EFFECTS OF IRRIGATION FARMING ON SOCIO-ECONOMIC DEVELOPMENT IN KAFUR LOCAL GOVERNMENT AREA OF KATSINA STATE, NIGERIA

Supported by tetfund TERTIARY EDUCATION TRUST FUND

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Received: June 12, 2018 **Accepted:** October 27, 2018

Abstract: The study assessed the effects of irrigation farming on socio-economic development in Kafur Local Government area of Katsina State, Nigeria. The study used three hundred and seventy-nine (379) irrigation farmers selected from two registered and functional irrigation Farmers' Association in Kafur and Mahuta districts. Purposive sampling technique was adopted in the administration of questionnaire to the 379 sampled irrigation farmers. The research centred on primary data such as information on socio-economic and demographic characteristics of farmers, major crops grown and types of technology adopted, land holdings and form of labour deployed, socio-economic benefits of the scheme and constraints to irrigation activities. Descriptive statistics such as frequency counts, averages and percentages was used to summarize the data into tabular forms. Similarly, charts were produced to show the results clearly. Additionally, Pearson Product Moment Correlation was used to test the relationship between irrigation farming and socio-economic development of Kafur LGA. The result indicates that the commonest crops cultivated were tomatoes (44%) and leafy vegetable (31%). Hired labour provided more than half (71.2%) of the labour engaged in irrigation activities. Nearly all, (285) respondents confirmed that a good number of infrastructural facilities such as deep wells, feeder roads, market, shops etc. were built via Sulma Dam Project. Besides, 70, 44 and 39% of respondents rated improved housing condition, improvement in education of children and better quality diet, respectively to be excellent. Correlation matrix of the community development indices indicates a positive and significant relationship between shops and income of irrigation farmers (r = .550, p =0.01) and construction of bridges and feeder roads (r = .527, p =1.000). The Constraints to effective irrigation activities were infestation of pests and disease on tomatoes and leafy vegetables (78%), price fluctuation (10.9%), drought (drying up of dam) (5%) and inadequate finance (3.9%). However, income from irrigation has substantially enhanced the overall economic well-being of irrigation farmers in study area. Hence, the study recommends increase in farmers' access to loan, improvement in farmers' knowledge of irrigation farming, intensification of irrigation agriculture, improved access to marketing opportunities and establishment of agro-rural industries.

Keywords: Effect, irrigation, socio-economic, development, Kafur

Introduction

Irrigation is the artificial application of water to arable land to initiate and maintain plant growth. It usually involves the capturing of natural run-off to increase water supplies for agricultural purposes (Rowland, 1993; Igbal, 1975). Similarly, Synder and Melo-Abreu (2005) noted that irrigation means the action of applying water to land in order to supply crops and other plants with necessary water.

Farming depends largely on water availability to varying degrees that at times do not meet the moisture requirements of cops due to high vulnerability to short and long-term drought. In addition, advances in agricultural technology have nowadays led to the need to supplement water needs of crops to increase production even in marginal lands (Obeng-Asiedu 2004). Consequently, Nigerian government since the colonial era has been embarking on irrigation development to raise crops necessary to meet the needs for food and fibre (Sale, 2006).

It is important to note that irrigation supplements water available through rainfall for increasing crop yields and/or crop quality. Hence, irrigation provides a good alternative source of moisture against inadequacy of rainfall and makes it economically attractive to grow with other agronomic conditions thus giving room for a boost in yields (Bede, 1991). Therefore, irrigation development stimulates economic growth and rural development as well as being the cornerstone of food security and poverty reduction (Makombe *et al.*, 2007) In areas where rainfall is low or erratic, irrigation adds value to cultivated lands. Globally, irrigated areas almost doubled over the past 50 years from 161 million hectares (ha) in 1961 to 318 million hectares in 2010 (FAO STAT, 2013). It is important to note that irrigation farming has enormous socio-economic development out comes such as stimulating regional income, production, employment and income distribution (Hagos *et al.*, 2009), as well as attracting physical, social and economic infrastructure. Accordingly, Hussain and Hanjra (2003) reported that irrigation has significant poverty-reduction and income generation effects and was an important contributor to lowering real food prices from 1970s through 1990s. In addition, self-sufficiency in food production based only on rain fed agriculture is difficult to achieve. This is particularly true for Nigeria. So, for self-sufficiency in food production, there is need to extend the farming season beyond the rainy season through irrigated agriculture (Ajayi and Nwalieji, 2010). Hence, the socio-economic importance of irrigation to rural economy cannot be overemphasized as its development creates an economic atmosphere that has direct benefits on the local economy.

Despite the significant contributions of irrigation to increasing food production and to overall socio-economic development, irrigation has come under increasing criticisms over the past decades for concerns such as socio-economic inequity, social disruptions and environmental changes that are attributed to irrigation development and reservoir construction (Rosenberg *et al*. 2000). This means irrigation may have negative externalities or shortcomings on development.

Irrigation activities in Kafur LGA is age-long and largely smallholder-based irrigation dependent on the shadoof system of lifting water as well as on residual moisture utilization techniques. Crop production in the area mostly relied on rainfall for moisture supply. Hence, a lot of damage to crop production had been caused by recurring droughts. This became a serious threat, sometimes significantly reducing the farm production. Although small-scale irrigation practices had

been undertaken during the period, mostly along streams and river-banks as well as other *fadama* areas, the output obtained from these practices was relatively small (Musa, Baba and Beli 2003) This implies that agricultural resources in the area had not been efficiently utilized. Hence, the development of Sulma Dam project in Kafur has great potentials of boosting agricultural production and enhancing other socio-economic activities. It is against this backdrop that this study examines the socio-economic effect of irrigation farming on the development of Kafur LGA of Katsina State.

Several studies have been conducted on different aspects of irrigation. Some of these include FAO (2000), Sale (2006), Adams (2008), Bagson and Kuuder (2013) and others. Most of these studies demonstrated a strong relationship between irrigation farming and socio- economic advancement in both rural and urban environments. However, their major focus was on the livelihood improvement of direct users of irrigation schemes. Little or no attention is paid to the multiplier effects of irrigation activities such as revenue generation to the government, growth of non-farm trading activities and development of rural infrastructural facilities. Besides, the presence of river Sulma and large arable land in Kafur LGA as well as the vulnerability to drought provides a good potential for dry season farming. Moreover, from extant literature available to the researcher, no published study on irrigation farming has been carried out in Kafur Local Government Area of Katsina State. It is against this background that the researcher intends to assess the effects of irrigation farms on the socio-economic development of Kafur LGA of Katsina State.

The study therefore sought to answer the following research questions: what are the major crops grown in the irrigation sites in the study area? , what are forms of technology/skills adopted in irrigation activities in the study area? , what are the social and economic benefits of irrigation to the society? and what are the constraints to irrigation activities in the area?

The aim of the study is to examine the effects of irrigation farming on the socio-economic development of Kafur LGA, Katsina State. Specifically, the study will: characterize the crops grown under irrigation in Kafur LGA, examine the forms of technology and labour involved in irrigation farming, analyze the social and economic benefits of the scheme to the study area and investigate the constraints to irrigation farming in the study area. The research hypothesis postulated for the study is that there is no significant relationship between irrigation farming and socio-economic development of Kafur LGA. The presence of the vast land resources in the study area coupled with persistent and sometimes devastating drought necessitating irrigation as a useful adaptation strategy to climate variability validates the study.

Agriculture has a unique position in the economy of Kafur LGA. Majority of the population are settled cultivators and traders. It was estimated that agriculture in its various forms provides the means of livelihood to over 80% of the population of the area (Dangusau, 1998). Major crops grown include soghum, maize, rice, soya beans, millet, cotton, cowpeas and vegetables. However, vegetables are majorly grown via irrigation system. Both crops and animals are sources of food and cash income as well as a symbol of wealth to the inhabitants of Kafur LGA (Ogungbile *et al.*, 1999).

Materials and Method

Study area

Kafur LGA is located in Southern Katsina State between Latitude 7º 29¹ and 7º 55¹ North of equator and Longitude 12º 22¹ and 12º 52¹ East of Greenwich Meridian (Fig. 1). It shares boundary with Danja in the south, to the northeast is Karaye LGA of Kano State. To the North West are Malumfashi and Bakori LGAs. Kafur LGA has area coverage of 220 km²; with a distance of 150 km from Katsina -Capital of Katsina State (Fig. 1). There are two climatic seasons: the rainy season and the dry season. The rainy season lasts for five months i.e. May to September with the wettest month in August (254 mm of rainfall). The second is the dry season, which extends from November to March accompanied by dry, cool and dusty wind called harmattan. The relative humidity falls considerable during the harmattan; with the maximum day temperature of about 33.1ºC and a minimum of 19.2ºC. Generally, the climate is hot and dry for many months of the year due to longitudinal location of the town and its location away from sea (Abbas, Muazu and Ukoje, 2010).

Methods

The reconnaissance survey/physical field observation of the study area (Sulma Earth Dam and bordering irrigation farms) was undertaken to determine its size, catchment area and reservoir volume as well as irrigation activities. The reconnaissance survey revealed that the irrigators were composed of young people, there were a lot of agrochemical shops, all irrigation farmers use motorize machines and they have a strong and well organized association.

Data on socio Socio-economic and demographic characteristics of farmers, major crops grown and types of technology adopted, land holdings and form of labour deployed, socio-economic benefits of the scheme and constraints to irrigation activities were obtained via questionnaire and Focus Group Discussion.

Three hundred and seventy-nine (379) irrigation farmers, which constituted 80% of the of total number of irrigation farmers in the study area were purposively selected from two registered and functional irrigation Farmers' Association in Kafur and Mahuta districts and hence administered questionnaire (Table 1). The basis for this was to gather information from respondents who have had experiences in irrigation over the years and are currently making use of the Sulma Earth Dam for irrigation activities. Data were analyzed via descriptive statistics such as frequency counts, averages and Likert rating scale. Pearson Product Moment Correlation Technique was used to examine the relationship between irrigation farming and socio-economic development of Kafur LGA at 0.05 significant level.

Table 1: Sample size for questionnaire administration

District	IFA	Total No. of members	No. of members selected
Kafur	KIFA	249	199
Mahuta	HDIFA	225	180
Total		**474**	**379**

Source: Author's Computation (2014)

IFA = Irrigation Farmers' Association; **KIFA** = Kafur Irrigation Farmers' Association; **HDIFA** = Hayin Daneji Irrigation Farmers' Association

Results and Discussion

Socio-economic characteristics of farmers

Amongst the specific objectives of the study is the examination of the socio-economic characteristics of irrigation farmers. These include sex, age, marital status, educational qualification and income status. These issues are presented in Table 2. Regarding sex of respondents, the data in Table 2 reveals that irrigation farming is male dominated in Kafur Local Government Area of Katsina State. This consisted of 99% male and 1% female. This result may be explained by the fact that irrigation farming involves hard labour that might be beyond the physical strength of females. Another possible explanation for this could be religious and cultural considerations that limit women's role to housekeepers thereby discouraging them from active business

activities in public (like in farming). These results seem to be consistent with British council (2012) and Parker (2011) who found that gender discrimination due to social norms limit women's ability to engage in workforce. On the contrary, Adekunle, Oladipo, and Busari, (2015) noted a significant proportion (28%) of female involved in irrigation schemes in Ilorin, Kwara State, which suggest that women are now given opportunity to own farm and contribute to household food security.

Concerning the age distribution of respondents, Table 2 also shows that a greater percentage (76%) are within the age bracket of 20 to 40 years. This means that they were within the economically active age. It could be presumed that the youth were being attracted into irrigation farming and given the right working conditions more output can come from these system of farming through expansion of farm size and adequate supply of inputs. These results are in agreement with Saleh (2006) findings, which showed that the active group (25-35yrs) dominated the sampled respondents.

In terms of marital status of respondents, Table 2 illustrates that majority (98%) of the farmers were married. A possible explanation for this might be the culture of the dominating tribe (Hausa), which encourages early marriage. This finding is in harmony with Hassan (2014) who attributed the predominance (76%) of married people to early marriage prevalent among Ashi tribe. It can be seen from Table 2 that a greater proportion (59.7%) of the respondents had household size of 5 – 15 persons. An important implication of this is the possibility that the farmers in the study area have ample labour for farming activities. These results corroborate the ideas of Villano and Fleming (2004), who noted that more members in a household means that more labour would be available for carrying out farming activities in time and thus increase production. Again, Stevens (2006) reinforced the aforementioned that big families may generally be associated with large number of potential labour, which naturally influences the quality of irrigation management.

Table 2 also shows that irrigation farmers in the study area were literate to varying degrees. It further indicates that a significant proportion (71.2%) of respondents had primary and secondary education.This implies that information on innovative irrigation practices can be easily disseminated and adopted with little effort, compared to people without formal education. Kim and Muhammad (2014) who noted that education makes farmers flexible to agricultural innovations that would result to intensive and improved production techniques strengthen the forgoing assertion. Stevens (2006) further supported the position that farmers with relatively high education levels in general understand the agriculture-marketing environment and challenges better than farmers with relative low level of education.

In terms of other occupations aside from irrigation farming, Table 2 indicates that 27% of the respondents is also engaged in animal husbandy, 43% in rainfed agriculture, while 20% is involved in trading. An explanation for these results is the necessity to diversify livelihood activities and support income from irrigation farming, cope with increasing family needs and climate variability impacts. These results are in accord with Frank (1999) indicating that a diverse portfolio of activities contributes to the sustainability of a rural livelihood because it improves its long-run resilience in the face of adverse trends or sudden shocks.

Table 2 illustrates information on the duration of irrigation farming, religion and ethnic composition of irrigation farmers. As can be seen on the Table, approximately 70.6% of the irrigation farmers had spent 11-20 years in this activity. This long years of farming would enable farmers in the study area possess ample experience, knowledge and information about irrigation farming, which is likely to enhance productivity. The analysis validates finding from Obinne (1991) who reported that long farming experience is an added advantage for increase in farm productivity since it encourages rapid adoption of farm innovation.

Table 2: Socio-economic and demographic characteristics of respondents (n=285)

Socio-economic factors	Frequency	Percentage
Sex		
Male	281	98.6
Female	4	1.4
Age		
Less than 20	5	1.8
20-30	96	33.7
31-40	123	43.2
Above 41	61	21.4
Marital status		
Single	3	1.1
Married	282	98.9
Household size		
Less than 5	64	22.5
5-10	98	34.4
11-15	72	25.3
16-20	30	10.5
Above 21	21	7.4
Education		
Quranic	61	21.4
Primary	144	50.5
Secondary	59	20.7
Tertiary	21	7.4
Alternative Occupation		
Trading	58	20.4
Civil service	19	6.7
Artisanal activities	6	2.1
Animal husbandry	70	27.7
Rain fed agriculture	123	43.2
Duration of Irrigation farming		
Less than 5	16	5.6
5-10	23	8.1
11-15	131	46.0
16-20	70	24.6
Above 20	45	15.8
Religion		
Islam	274	96.1
Christianity	10	3.5
Traditional	1	4
Ethnicity		
Hausa	263	92.3
Fulani	22	7.7

Source: Fieldwork, 2015

Table 3: Income of respondents (n=285)

Parameters	Frequency	Percentage
Annual Income from Irrigation farming		
Less than 50,000	11	3.9
50,000-100,000	106	37.2
101,000-150,000	89	31.2
151,000-200,000	62	21.8
Above 200,000	17	6.0
Annual Income from Rain fed farming		
Less than 50,000	65	22.8
50,000-100,000	78	27.4
101,000-150,000	82	28.8
151,000-200,000	43	15.1
Above 200,000	17	6.0
Annual Income from other occupation		
Less than 50,000	79	27.7
50,000-100,000	50	17.5
101,000-150,000	64	22.5
151,000-200,000	70	24.6
Above 200,000	22	7.7

Source: Fieldwork, 2015

Table 3 undertakes the breakdown of farmers' annual income based on livelihood activities. It shows that the three categories of livelihood activities embarked upon by irrigation farmers in the study area are irrigation farming, rain fed agriculture and off-farm activities. Table 3 further portrays that income from irrigation farming is highest. A greater number -195 representing 68.4% earned between 50,000-150,000 annually. Regarding rain fed agriculture, 56.2% had annual income between 50,000-150,000, whereas 114 representing 40% of other occupations like trading, civil servant, animal husbandry etc.earned between 50,000-150,000 yearly. There are several possible explanations for this result. Farmers derive more income from irrigation farming owing to increase in price of agricultural produce during the dry season and less number of farmers engaging in irrigation agriculture. It should be noted, however that irrigation farming is not done throughout the year and farmers reported an average period of 4 months for which they are engaged in irrigation farming. If this average income is divided by 120 days (four months), it means an average farmer realizes N1, 250 per day from irrigation farming.

Furthermore, it should be noted that an average farmer has the responsibility of catering for the household and it should be recalled that the average household size was 15 people per household in the study area. In the light of the above, the average income per person per day from irrigation farming (that is 1,250 / 15) is N83.33 (less than $1) per day. This is quite below US $1 per day suggested by the United Nations as the poverty threshold. It has been recommended that for an individual to live above poverty level, he/she must be able to spend at least $1 /day. To this end, irrigation farmers in the study area were poor , living under one USD per day (one USD was equivalent to ₦200.00 during the study period).This low income could be attributed to the smallholding system predominant in the study area.This view is in harmony with Palamang (2011) who noted that the size of the farm can significantly influence the potential income of the farm and the performance of irrigation farming. The author further noted that bigger farms are usually more profit oriented than small sized farms, and farmers are usually in better positions to invest in more sophisticated agricultural technologies. However, the analysis here is based only on income from irrigation.

Crops cultivated in the study area

The most common crops include tomatoes (43.5%), leafy vegetables (30.5%) and maize (11.2%). Tomatoes and leafy vegetables are crops highly marketable; hence, most farmers cultivate it for economic purposes. Maize is regarded a staple food in the study area hence it is not surprising that it is planted by a significant proportion of irrigation farmers. The rest of the crops are mainly grown for household consumption. These results are consistent with that of Palamang (2011) who found out that majority of irrigation farmers in Lesotho cultivated maize and potatoes, because maize formed the basis of the diet of the people, while potatoes were grown as cash crops. The comment below from a discussant at the FGDs also validates the above analysis:

> *When we sell tomatoes, we realize more money than other crops. The price can easily go up very high and can make someone rich in one day* (Shamsu, 19/12/2015).

Similarly, an interviewee alluded to the foregoing that:

> *Tomatoes and Leafy vegetables also give daily income and prestige. We sell vegetables every day since they have the potential of sprouting within some few days. Tomatoes produce many fruits and can be harvested often especially in seasons that are diseases free. We also give as gifts to other family members and friends* (Umar Kanti, 19/12/2015).

Labour and technology of production

Findings on types of labour used by irrigation farmers in the study area shows that hired labour provided more than half (71.2%) of the labour engaged in irrigation activities. This is followed by family labour (22.1%), while the least is communal effort (6.7%). This implies that irrigation farmers in the study area expended much on labour for them to be efficient in irrigation. This result may be explained by the fact that majority of the children of farmers practicing irrigation could be engaged in school or non-farm activities and hence, do not have enough time to assist in irrigation activities. Besides, the small proportion of the irrigation farmers who were civil servant may depend solely on hired labour owing to official engagements. A possible explanation for low percentage of communal labour is that because it is a commercial enterprise, each farmer is busy with his own work and do not have time for group work. This result is opposed to Saleh (2006) who asserted that family labour provided the largest (52%) labour used by small scale irrigation farmers in Auyo LGA, Jigawa state. Irrigation farmers in Kafur LGA solely make use of pumping machines i.e. motorized technique of irrigation. This method is most affordable for them considering their main sources of water, which is Sulma, dam reservoir. These results seem to be inconsistent with other researches (Mohammed (2002); Palamang (2011); Hassan (2014)) which found that irrigation farmers use a variety of method such as shadoof, gravitational, sprinkling, moisture utilization etc.

Socioeconomic benefits of irrigation

Infrastructural Facilities Developed Via Sulma Earth Dam Project

Table 4 presents data on infrastructural facilities developed through the instrumentality of Sulma Dam Project. Irrigation farmers free of cost use the Dam, which is controlled by the Ministry of Water Resources and Environment, Katsina State. However, Kafur irrigation Farmers' Association and Hayin Daneji Irrigation Farmers Association have the responsibility of ensuring sanity around the dam and resolution of conflicts among users of the dam. Nearly, all the respondents confirmed that a good number of infrastructural facilities such as deep wells, feeder roads, market, shops etc. were built via Sulma Dam Project. Similarly, more than three-fourth of the respondents also affirmed that quite a reasonable number of infrastructure were developed off-farm owing to the establishment of Sulma Dam Project. Some of the villages that benefited from these infrastructures include; Gidan Keke, Gidan Dangulo, Ungwar Audu, Ungwar Maza and Rugoji, which were rural settlements enjoyed feeder roads. Kafur, and Ungwar Maza benefited from recreational centres, accommodation and farm input centres.

Table 4: Infrastructural facilities

Infrastructure	Frequency	
	On-farm	Off-farm
Deep wells	275	-
Tap water	-	-
Feeder	250	237
Market	278	-
Recreational Centre	273	240
Shops	282	270
Accommodation	189	170
Storage	-	-
Farm Input Centre	-	267
Bridge	283	-
Culverts	160	-
Generator house	205	-
Public toilet	223	-

Source: Fieldwork, 2015

The infrastructures established off-farm include feeder roads, recreational centres, shops, accommodation and farm input centre. This implies that that Sulma Earth Dam project has in no small measure benefited the Kafur community socio-economically.

Irrigation farming and welfare needs of farmers

This section deals with the effects of income from irrigation by the irrigators on their over-all economic well-being in the communities. The ability to meet domestic daily needs like better-quality diet, appropriate clothing, better medical services, improvement of education of wards. Improvement of sources of water and improved cooking energy and bed clothes. Table 5 shows the result of respondents' rating of welfare needs based on the extent to which they have been met through their involvement in irrigation farming. Result in Table 5 discloses that 70% of respondents rated improved housing condition to be excellent. This is followed by improved toilet facilities (49%), improvement in education of children (44%) and better quality diet (39%). These analyses underscore the fact that income from irrigation has substantially enhanced the overall economic well-being of irrigation farmers.

Table 5: I irrigators' rated welfare needs from proceeds of irrigation farming

Met welfare needs	Excellent		Very Satisfied		Satisfied		Not Satisfied	
	F	%	F	%	F	%	F	%
Better-quality diet	112	39.3	90	31.6	45	15.8	38	13.3
befitting clothing	93	32.6	55	19.3	100	35.1	35	12.3
Better medical services	45	15.8	66	23.2	120	42.1	54	18.9
Improvement of education of wards/Children	125	43.9	60	21.1	55	19.3	45	15.8
Improvement of sources of water	58	20.4	93	32.6	100	35.1	34	11.9
Improved cooking energy	85	29.8	45	15.8	55	19.3	100	35.1
Comfortable beddings	100	35.1	120	42.1	35	12.3	30	10.5
Improved toilet facilities	140	49.1	95	33.3	20	7.0	30	10.5
Improved housing condition	200	70.2	66	23.2	10	3.5	9	3.2

Source: Fieldwork, 2015.

Table 6: Effects of irrigation Farming on Acquisition of properties by Irrigation Farmers

Type of Property	Quantity as 2005	Quantity as 2015	% Difference	Remarks
Brick house	47	187	74.9	Increase
Bicycle	140	22	-84.3	Decrease
Motorcycle	62	117	47.0	Increase
Car/Bus	1	20	95	Increase
Mud house	132	30	-77.3	Decrease
Dug well (at home)	34	160	78.8	Increase
Mobile phone	21	250	91,6	Increase
Housing furniture	35	120	70.8	Increase
TV and household electronics	58	231	74.9	Increase
Additional Farm land	23	79	70.9	Increase
More building Plots	10	34	70.6	Increase

Source: Fieldwork, 2015

Table 7: Correlation matrix of the community development indices

Variables	INR	BOH	MKT	FDR	SHP	BRG	CUV	PBT
INR	1.000							
BOH	.824**	1.000						
MKT	-411**	-192**	1.000					
FDR	.774**	.866**	-166**	1.000				
SHP	.550**	.436**	-084	.504**	1.000			
BRG	.806**	.609**	-315**	.527**	.266**	1.000		
CUV	.636**	.634**	-121*	.732**	.688**	.386**	1.000	
PBT	.753**	.832**	-159**	.961**	.524**	.507**	.762**	1.000

*Correlation is significant at the 0.05 level (2-tailed) N=285; **Correlation is significant at the 0.05 level (2-tailed); **INR**= Income from irrigation farming, **BOH**= Construction of Borehole, **MKT**= Establishment of Market, **FRD** =Construction of Feeder Road, **SHP** = Building of Shop, **BDG** = Construction of Bridge, **CUT** = Construction of Culvert, **PBT** = Building of Public toilet

Material acquisition before and after involvement in irrigation farming

Acquisition of materials by farmers is an index of the socio-economic benefits of farming. To properly assess properties acquired by farmers from irrigation activities, ten years estimate was used. Hence, Table 6 shows information on effects of irrigation farming on acquisition of properties by irrigation farmers. It reveals a style of positive movement from less expensive items to more expensive valuables based on the economic needs of the respondents. Table 6 clearly shows that there is an increase in the building of brick house from 47 to 187 (74.9%) among the irrigation farmers, while the acquisition of bicycle decreased from 140 to 22 (-84.3). Similarly, motorcycle increased from 62-117 (47.0%), Car increased from 1 to 20 (95%), Mud house decreased from 132 to 3 (-77.3) etc. The results revealed that a greater number of irrigators have acquired more of bicycles and motorcycles than cars or buses.

A possible explanation for this result might be the fact that majority of the irrigation farmers are low-income earner (Table 3) living under one USD per day and hence may not be able to purchase and maintain vehicles. However, evidence abound from the analysis that there has been great improvement in material acquisition by the irrigators due to their involvement in irrigation.

Irrigation activities and physical infrastructural development

In order to ascertain the contributions of irrigation farmers to community development, some socio-economic development indices such as construction of tube wells, feeder roads, bridges, culverts, public toilets and establishment of markets were subjected to Pearson Product Moment Correlation analysis. Table 7 shows correlation matrix of the community development indices. The results showed that a significant positive relationship exists between shops and income of irrigation farmers (r = .550, p =0.01). This implies that in the face of credit constraints irrigation farmers normally diversify into non-farm activities, like trading. This provides them with cash to supplement family needs or to invest in productivity-enhancing inputs. This assertion is reinforced by Ellis (2000) who stated that through diversification, households have been able to generate extra income and are improving their welfare.

Data in Table 7 again established a significant relationship between construction of bridges and feeder roads (r = .527, p =1.000). A possible explanation for this relationship might be that for efficient marketability of agricultural produce, access roads need to be built by the government. Hence, the more feeder roads are constructed, the more bridges are built across streams, brooks and rivers. In addition, Table 10 shows that construction of public toilets and building of shops have a significant positive relationship (r = .524, p= 1.000). A likely reason for this association is that the more shops are built the more the need to construct toilets around the shops for people to ease themselves. Furthermore, the result of the correlation analysis indicated that establishment of shops and construction of boreholes have significant positive relationship (r = .436, p = 1.000). This suggests that agglomeration of shops could lead to the demand for water for domestic uses. Table 7 as well indicates a positive relationship (r = .550, p = 1.00) between income from irrigation farming and establishment of shops. This demonstrates that increase in income from irrigation can lead to acquisition of more shops by way of investment. Moreover, a significant positive connection (r = -166, p= 1.00) have been established between market and feeder roads (Table 7). This implies that improvement in road network by the government will increase access to market resulting into general socioeconomic development.

Constraints to irrigation farming

Constraints in this study refer to barriers, impediments or factors that constitute hindrances to effective irrigation farming. Results reveal that the greatest constraints were infestation of pests and disease on tomatoes and leafy vegetables that accounted for 78% response. This is followed by price fluctuation (10.9%), drought (drying up of dam) (5%) and inadequate finance (3.9%). The above analysis has shown that irrigation activities in the study area are greatly constrained by climate, institutional and economic factors. The likely justification for the forgoing claim might be the adverse impact of climate variability ensuing incidence of drought, pests and diseases among others.

Conclusion and Recommendations

From the findings of this study, it could be concluded that irrigation farming in the study area is of immense benefits to the irrigators and their respective communities. The reason is that farming remains the major occupation of the community and there are viable potentials for irrigation. Undoubtedly, the welfare needs of irrigators in the study area are more positively affected by irrigation activities than community development.

The problem of price fluctuation and inadequate finance discourage irrigators from increasing production. Inadequacy of finance as a major threat to irrigation activities is attributed to shortage of credit facilities prevalent in most of the communities. Pests and diseases resulting from climate variability have greatly impeded irrigation farming. This often leads poor harvests. Therefore, the following recommendations are put forward: First and foremost, for overall improvement of the social welfare of the family, women should be encouraged to participate in irrigation farming by granting soft loans to women via the Bank of Agriculture, uphold government programmes that support rural women engaging in irrigation farming. Secondly, government should improve farmers' access to loan/credit in order to enhance their productivity through establishment of more financial institutions in the rural areas and moderate conditions attached to loans and advances.Thirdly, government and development actors are to make pesticides available to farmers at subsidized rates to enable farmers combat the menace of pests and diseases. Fourthly, government through extension services should educate farmers on modern skills and knowledge of irrigation farming capable of combating adverse effects of climate variation through intensive adult education classes and enlightenment campaign. Fourthly, the government should intensify irrigation agriculture, encourage access o marketing opportunities and encourage integration by establishing agro-rural industries.

Conflict of Interest

Authors declare that there are no conflicts of interest.

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