities of small scale (fadama) farmers in Jalingo Local Government Area of Taraba state in Nigeria using the livelihood conceptual framework. The study employed structured questionnaire and participatory rural appraisal method in obtaining information during field survey. The findings showed that the increasing production of crops such as vegetables, sugarcane and maize in the study area has not only helped the town secure employment and livelihood opportunity for its citizen, but has also enhanced greatly the income of farmers and those involved in their trade. However, the study highlighted inaccessibility to irrigation farmland, fertilizer, capital and pesticides as the greatest challenges confronting farmers in the area.

Irrigation scheme is introduced for socioeconomic development of the community where it is based. One of such is the Galma Irrigation Fadama Project III around River Galma in Zaria Local Government Area of Kaduna State. The irrigation scheme was introduced to provide water to surrounding communities for agriculture. Since the scheme has been going on for over a decade, there is the need to assess its impact on the community in the area with a view to find out whether it has been successful or not. The focus of this study is to examine the impact of the Galma irrigation scheme on the farmers in Dakaci of Zaria Local Government area of Kaduna State. Therefore, this study seeks to find out:
  i.   Whether farmers benefit from the irrigation scheme in the area?
  ii.   The impact of the irrigation on crop production.
  iii.   Socioeconomic impact of the scheme on the farming community in the area.

1.1. The Study Area

Dakaci lies in Zaria region. Zaria is located in Kaduna state of Nigeria, and lies between latitude 11^0 04'N of the Equator and 7^0 42'E of the Greenwich Meridian as shown in Figure 1. It is bounded by Funtua Local Government Area (L.G.A.) of Katsina in the North, to the south by Kachia L.G.A. of Kaduna, in the southwestern part by the southern limit of Igabi L.G.A., to the west is BirninGwari L.G.A. while to the east and southeastern part is Ikara and Lere L.G.As. of Kaduna State respectively. Zaria region has a tropical continental climate which is characterized by distinct wet and dry seasons. The vegetation in the area is classified under the northern guinea savannah, which is characterized by short scattered trees and stunted grasses.
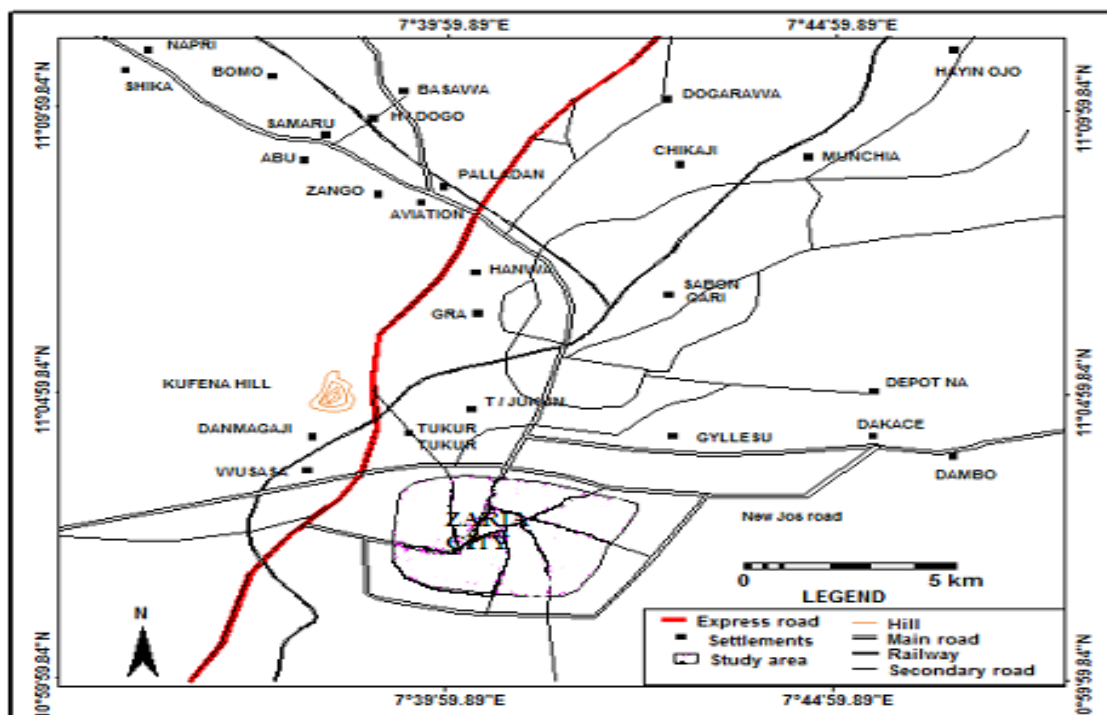
Fig. 1 : ZARIA : VILLAGES AND SETTLEMENTS
Source : Adapted and Modified from Zaria Topographic Map, Sheet 102 SW.

Figure-1. The Study Area

2. Materials and Methods

The materials used for this study involves data collected from field survey, questionnaires and other secondary sources. A reconnaissance field survey was first conducted to get acquainted with the area, create familiarity with some farmers, as well as estimate the farmers' population.

2.1. Primary Data

The structured questionnaire employed to obtain primary data comprises of two sections: section 'A' was for personal data of the farmers. While section 'B' had to do with the activities of the farmers in the irrigation scheme e.g. average crop yield before and after adoption of irrigation farming practices and other activities of farmers before and after adoption of irrigation scheme. Other data acquired include the farm size, sources of capital etc. The questionnaires were administered to farmers in Dakaci area, Zaria local government area.

2.2. Sampling Technique

A total of 150 questionnaires were used for the purpose of the study. This was determined based on Krejcie and Morgan (1970) sampling method. The questionnaires were used to seek information on the socioeconomic impact of irrigation scheme on the people in the area.

The technique used in the sampling of the farmers during the field survey was a combination of stratified and random sampling.

2.3. Oral Interview

Oral interview was also conducted with about 50 farmers and 30 inhabitants of the area of study. The farmers were selected purposively based on the type of crops they produce, and the inhabitants were selected randomly to represent those who buy and sell the crops produced in the area.

3. Results and Discussion

In this section, data collected from the field survey were analyzed. The results of the analysis are presented as follows:

3.1 Socio-Economic Characteristics of Respondents

Results from the survey indicated that 38% of the respondents are from Galma village and 62% of them originated from Bizara village all in Dakaci district of Zaria. All the respondents for this study were males because they are the only ones who engage in irrigation farming in the area.

3.1.1. Age of Respondents

Table 1 below shows the age distribution of the sampled population in the study area. It can be seen that the young age population (15-25 years) constituted about 36%, middle-aged (26-45 years) make up 42% and the aged (46 years and above) constituted about 28%. This implies that majority of the farmers who engage in irrigation farming in the area belong to the middle-aged group who are economically active; followed by the elderly population and then some of the youth. The dominance of middle-aged group in irrigation cannot be unconnected with the fact that that people in this area practice early marriage, hence the need to farm in order to meet their family needs.

Table-1. Age Distribution of Respondents

Age of Respondents	No. Of Respondents	Percentage (100%)
15-25	36	24
26-45	72	48
46 above	42	28
Total	150	100

3.1.2. Marital Status of Respondents

This study found that majority of the respondents representing about 94% were married and only 6% were single as presented in Figure 2 below.
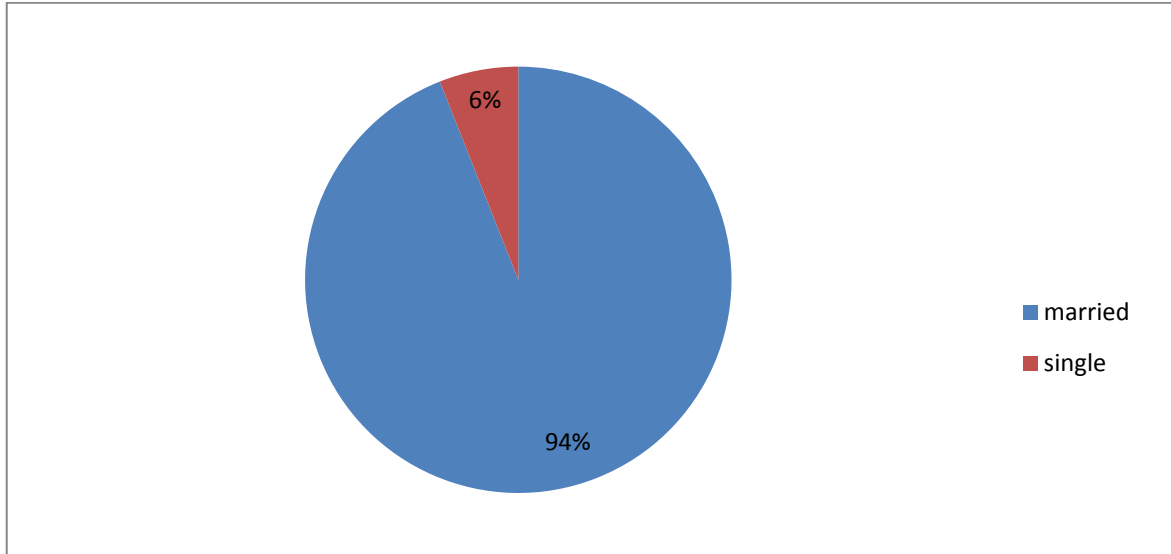

Fig-2. Marital Status of Respondents

Table 2 shows that 25% of the respondents have a household size of 0-5 persons; 31% has about 6-10 persons, 24% has 11-15 persons and 20% has up to 16 persons and above. This indicates that most of the respondents tend to have large family, and therefore require extra effort to meet the basic needs and food demand of the family which is achieved through the irrigation farming.

Table-2. Household Size of Respondents

Range of household size	No. of persons in the household	Percentage (100%)
0-5	37	25
6-10	47	31
11-15	36	24
16 above	30	20
Total	150	100

3.1.3. Educational Attainment of Respondents

Table 3 indicates the educational level of the respondents. A total of 15% have no formal education, 17% had secondary education, 18% had tertiary education, while 26% had primary education and 24% had Qur'an education. It is observed that the literacy level among the people in the area is low which has implication on irrigation farming in the area.

Table-3. Educational Attainment of Respondents

Educational Attainment	No. Of Respondents	Percentage (%)
None	23	15
Primary	39	26
Secondary	25	17
Tertiary	27	18
Qur'an	36	24
Total	150	100

3.1.4. Other Economic Activities of the Respondents

Table 4 shows that most of the respondents in this area do not only depend on irrigation farming as their means of livelihood but also engage in other economic activities. Findings revealed that only about 17% had no other economic activity apart from farming, 17% are civil servants, while 43% engage in trading and 21% engage in other economic activities like driving, black smiting and building works. This implies that a large proportion of the respondents engage in both farming and other economic activities in the area.

Table-4. Other Economic Activities of Respondents

Activities	No. Of respondents	Percentage (%)
None	26	17
Civil service	28	19
Trading	64	43
Others	32	21
Total	150	100

3.1.5. Transport Means of Respondents

Table 5 shows that 24% of the respondents own bicycles, 76% had motor cycle and 25% had cars. This implies that most of the respondents use motor cycle as means of transportation to their farms. It was found that the irrigation farming provided the money to purchase bicycles, motor cycles and even cars by some farmers.

Table-5. Transport Means of the Respondents

Transport Means	No. Of Respondent	Percentage (%)
Bicycle	36	24
Motor cycle	76	51
Car	38	25
Truck	0	0
Total	150	100

3.2. Agricultural Activities of the Respondents

This section acquired information concerning the source of farmland , sources and cost of labor, farm size, source of water for irrigation, types of crop grown before and after the introduction of the scheme and other relevant questions in relation to the farming system.

3.2.1. Method of Farm Land Acquisition

Table 6 illustrates the means of farm acquisition in this area of study. Findings revealed that 37% of the farmlands used by the respondents are hired, 23% are purchased, and 40% are being inherited. Some of the farmers hired or purchased the farmlands because of the viable gains of the irrigation farming in the area.
The survey found that River Galma is the only source of water supply for irrigation farming in the area.

Table-6. Method of Land Acquisitions

Farm land acquisition	No. Of respondents	Percentage (%)
Hired	56	37
Purchased	34	23
Inherited	60	40
Lease	0	0
Total	150	100

3.2.2. Surplus Farm Produce of Respondents

Findings revealed that all the respondents (100%) usually get surplus produce from the farm. Some of the surplus is preserved in the store and some is taken to the market and the proceeds are used to meet their pressing needs at that point in time.

3.2.3. Major Crops Grown By the Respondents

It was found that there is a significant change in the variety of crops grown in the study area after the establishment of the irrigation scheme. Results showed that before the introduction of the scheme, tomato was the major crop cultivated in the area, but after the establishment of the scheme, maize and other crops are cultivated in large quantity as shown in Table 7. It could be observed form the Table that there is significant increase in the number of farmers producing various crops. Also, the scheme has made it possible for many farmers to practice mixed cropping and shifting cultivation.

Table-7. Kinds of Crops Grown Before and after the Establishment of the Scheme

Crops	Before	Percentage (%)	After	Percentage (%)
Maize	31	62	47	94
Tomatoes	44	88	46	92
Onion	41	82	40	80
Paper	42	84	41	82
Okro	23	46	34	68
Other vegetables	12	24	26	52

3.2.4. Source of Capital for Farming

Though land and labor remain the two main inputs in traditional agriculture, but capital is also very important especially at the initial stage as take off grant for purchasing of simple farm implements, buying of fertilizer or renting of pumping machine used for the irrigation etc. The survey found that there is no other source of capital to the farmers apart from their personal savings.

3.2.5. Farm Sizes Before and After the Establishment of the Scheme

Farm size is a major element in determining the economic output in agricultural production in the area. The farm sizes of the respondents have increased significantly after the introduction of the scheme as indicated in Figure 3. This increase is due to the fact that the irrigation scheme has made water available and easily transported from the source to complement the rain water at the beginning of the project. However, there is presently a serious problem with the canals because most of them are blocked and could not transport water around the area. The farmers had to use generators to pump water thereby increasing the cost of production.
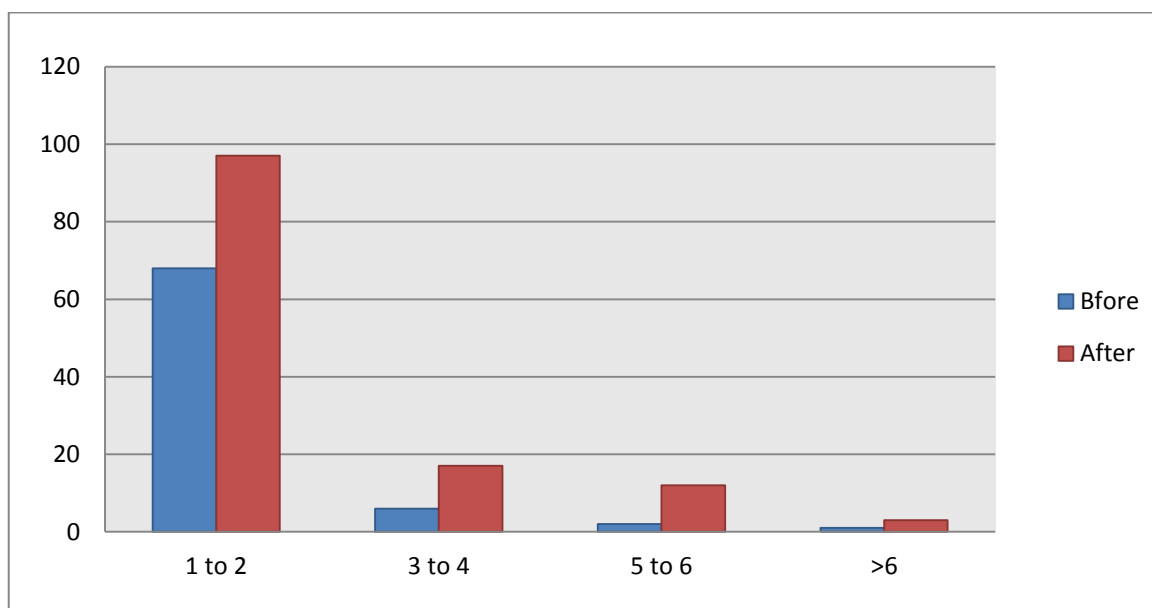
Figure-3. Distribution of farm sizes of the sampled farmers (in acre) before and after the introduction of the scheme

3.2.6. Assessment of Crops Yield after the Establishment of the Irrigation

Results from field survey revealed that there is a significant increase in both the production and yield of the farm produce after the introduction of the project. It is obvious that many factors are responsible for this increase, but the availability and easy water transfer from the main source to the field for the irrigation is the major determinant for this increase. Other factors include free land preparation, land expansion and availability of fertilizer which all together have lesser impact.

3.2.7. Estimated Annual Income of the Sampled Farmers

Results showed that the farmers' annual income has increased after the establishment of the scheme. The breakdown of the farmers' annual income before and after establishment of the scheme is displayed in Table 8.

Table-8. Distribution of estimated annual income of the farmers before and after the establishment of the scheme

Average Annual Income (in Naira)	No of Respondents	
	Before	After
< 100,000	100	34
100,000-299,000	41	87
300,000-499,000	9	24
500,000 and above	0	5
Total	150	150

The remarkable increase in the farmers' income is basically from the sale of their surplus produce. Grains like maize are often sold while still green or fresh in order to realize higher returns. However, the prices of these produce fluctuate as a result of the function of demand and supply from consumers and the rural farmers. For example, the prices of crops like tomatoes and pepper increase during rainy season. This is because they are not readily available in the market compared to dry season when they are cultivated.

3.3. Problems Encountered by the Respondents

The basic problem faced by the respondents associated with irrigation farming is inadequate, irregular and poor supply of water from the scheme to the farmland for irrigation purpose. This shortage of water to irrigate the farmlands occurs as a result of the dilapidation of scheme manifesting in the blockage of the canal. Therefore, water that is meant to be supplied to farms percolates and infiltrates into the soil instead of performing its primary function. To solve this problem, efficient and effective measures need to be put in place towards the maintenance and rehabilitation of the scheme for better production. Other problems encountered by the respondents include: inadequate pumping machines, shortage of fertilizer, and insufficient capital for farming as presented in Table 9 below.

Table-9. Problems Encountered by Respondents

Encounters	No. Of respondent	Percentage (%)
Poor water supply	54	36
Inadequate fertilizer	33	22
Shortage of pumping machines	35	23
Insufficient capital	28	19
Total	150	100

4. Conclusions

This study examined the economic impact of irrigation scheme on the farming community in Dakaci area around River Galma, Zaria local government area of Kaduna State. It was observed that majority of the farming community are found around the GalmaFadama Project because the irrigation scheme provides the ultimate source of water for agriculture in the area.

Findings revealed that more than 50% of the farmers in the area belong to the productive age group (25-45) thereby providing occupation for the people in the area. Although, most of the farmers engage in other economic

activities such as civil service and petty trading, they testified that the irrigation farming is a very important means of their livelihood as it provides food security and income for their daily activities. In addition, it was found that most of the respondents have relatively large family size, and their demand for food and other basic needs is met through the irrigation farming. Moreover, the educational attainments of the respondents as discovered by the study suggest that the farming community is not illiterate as 85% of them have some form of education. This according to them was achieved through the support of the irrigation farming. Furthermore, the establishment of the scheme enabled the farmers to have some savings which were used to own motor cycles, cars and build houses.

The study discovered that a variety of crops were grown in the irrigation field in Dakaci. The major crops grown include maize, rice, pepper, tomatoes, onions, okro, carrot and other leafy vegetable e.g. spinach. Irrigation has actually allowed the growing of more than four varieties of some crops such as tomatoes (*UTC, Indian, Acre, and Tangilo*) that wouldn't have been possible under dry condition. In addition, it was observed that the irrigation scheme has resulted into high yield produce as well as agricultural production throughout the year. The scheme has also made it possible for many farmers to practice mixed cropping and shifting cultivation. Besides, the viability of the irrigation farming has made it possible for about 60% of the farmers to either purchase or rent the farmlands.

Findings revealed that the farm size of the people has increased significantly after the introduction of the scheme in the area. An examination of the trend of average annual crop yield of the farmers as discovered from the interviews suggest that it fluctuates from time to time depending on the forces of demand and supply acting at a given point in time. This has implication on the average annual income of the farmers. Generally, high crop yields and high income levels of the farming community have been associated with the irrigation scheme in the study area.

It was found that there is significant rise in the average annual income of the farmers after the establishment of the scheme as some of the farmers now earn over half million annually; while the percentage of the farmers with annual income of 300,000-499,000NGN has almost tripled; whereas the percentage of the farmers with annual income of 100,000-299,000NGN more than doubled after the introduction of the project.

The major problem encountered by farmers in the area is inadequate, irregular and poor supply of water from the scheme to the farmland for irrigation purposes. This shortage of water occurs as a result of the dilapidation of scheme manifesting in the blockage of the canals as they could not transport water around the area. The farmers had to use generators and pipes to pump water to the farmlands thereby increasing their cost of production. Other problems encountered by the farmers include unavailability of pumping machines, shortage of fertilizer, and inadequate capital.

4.1. Recommendations

The irrigation scheme plays significant role on agricultural activities in the area, it is imperative to give the following recommendations:

- Efficient and effective measures need to be put in place towards the maintenance and rehabilitation of the scheme for better production.
- Government should introduce more of these projects to boost agricultural production.
- Government should provide credit facilities to the irrigation farmers through the Bank of Agriculture, and it should be made accessible to the farmers.
- Farmers should be supplied with pumping machines and fertilizers at a subsidized rate to enable them increase their output.
- There is the need to involve the farming community in the management of the irrigation scheme.

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