

## **Rural Farmers' Benefits from Agricultural Modernization in Kano River Project Phase I, Kano Area, Nigeria**

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### **Abstract**

*This paper describes the earning activities of rural farmers in and around Kano River Project Phase I with a view to assessing benefits from agricultural modernization over the years. 426 benefiting farmers were interviewed through questionnaire administration, and the results show that a large number of rural farmers depend on family labour, modern inputs and personal instincts to earn productive incomes. Also, an average farmer within the project site earned a high income which subsequently accorded them improved standard of living. To corroborate this, 85% of our respondents agreed that there have been improved agricultural development and a high level of annual yield and accessibility to modernization. Similarly, in terms of agricultural transformation, farm practices have drastically changed from traditional to modern over the years in which various technical processes were being applied by local farmers. Despite these, farmers face the usual problems of technical in efficiency and farm distortions. Appropriate recommendations were made to enhance sustainability.*

**Key Words:** Modernization, Mechanization, seedlings, irrigation, farm inputs, agriculture

### **1.0. Introduction**

Agriculture plays a significant role in the process of economic growth and development. It contributes greatly to the provision of food and raw industrial materials. Agriculture is the market for the input of the industrial sector, and provides employment opportunities for the people (Clavence 1979). In the late 1960s, before the diversification of the Nigerian economy to the oil sector, over 60% of the Gross National Products (GNP) was earned from the agricultural sector, whereas over 80% of the labour force of the Nigerian population was employed in the agro-allied industries, (and Olofin, 1987, and Sullivan 2001). Consequently many researchers and theorists consider agriculture as the priority sector for development planning. As Gunnar (1968) noted, it is in agriculture that the battle for long term economic development will be won or lost.

Similarly, Todaro (1995) stated that the main burden of development and employment creation will have to be borne by the part of the economy in which agriculture is the predominant activity: that is, the rural sector which if properly utilized will solve the problem of migration for Third World countries which is proceeding at historically unprecedented rates.

Despite its contribution, it is acknowledged that agricultural production cannot be expected to meet the rising level of population demand in Nigeria due to the many problems confronting rural farmers. In the first instance, Nigerian agriculture remains basically inefficient, under utilized and costly. (Aribisala 1983). It is inefficient in the sense that crop yields remain markedly low when compared with other third world countries of Asia and Latin America. It is under utilized in that only about 45% of the country's 70 million hectares of potential cultivable land are under cultivation (Olawepo,2010). The under utilization of agricultural land in Nigeria is a function of social and cultural defects. Among these is the land tenure system which is mainly responsible for the fragmentation of land holdings difficulties of mechanization and overall transformation of agricultural production. Furthermore, Nigeria's agriculture remains among the most costly in the world in terms of the amount of cash required to produce a given unit of food (FAO,1987).

Agriculture has had many 'revolutions' from its advent some 8-10,000 years ago through the significant changes of the seventeenth and nineteenth century agricultural revolution in Europe to the present period. In the past century, rural environments in most parts of the world also have undergone massive transformations. Pretty (1995) noted that these have been the most extra-ordinary in their speed of spread of new technologies and the far reaching nature of their impact upon social, economic and ecological systems.

Pretty (1995:75) mentioned two guiding themes that have dominated this period of agricultural modernization and rural development. One has been the need for increased food production to meet the need of the growing population. The second is the desire to prevent the degradation of natural resources, perceived to be largely caused by growing population and land use practices. Agriculture and rural development have been remarkably successful. Both food production and the amount of land conserved have increased dramatically through the process of modernization.

In recognition of the importance of technology is the increase of food production. Various efforts have been made over the years by various governments to develop strategies and policies to spread technology to farmers. These efforts have not yet achieved the desired results; because modernization process assumes that technologies can universally transform agricultural system without affecting social systems (Dahlberg 1990).

Similarly, Kurokawa (1991) pointed out that the problem of new technology does not take root when it is cut off from culture and tradition and also the transfer of technology required sophistication, adaptation to region, to unique situations and customs. Universality of technology has inevitably led to greater standardization. As farmers comply in their interest and completely change their livelihoods by implication, they simplify practices to incorporate the own technology and homogenization environments. Initially these farmers used to grow tens or even hundreds of crop varieties, now they might only grow one or two. Terrace cultivation replaced biological and physical measure to control soil erosion.

Pretty (1995;88) observed the impact of modernization and how it is exercised as sought to sweep away the confusion of diverse local practices and pluralistic functions accumulated over the years and established a new order which brings freedom from the constraints of history in new technologies and practices.

The creation of large scale irrigation scheme in Kano State, there Kano River project phase 1, has brought new ideas and opportunities to the people such as offering farmer improved irrigation machinery and crop varieties which have contributed to the increase of food and other raw materials to meet the needs of a growing population, and farmers gross revenue worth billions of Naira annually. (H.J.R.B.D.A. 2004) This study is therefore concerned with modern agriculture and how it influences farmer's benefits through professional institutions.

## **1.2. Irrigation Practice in Nigeria: a Historical Perspective.**

Officially, development planning in Nigeria started with a ten year plan of development and welfare (1946 - 1956) put forward by the colonial government in which agriculture was the major source of employment. Then one of the basic needs of the government was the full exploitation of the agricultural potential which required the development of the water resources of the country together with control floods to prevent annual inundation of fertile lands along the rivers and in the delta. (FAO 1965) this recognized the accomplishment of these objectives under a long range programme with very heavy capital investment and indoctrination of farmers in radically different agricultural techniques. This included farming practices and also involved changes in land tenure and even resettlement.

Even since the early days of colonial rule discussion have been going on about how to improve farming in the densely populated areas, where much fertile land could be cultivated only once a year because of the limited rainfall (Palmer-Jones 1977). The first irrigation division in Nigeria was established in Northern region in 1949 with principal functions to investigate, design and construct irrigation schemes in consultation with services of the agricultural division and native authority to collect hydrological data.

The second national development plan (1975 – 80) introduced more government function in promoting more land areas in irrigation development. It is in the light of this that a new ministry of water resources was created in 1975; with the development of water resources and rural development as its technical aims. There was also an agency responsible for the implementation of government programmes in the sub sector. In 1976, nine river basin development authorities were created and the two existing authorities (Sokoto Rima and Chad basin established 1973) reconstituted to serve as vehicles for realizing the government's objectives in this area (Nigeria 1980). Table 1 shows the break down of the potentials of the River Basin Projects in the country.

The eleven authorities were charged with a range of responsibilities including the harvesting, management and exploitation of the country's water resources for large scale irrigation scheme; which is the capital intensive, technically complex, partly mechanized irrigation. The introduction of the river projects shows that the government believes that the best way to improve productivity and relieve poverty is to bring modern technology and skilled advisers into rural areas. This is the assumption of William (1976), and Wallace (1981) who opined that as a result of many problems facing the country's economy the government adopted a free market oriented economy that encouraged private enterprises and efficient use of resources.

It has therefore by decree No. 35 of 1987, reviewed the situation with a view to streamlining the functions of the river basin development authority require which was to: undertake comprehensive development of both surface and underground water resource for multipurpose use with particular emphasis on the provision of irrigation infrastructure and the control floods erosion and for water shed management. It was also to construct, operate and maintain dams, dykes, polders, wells, bore holes, irrigation and drainage system and other works necessary for the achievement of the authority, function, and have overall yards to be cultivated under irrigation scheme to farmers.

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**Table 1. The estimated land potential of the Nigerian River Basins**

S/N	Authority	Jurisdiction	Estimated land
1	Sokoto-Rima Basin	The whole of Kebbi, Sokoto Zamfara State and part of Katsina State	116,132km <sup>2</sup>
2	Hadejia-Jama'are Basin	The whole of Kano State and part of Jigawa and two-third of Bauchi State	64,692km <sup>2</sup>
3	Chad Basin	The whole of Borno State and part of Yobe State	136,361km <sup>2</sup>
4	Upper Benue Basin	The whole Adamawa and part of Plateau excluding Bayelsa-Ran River	84,024km <sup>2</sup>
5	Lower Benue Basin	The whole of Benue and Plateau State	105,352km <sup>2</sup>
6	Cross River Basin	The whole of Cross River	28,620km <sup>2</sup>
7	Anambra-Imo Basin	The whole of Adamawa and Imo States	30,003km <sup>2</sup>
8	Niger River Basin	The whole of Kwara, Niger, part of FCT and also Kaduna States	66,264km <sup>2</sup>
9	Ogun-Osun Basin	The whole of Oyo, Ogun, and Lagos States	56,791km <sup>2</sup>
10	Benin-Owena Basin	The whole of Delta Edo and Ondo States	56,791km <sup>2</sup>
11	Niger-Delta Basin	The whole River States	20,873km <sup>2</sup>

Source: Annual Report 1991 H.J.R.B.D.A

Kano river project is one of the irrigation schemes overseen by the Hadejia Jamaare River Basin Development Authority in terms of water supply and infrastructures development. Large scale irrigation projects have been the major products of the works of the Federal River Basin

Development Authority in the late 1970s and early 1980s (Adams, 1985). They absorbed huge amounts of capital, but have shown very poor economic performance. This is in addition to suffering a range of serious socio-economic problems (Baba 1989; Adams 1991).

Sangari (1991) has shown that the shift in emphasis from traditional to modern irrigated agriculture is based on the belief that the modernization of farming operations is crucial to increased agricultural production; however, the performance of the new production system has been disappointing. Adams (1991) has also indicated that the project comparisons of Kano River project which (despite its many critics) is widely regarded as the least unsuccessful of the Nigeria schemes.

Finally the relevance of spatial distribution of benefits in Kano River Project Phase 1 is not prominent but is attractive enough to rural development planners, academicians, non government organizations to enhance the growth and development of the scheme in the nearest future.

From the foregoing statements, some research questions become pertinent to be asked about Nigerian Agricultural Modernization and Spatial distribution of benefits in Kano River Project Phase 1:

- does agricultural output and productivity increase using technical progress to affect socio-economic status of the peasants?
- what are the constraints affecting technical progress in farming practices that affect farmer's farm benefit?
- how is agricultural modernization perceived and utilized by peasants in various communities around the River Project?

The aim of the study is thus to examine the relationship between technical progress and benefits distribution associated with irrigation project, with a view to analyzing constraints to farmers' participation for modern farming practices in the study Area. It is also to examine a spatial distribution of technical progress in Kano River Project Phase I. Thus, agricultural modernization is seen here as a very important component of rural development process.

Hence, attempts at relating irrigation scheme toward rural increase of income is therefore relevant. This research therefore focuses on appropriately identifying the farmers technical progress and their benefits distribution with a view to suggesting different farm management techniques that are useful in providing information for solving rural poverty, employment generation benefit forecasting and agricultural investment risk management.

### **1.3. The Study Area**

The study area for this research work focuses on three local government areas notably Bunkure, Garun Malan and Kura Local Government Areas and regionally formed Kano River Project Phase 1. Kano River Project is a large scale, capital intensive irrigation scheme designed to cover an area of 58,000 acres in Kano State. The Kano State Government established, the Kadawa Irrigation Scheme in 1970, and the Bagauda Lake in 1974. The project comes under the authority of the Hadejia and Jamaare River Basin Development Authority in 1976 so as to run the affairs of Kano River Project I and is the first of several such schemes which will eventually cover 146,000 acres in Kano State. The project was started in 1971 and the initial research was conducted in 1976-77 when the scheme was still at its first phase and restricted to 3000 acres. Also Kano River Project has 22,000 hectares of irrigable areas out of which only 15,000 hectares had been fully developed at cost of about N160 million between 1970 and 1984 (H.J.R.B.D.A. 2004.) However the remaining 700 hectares were being developed by present Civilian administration.

The study Area describes the settlements that are geographically confined within Kano river projects phase 1. The position of the project lies between 11<sup>0</sup>3'N - 12<sup>0</sup>3'N and 80<sup>0</sup>30'E - 90<sup>0</sup>40'E (Maurya, 1993). The total landmass was to cover about 60,000 hectares (146,000 area).

The position of Tiga Dam reservoir lies between longitude 8°16' to 8°38' East of Greenwich meridian and latitude 11°15' to 11°29' North. It is about 40.42km long and 24.42km at its widest point, which covers 176km<sup>2</sup> (68m/ s<sup>2</sup>). The population figure for Kano River Project Phase 1 was carved out from three local government areas: Bunkure, Garun Malan and Kura. In the irrigation project, Water main canal, splits the settlement into west and east branch regions.

The economic activity of the natives is predominantly agriculture during the dry and rainy seasons. During the dry season farming is done through irrigation due to inadequate water/rainfall, except for some vegetable gardening, maize etc. Fishing also takes place but in small quantity. The non farm activities include trading, weaving, butchering, barbing, electric work, maintenance of automobiles, animal rearing, building, Qur'an teaching, sewing and rice thrashing.

The climate may be classified as tropical dry and wet type, the annual mean rainfall is between 500mm and 900mm. However, it is usual to regard mid May to mid October as the wet season. Rainfall intensity is in the range when rainfall is characterized by heavy storms whose average intensity is about 500mmhr<sup>-1</sup>(Leows and Ologe 1981).

#### **1.4.Types of Data and Research Methodology**

The degree of accuracy of any research work depends on the use of relevant data. The data required for the purpose of achieving objectives of the study include among others, Data on socio economic characteristics of the respondents, land holding and tenancy, number of farm plots per household and number of peasants with farm plots tenancy in the irrigation project area.

Others include, number of peasants with farm plots tenancy outside the irrigation project area , average income within a farming season number of peasants using high yielding variety or new clones, farm outputs and accessibility to various farm inputs. The above data were generated from two major sources, notably primary source and secondary. The primary source is a first hand information from the original source mainly through questionnaire administration. To complement those information collected from the field, the general features and characteristics of the study area were obtained from relevant published information outlets. Demographic information and population were equally collected from Nigerian population Commission. Other sources include Kano state agricultural and rural development agency (KNARDA) and Hadejia Jamaare River Basin Development authority (H.J.R.B.D.A.).

The sample frame as shown in Table 2 involves getting representative samples for the study so as to ensure that sufficient information is collected within the study area. In order not to make the survey too complicated, two urban towns, five rural towns and thirteen villages were selected on the basis of geographical distribution, population concentration, and distance to the nearest motorable road. Such towns include Kura, Yadakwari, Bunkure, Makwaro and Gundutse to mention a few. A multi stage sampling procedure was utilized to cover about 8% of total urban towns, 11% of rural towns and 15% of villages. This will provide us a minimum sampling fraction to be estimated precisely to obtain sufficient reliable data and results. In all, 426 participating farmers were selected randomly to cover the project site as shown on Table 2. The techniques employed in the analysis of data are simple descriptive and inferential statistical methods. All variables of modern farm inputs and technical progress are expected to contribute directly to the extent of peasants' farm benefits and modernization effects which vary according to variation in the settlement farming indices.

**Table 2.Sampled Households**

S/No	Name of Urban Town	Number of Household	
	<u>Urban Town Sampled Household</u>	NO	3.5%
1	Kura	3532	124
2	Bunkure	1278	45
	Total	4810	169
	<u>Rural Town Sampled Household</u>	NO	5%
	Dan Hassan	863	43
3	Gun Dutse	546	27
4	Yadakwari	823	41
5	Total	2235	111
	<u>Village Sampled Household</u>	NO	15%
6	Daganawa	96	14
7	Gafan	127	19
8	Goribawa	112	17
9	Imawa	97	15
10	Kosawa	70	11
11	Makwari	110	17
12	Tugugu	194	29
13	Yan Tomo	158	24
	Total	967	426

Source: Authors' Research.

### 1.5.Findings and Discussion

This section deals with analysis of data collated from the field work. The major task of this section is to explain farm production and benefits by the peasants from the Kano River Project Phase 1 in the study area. For the purpose of discussion it is divided into four major sections; these are general characteristics of respondents, farm production and marketing of farm resources, wealth index and farm incomes, and the Benefits by farmers from the Project in the study area.

#### 1.5.1. Socio Economic Background of Respondents.

The main effort here is to assess farmers' personal information and questions were exclusively asked regarding their sex, ages, family sizes and educational qualifications. Farming is being undertaken mainly by men in the study area.

It is clear that the majority of people dealing with farming in the study area are mostly men.

As regards the age of our respondents, it is evident that a large proportion of our respondents fall within the age range of 36-55, that is about 54.69% of the total number of local farmers involved in farming production. From these findings, inference can be made that the active population makes up the main farming labour force in the study area. The younger age range of 26-35 has a lower percentage of about 33.10%, this indicates that farming is exclusive job for the elderly, especially the men folks.

This is evidently shown by the number of people found in the age bracket 55 and above. This group accounts for about 12.21 % of the total labour force as shown on Table 3.

**Table 3: Age Group of the Respondents**

Year	No	%
26-36 years	141	33.10
36-55 years	233	54.69
56-75 years	52	12.21
Total	426	100.00

Source: Authors' Research.

In the same vein, 93% of our respondents were married. This also has contributed in the production of younger ones for family farm labour. Most of the single respondents cultivate land purposely for additional family diet and his personal income. In terms of education, it was revealed that most of the respondents are conscious of religious education, in which 100% of the respondents acquired Arabic Education, but 36.38% restricted themselves to the Arabic Education, Primary education, and post secondary education. This is because the younger generation of the respondents makes up a greater proportion of farmers who engage actively in farming in the project area. Similarly, when it comes to occupation, the rural people consider farming as a way of life; 90.85% of respondents' combine farming and other non farm occupation. It also indicates that 90.85% of the respondents have non farm occupation which is additional source of income.

### 1.5.2. Agricultural Production and Land holding and Tenancy

Land tenure is a major obstacle to agricultural development, in most of the third world countries. There are two important dimensions of this problem: land tenure arrangements (i.e. the form in which agriculture land to is held – free holding lease etc) and the distribution of agricultural land. Table 4 shows the locations of farms in relation to the project and tenancy, in which 91.96% of the respondents cultivated land in irrigation project site with single tenancy and 8.04% were accounted for in double and triple tenancy. Similarly among the respondents 33.80% cultivated additional land outside the project as Fadama irrigation using Kano River tributaries.

Among them 96.53% respondents were accounted for in single land tenancy and one more tenancy as double tenancy.

**Table 4: Respondents Farms Location and Tenancy**

	Tenancy	IWP	%	IOP	%	NI	%
i.	Owner	274	63.32	53	36.81	50	29.41
ii.	Tenant	77	18.08	44	30.56	23	13.53
iii.	Lease	32	7.51	40	27.78	11	6.47
iv.	Others	13	3.05	2	1.38	46	27.06
v.	Owner and Tenant	21	4.93	5	3.47	40	23.53
vi.	Owner and Lease	6	1.41	-	-	-	-
vii.	Tenant and Lease	2	0.47	-	-	-	-
	More two Tenancy	1	0.23	-	-	-	-
	Total	426	100	144	100	170	100

Source: Authors' Data Analysis

IWP = Irrigated within the project, IOP= Irrigated outside project

NI = Non Irrigated.



Lastly Non Irrigated lands mainly for rainfed agricultural were also cultivated. 39.91% of the respondents cultivated land in those near by area. Most of the settlements that located at the border of the project participated in these agricultural practice, 76.47% of the respondents have single land tenancy, while 23.53% of the respondents have double land tenancy.

It was well known that there are different land tenure systems which directly or indirectly affect agriculture and rural development in the study area. This is made clear on tables 4.and 5; the respondents land distribution shows 63.32% belong to owners and 18.08% belong to tenants and others 18.6%, of the total land irrigated with the project from the total 426 respondents in the case of land tenancy in irrigated land outside the project 36.81% belong to lease and others accounted for 4.85% from the total 144 respondents.

Despite the land utilization in and outside the project area; there are 170 respondents with land tenancy in non irrigated areas; in which 29.41% belong to owners, 13.53% belong to tenant, 27.06% belong to owner and tenant, 23.53% belong owner .This is an indication that there is a high land demand in the project area for extensive agricultural practices.

Table 5 shows fragmentation of farm plot size distributed to the respondents' i.e. in which 65.26% of the respondents occupied less than 6 acres of the total land cultivated. The remaining 34.74% of the respondents occupied more than 6 acres by our observation. Table 5 further shows the total land cultivated within the project and outside project site in the last farming season. The respondents cultivated irrigated land for both large scale and Fadama irrigation in which accounted for 67.62% acres of the total land acres cultivated. In addition to farming practice 32.38% of the cultivable land acres are tilled for rainfed agriculture. This table shows the available land cultivated at the margin land of the project site.

**Table 5: Respondents Location of Total Land Areas Cultivated**

Farm location	Total km of (acre)	%
Irrigated within the project	1,742.5	43.66
Irrigated outside project	926.5	23.96
Non irrigated	1,292.5	32.38
Total	3,991.5	100.00

Source: Authors' Research

### 1.5.3. Crop Production and Farmers Gross Revenue.

With progress made over the years the farmers in Kano River project phase has been growing both dry and wet season crops under irrigation and rainy season crops under supplementary irrigation oversees by Hadejia River Basin Development Authority.

In addition the Authority has launched a programmed of facilitating the participation of farmers in irrigation management through the formation of organized groups of water users (Water Users Association). The project has over the years improved the living standards of the farming communities within and outside the project area.

**Table 6: Respondents Crops and Land Areas Cultivated in Acres.**  
Wet Season Agricultural Production.

Crop Type	Acre Crop (Acre)	%	Average Yield (Basket & Sacks)	Production (Sacks & Basket)	%
Rice	1626.27	93.33	44.92	73,052.50	92.32
Maize	23.18	1.33	149.07	3,455.44	4.37
Others	93.05	5.34	28.22	2,625.87	3.31
Sub Total	1742.50	100.00		79,133.81	100.00
Dry Season Agricultural Production					
Maize	662.15	38.00	127.77	84,602.91	21.69
Onion	395.03	22.67	101.92	40,261.46	10.32
Pepper	168.50	09.67	554.33	93,404.61	23.95
Tomato	493.65	28.33	347.39	171,489.07	43.97
Others	23.18	01.33	12.36	286.51	0.07
Sub total	1742.50	100.00		309,044.56	100.00
G/Total				469,178.37	

Source: Authors' Research.

Table 6 shows Rice Crops produced per land in the study area, during wet season Rice dominated the land cultivation in which 93.33% of the total irrigation land within the project site. Similarly the rice production per sacks accounted for 92.32% of the total Crops produced. The crops produced during dry season, which dominated the Agriculture lands use, include maize, Tomato, and pepper accounted for 89% of the total land area.

The yield per acre was dominated by Tomato accounted for 43.97%, pepper is 23.95% and maize is 21.69%. The total crops produced dominated by these crops (Tomato, pepper and maize) accounted for 89.61%. One of the advantages of the irrigation project is the dry season crop production in which 65.87% of the total crops produced in the study area were dry season production.

**Table 7: Farm Benefits From Agricultural Practice**

Wet Season Agricultural Production

Crop type	Production sck /Bsk	Price (₦)	Value of crops (₦)	Cost of production (₦)	Net Benefit Profit (₦)	% gain
Rice	73,052.50	3050	222,810,125.00	85,742,485.54	137,067,639.50	96.89
Maize	3,455.44	1350	4,664,844.00	1,156,450.20	3,508,393.80	28.80
Others	2,625.87	1225	3,216,690.75	2,326,250.00	890,440.75	0.63
Sub Total	79,625.87		230,691,659.80	89,225,185.74	141,466,47.4	16.99
Dry Season Agriculture Production						
Maize	84,602.91	1500	126,904,365.00	33,696,813.50	126,242,795.00	18.27
Onion	40,261.46	2,300	92,601,358.00	25,487,639.47	67,113,718.53	9.71
Pepper	93,404.61	2880	269,005,276.80	9,302,604.17	259,702,672.60	37.58
Tomato	171,489.07	1475	252,946,378.30	15,065,818.27	237,880,560.00	34.42
Others	286.51	2250	644,647.50	573,020.00	71,627.50	0.02
Sub Total	287,151.12		742,102,025.60	84,125,895.41	691,011,373.60	83.01
G/Total	366,284.93		972,793,685.40	193,056,590.90	832,477,848	100.00

Sources: Authors' Data Analysis.

Table 7. shows respondents farm benefits accrued from modern agricultural practice in the study area. The respondents production crops valued at ₦972, 793, 68, 40 at a cost of ₦193,056,590.90 with net profit of ₦832,477,848.00 in a total land area of 1742.50 acres by 426 households of 13 settlements in Kano River project phase 1 is definitely a positive output when compared to average farmers production outside the Project area..

The value of crops produced per seasons varies in which the Dry season crops valued at ₦742,102,025.60 and which accounted for 76.29%. This is shown to have been greater than wet season crops produced at a cost of ₦84,125,895.41. The percentage gains of crops produced for wet season were 96.89% the highest farmers gain and 0.63% the lowest gain for maize and others crops produced. The percentage gain for Dry season crops produced in which for pepper gain were 37.58% follows by tomato 34.42% and the lowest gain 0.02% for other crops. The respondents utilized 1742,50 land area seasonally with annual net profit of ₦832,477,848.00 The net profits accrue for dry season were ₦691,011,373.60 accounted for 83.90%. The net benefits accrue for wet season were ₦141,466,47.4 accounted for 16.99%.

The implication is that the irrigation in Kano River project phase 1 would effectively promote the income distribution of net profit of ₦691,011,373.60 to 426 households. This shows that the irrigation is not failure but a production booster which could definitely promote sustainability. Table 8. shows mean value of cost of inputs and benefits accrued per acre the input component with high cost were fertilizer in which not less than sack was applied per acre, almost one fifth of total cost. Pumping machine fee is the second which includes machine fee hired from farmers union or individual rural merchant.

In the same vein, Fuel cost used for a couple of days and accounted for up to one fifth. The third component in term of cost is land rent and accounted for one tenth of the total cost. Mechanical land preparation accounted for about one tenth of the total cost. The highest crop cost produced per acre among the five crops were onion, tomato, rice, then followed by pepper and maize. The price per sacks or Basket is usually determined by the demand of the crops, water supply farm management scheme and better yield. The favourable price goes to rice pepper, Onion followed by Tomato and maize. The better yields go to replicate in the Gross Revenue and Benefits for each crop. The highest among the crops are Tomato, pepper, onion then maize and rice.

**Table 8: Mean Value of Cost of Inputs of some Selected Crops and Benefit Per Acre**

Average cost of production Component	Maize (Naira)	Onion (Naira)	Pepper (Naira)	Rice (Naira)	Tomato (Naira)
Mechanical land preparation	3,559.09	3,513.64	3,375.00	3,581.82	3,659.09
Manual land preparation	2,357.14	2,784.62	3,683.00	3,161.54	2,934.62
Planting of seeds	542.31	3,619.23	3,850.00	2,815.39	1,926.92
Manual weeding	3,638.46	4,338.46	4,000.00	5,630.72	4,038.46
Fertilizer Application	550.00	2,207.69	991.67	903.85	834.62
Water fee & Application	4,762.31	6,649.23	2,791.67	971.43	6,131.92
Cost & Seeds	678.46	6,753.85	1,983.33	3,753.85	5,835.46
Cost of Fertilizer	10,300.00	9,684.62	2,692.31	10,961.54	9,528.08
Cost of Chemicals	1,713.64	1,633.85	2,100.00	3,653.85	3,075.00
Harvesting fee	3,476.92	4,161.54	8,450.00	5,976.92	10,361.54
Transportation cost	5,284.62	3,938.46	5,783.33	3,607.50	9,588.89
Pumping Machine Fee	9,711.54	12,361.54	8,375.00	12,250.00	10,207.69
Land rent	5,500.00	6,076.92	4,333.33	6,307.69	6,000.00
Average Total cost	52,374.49	67,743.65	52,408.97	60,656.15	64,765.29
<b>Gross Revenue</b>					
Average production in sack/Baskets	127.00	101.92	99.33	43.39	347.54
Price/sacks or Baskets	1319.23	2,123.08	2,887.50	3038.46	1475.39
Gross Income	16,542.21	216,384.31	286,815.38	131,838.78	512,757.04
Net Average Income	115,167.72	141,867.01	234,406.44	71,182.63	447,991.75

Sources: Authors' Research

Rice is the lowest profitable produced in the project site it normally produced during wet season in which 92.32% of the total land acreage were cultivated with rice and yet produced profit per say. Maize was also produced during both wet and dry seasons, but farmers have one market strategy; they harvested the crop in premature period. Buyers come to purchase, at a favourable price better than to sell it at matured period. The price per matured seed sack of maize (ground to Gari) cost at about ₦3000. The pre-matured cob maize sold at cost of ₦1319.23. Ten sacks of pre mature maize make one sack of matured seed. It is for rational to sell the maize in its pre-matured cob stage. In addition large number of people takes it as diet toasted or boiled maize.

Tomato and pepper were disastrous, because of poor storage facilities; rotten and damages, but farmer dry the crops for storage and sell it in high turn demand period. Likewise onion and rice have no much difficulties of storage they need a moderate weather and can be stored in an open space or tree shade.

Despite the cost of variable inputs the respondents have highest profit on tomato cultivation and least profit on rice production. The crop with highest cost of production was onion and least profit after rice and maize. The different performances among various land tenure group operating within Kano irrigation project 1, indicate different yield responses from the same level of input application per acre. One strong hypothesis is that they may reflect differences between groups in knowledge and management of irrigation and the new high yielding crops technology.

#### 1.5.4. Peasants Attitudinal Analysis toward large scale agricultural transformation.

During the course of this survey, farmers were asked whether or not there have been benefits and improvement on their farming productions or not since they have been involved agriculture in this region, 85% of our respondents agreed there have been positive development. When asked to mention these developments, frequently mentioned are the accessibility of farmers to sizeable land for cultivation, inputs like fertilizer, chemicals and improved seedlings. Others include the use of pumping machines, leasing of tractors at subsidized cost and having access to central storage facilities. All these have afforded the farmers their regular and increasing income yearly as well as improved annual production that guarantee an enhanced modern farmers statuses.

In order to ascertain the farmers' claims, our respondents were asked to score the performances of the benefits derived from the Kano River projects in the areas of land allocation, process of agricultural transformation, farming methods and accessibility to various farm inputs. This was to test the perceptions of the local farmers regarding acquired benefits to boost agricultural production. With summated scales, respondents were asked to react to items that are either definitely favourable (agree) or definitely unfavourable (disagree) towards the objects under investigation.

Farmers' participation in agricultural practice is affected by available land size, land tenure and high output of farm product among others.

**Table 9: Perception of Agricultural Population**

	Per capital agriculture	S.A.%	A%	D.A%	S.D%	N %	Total
1	Farmers used sufficient land size annually	28.17	57.98	9.63	2.11	2.11	100
2	Farmers land possession and occupancy through free land application and purchase	30.05	47.05	15.96	5.63	0.94	100
3	Farmers harvest high agricultural output	24.17	56.81	17.14	1.88	0	100
4	Farmers yearly substantial increased of agricultural production	25.35	69.25	3.05	2.35	0	100

Source: Authors' Research

On land allocation and utilization, Table 9 shows that land tenure in the project area does not hinder the ownership of sufficient land sizes. For every aspect of land allocation and utilization, 86.15% of the respondents strongly agreed on the development facet. Farmers are thus seen as being satisfied that they cultivate sufficient land size annually. In this wise, not less than 77.42% of the respondents owned their land through free land application and purchase. Detailed levels of satisfaction can be obtained on table 9 accordingly.

Similarly, in terms of agricultural transformation, farm practices have drastically changed from traditional to modern over the years in which various technical processes were being applied by local farmers. These include farm inputs such as variety seeds or clones and chemicals among others. The table 10 shows that modern farm inputs introduced to the land for agricultural practice affected farmers positively. For example, 28.17% of the respondents strongly agreed that they have increased accessibility to high yielding varieties of seeds, 57.98% while only 2.11% disagree.

In the same vein, 20.18% of the respondents strongly agree that they have optimum fertilizer applications on their farms, while 63.15% agree in favour of optimum application of fertilizer.

Other detailed responses are shown on Table 10 accordingly.

**Table 10 Farm Inputs for the Agricultural Transformation**

	Farm Inputs	S.A.%	A%	D.A %	S.D %	N %	Total
1	Farmers now used of high yielding various or clones	28.17	57.98	9.63	2.11	2.11	100
2	Farmers have optimum fertilizer application on their farms	20.18	63.15	14.79	0.47	1.41	100
3	Farmers use of chemical (insecticide pesticides)	42.25	52.35	5.16	0.24	0	100
4	Farmers used of weedicide to control farm weeds	25.35	69.25	3.05	2.35	0	100
5	Farmers used of tractors for farm cultivation	47.42	44.36	3.76	4.46	0	100
6	Used pumping machine to increase soil moisture	8.68	33.33	47.89	8.22	1.88	100

Sources: Authors Research

In all, it could be deduced that a large proportion of rural farmers around Kano have access to benefits from the Kano River Project Phase 1. This has also shown that there have been rapid agricultural developments among the rural farmers. They don't only have access to improved inputs, much of their productions are secure in silos and made available for the ready markets within the localities and government organized markets. A substantial part of their productions are often transported down south for spatial consumption. It could thus be established that the purposes of the irrigation project in Kano River Phase 1 have been attained. This can also be taken to be a panacea for sustainable agricultural and rural development in Nigeria. If what is happening in Kano River project could be extended to other River Basin Projects in Nigeria, then the whole river basins in Nigeria could be turned into food baskets of the West Africa sub region.

Our local farmers would not only feed the nation, there would be food security all around us as well as the ones meant for International markets.

### **1.6. Conclusions and Recommendations**

This study sought to examine the performance of rural farmers who were introduced to irrigation farming as part of the strategies of government to boost agricultural production as well as to effect sustainable rural development. The empirical findings of this study showed unequivocally that all socio economic groups of the thirteen settlements benefited substantially from the concurrent introduction of irrigation and improved production technology. This scenario has made the production of grains and vegetable possible in the Northern part of the country through out the year.

The analysis further revealed significant difference in production technologies between socio economic groups. Broadly, the production technology improved significantly and directly with modern large scale area up to a medium size group of three to five acres annually.

When asked whether or not there have been development and benefits in their production strategies, more than 85% of our respondents there have been agricultural development in their region, and that they had benefited substantially. When compared to other farmers outside the project locations, they are now exposed to modern farming techniques. Apart from these, farmers have improved accessibility to improved seedlings as well as subsidized utilization of tractors and harvesters within the project programmes.

This has not only guaranteed continuous production, but has led to improved earning capacities among the project farmers. With what has happened in the Kano region, the use of agricultural development through irrigation, could be said to be a positive panacea to our rural development. If monitored continuously, Kano could continue to be the food basket of this country especially in grain and vegetable productions. This system could be motivational for extended agricultural production among local farmers. It could be motivational for instance, high cost of modern input and poor access to extension services for tenants place them at a great income disadvantage so far as irrigation income is concerned.

There may be relatively stronger motivation among tenants to achieve high technical efficiency to try to counter balance the disadvantage of poor land management and farming techniques among farmers

Thus far the impact of Kano River Project Phase 1 has over the years improved the living standards of the farming communities within the outside the project area. The overview of the study of Nigerian large scale irrigation has now captured a complex change in the period of globalization and multilateral trade agreement to have a change in farm size. Because of this great success, there is a need to manage the project effectively. We therefore recommend evolving an approach which will emphasize State government participation in the commercial production provision of infrastructure and involving a policy which will guarantee technical transfer to the local farmers over the years. Also Large scale irrigation policies need to be re-examined; so as to increase large scale production capabilities and maximization of opportunities that will bring peasants voluntarily into production like other white collar jobs.

There is a need to create adequate market in relation to the increased production to be brought about by the large scale irrigation and specific linkages could be designed with agro based industries to enhance inter firm relationship by lowering transaction costs. Similarly, Government must not loose sight of fostering general market distribution of primary commodity markets through improvement in transportation, marketing and storage infrastructures.

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