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Breaking the Vicious Cycle in Irrigation Farming System for Sustainable Food Security in Nigeria

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Abstract
This paper is a pilot investigation into irrigation activities and the need for a reform to attain food security in Nigeria. Oke-Oyi irrigation project of the Lower Niger River Basin Development Authority, Ilorin was chosen as epitome of irrigation projects in Nigeria. Structured questionnaire were administered on the 135 farmers participating in the project for detailed analysis. Past and present project officers were also interviewed. Simple percentages were used to summarize the data for discussion. The study revealed that the services of the irrigation agency is poor and grossly inadequate, revenue from irrigation farming cannot meet the cost let alone aiding further investment. The farmers do not have access to farm inputs such as fertilizer and micro credit among others. The paper is of the opinion that a reform in this sector will transform irrigation system towards a path of sustainable food security.

Key Words: Irrigation, vicious cycle, food, sustainable, security

Introduction

Irrigation Agriculture in Nigeria is plagued with problems of poor access to inputs and low productivity due to poor funding of institutional agency which in turn leads to poor distribution of irrigation water and delay in supply of fertilizer and in summary poor efficiency of irrigation agency.

The resources for normal irrigation operation and maintenance are under severe pressure as cost of recovery is extremely low. The Government often finds it difficult to allocate enough funds because of the overall fiscal crunch.

Even when funds are allocated they are not released on time to meet time when the services are needed. Unless this trend is reversed through institutional reforms, the whole system will collapse or at best continue to run at a low potential for food production. It won't be able to contribute as much as expected especially at this instance of increasing population and consequence increase demand for food and fiber for industries. For example, there has been a continuous increase in food demand-supply gap (table 1.). The table presents the scenario in the 90s. In fact nothing has changed since the beginning of the Millennium. The three year average (2003-2005) net cereals export import for Nigeria was -2,927,000 tons (FAO 2007a).

In order to make up for the gap, Federal government over the years relies on food importation to supplement the local output as presented in the table 2.

The National Economic Council recently reported that Nigeria spends 2.8 billion American dollar annually on food importation (Nigerian Tribune, March 2008) in fact the situation is getting worst as the global food crisis is reaching alarming rate and has become a great concern. Recently, World Bank inaugurates 1.2 billion American dollar 'fast –track facility to boost its support for global agriculture and food to overcome global food crisis (The Punch, June 2008). We should note that the first goal of the eight Millennium Development Goals, eradicating extreme hunger and poverty has been traced to agriculture. This first goal calls for halving hunger and poverty by 2015 taking 1990 as the base line (Braun et al, 2004)

This paper attempts to evaluate irrigation activities in one of the River Basin Development Authorities in Nigeria as an epitome of irrigation projects in the country, with a view to establish the need for making irrigation more efficient to enhance food security in the country.

The Project of Investigation

Oke-Oyi irrigation project of the lower Niger River Basin Development Authority, Ilorin was selected for in-depth investigation. Oke-Oyi Irrigation Scheme is one of the small schemes of the River Basin Development Authority, Ilorin. The scheme is located in Oke-Oyi the Headquarter of Ilorin East Local Government Area of Kwara State. The scheme has a 47m long concrete weir constructed on Oshin River to impound water for irrigating about 100hectares. of farmland at the inception. Additional weir was constructed in 2001 down the main weir together with the improvement

made by increasing the height of the former weir. The weirs have been upgraded to impound capacity of over 7million cubic meter of water.

The Oke-Oyi irrigation project has a success story of a viable small-scale irrigation scheme. Since 1994/95 dry seasons, farming activities have been intensive on all available 100ha. More land area has been cleared to make available 300ha for irrigation annually. The target however is to be able to cultivate about 1000ha. This is one of the reasons for the additional weir constructed in 2002 (L.N.R.B.D.A, 1999).

Materials and Methods

The selection of Oke –Oyi scheme was based on availability of data, accessibility, and the success story of the scheme and the progress of development in the project site (L.N.R.B.D.A, 2002). In the project area another weir was constructed and completed recently to impound over 7million m^3 of water. The irrigation scheme is a viable small to medium size irrigation project that is fully operational. Since 1994/95 dry seasons farming activities have been intensive in the project (LNRBDA, 1999). One hundred hectares of cultivable land are currently under intensive irrigation cropping by 135 participating farmers.

Structured questionnaire was administered on the 135 participating farmers at the Oke – Oyi irrigation projects of the LNRBDA, Ilorin. This is to harvest data related to maize cultivation at the project site. They include Crop yield, Quantity of fertilizer applied, the cost of inputs (pesticides, labour and logistics), quantity of water supplied, frequency in water distribution, man hour on the farm. The past and present project officers were interacted with and discussions were made during the fieldwork and data collecting stage. This assisted in validating some information supplied in the printed questionnaires that were distributed to the participating farmers.

Crop yield: Crop yield estimates were determined by using the 50kg bag to measure the maize harvested per hectare during the farming session.

Fertilizer: The quantity of fertilizer used was estimated by using the number of bags of fertilizer applied multiplied by the weight of the bag (50kg) divided by the farm size.

Volume of water: This was determined by calculating the water discharged per unit area per time using the formula:

Amount of Water Discharge = AV

Where A = area of the circumference of the water hose and

V = Velocity = Revolution per min

Average per day = Discharge x 7.4 hrs

15 ha.

Area of the water pipe multiplied by the revolution of the engine and duration of pumping over the land area.

Man hour: The number of hours worked on the farm was estimated by the numbers of hours spent on the farm daily multiplied by the number of days-spent working on the farm.

Cost of input: The farmers estimated the cost of other inputs (pesticides, hired labour and logistics) and added the estimate to the estimated cost of fertilizer applied to the farm.

Income: Farmers' income was estimated by multiplying the current market price by the total estimated quantity of maize harvest from their farms.

The calculated/estimated results of all input and output parameters were converted to units per hectare.

Since all the 135 participating farmers form the population of study on the project, simple percentage was used in analyzing the data.

Results and Discussion

Eight key parameters of maize cultivation selected for this study include crop yield, quantity of fertilizer applied, volume of water, farm size, frequency of water distribution. Man hour on the farm, Cost of inputs, income of farmers.

Socio-Economic Inputs and Maize Yield at the Irrigation Project Site

The farm size of farmers ranges between 0.1 and 2.0 ha. Majority (60%) of the farmers have between 0.5ha and1.0ha. The volume of water required for a 90 days maturity maize variety planted on the farm according to the project officer, is 1481104 m^3 ha^{-1} per distribution at an interval of 5 days = 26767872.2 m^3 ha^{-1}. This is approximately 2.7 Million M^3. None of the plots received as much, and only $1/3^{rd}$ of the plots had $2/3^{rd}$ of the amount of water required for maximum crop yield. The frequency of water distribution revealed that a maximum of 18 times is expected for the crop to mature at the 5days interval. The observed situation is that water is supplied to the plots on

7-days interval while only 45 plots had water on them 12 times. Others had it 6 times as against the expected and desirable 18 times. The expected quantity of fertiliser is between 7 and 8 bags per hectare i.e. 350 – 400 kg per ha. In this study, only plots 7 and 9 had the lower limit of the required quantity (350Kg). While 99 others had less, 2 of the plots had more than the required quantity. The required number of hours spent on the farm does not correspond with the size of the farm. Number of hours spent on the farm ranges from 2 – 4.8 hours per day. Farmers that spent high number of hours have correspondingly high crop yield. The inputs that attract cost in this study for maximum yield include fertiliser, hired labour, pesticides and herbicides in some cases. The farmer with high farmland (2ha) recorded the highest cost (N19, 428.00).

Table 3 shows the list of irrigation equipment (Hardware) that are necessary for full operation on the site. A general assessment of the condition of the equipment revealed that water distribution to the farmland would be grossly inadequate. The two water pumps are old and they need replacement. The first weir is silted up and this may lead to the silting of the second weir in the shortest time if silt in the first weir is not removed or controlled on time. The distribution pipes are relatively inadequate because those that are in good condition are not in sufficient quantity, while the engine of the utility vehicle also needs to be overhauled.

Accessibility to Farm Inputs

With over 70 per cent of rural people in agriculture their access to productive resources and employment is critical. According to IFPRI report 2002, more productive agriculture is vital, for productive gain in agriculture can boost the income of rural people both on and off the farm. To the extent that gains in agriculture productivity leads to lower food prices. Despite this, many rural people do not have the tool they need to be more productive farmers (IFPRI, 2002). They need access to credit and savings institutions, fertilizer, and high yield seedlings among others.

On the field interaction and discussion with the farmers on the project and outside the project revealed that many farmers are willing to engaged in irrigation agriculture but the available land is not enough for any meaningful crop production for instance, only 100 hectares of farmland was available for intending irrigation farmers and 70 hectares were put into maize in year 2007 at the project site in Ilorin. The land had to be unnecessarily fragmented to accommodate 135 farmers. This does not give room for economics of scale.

The farmers have little access to inputs such as fertilizer, fund and other inputs. For example, the response of the 135 farmers is summarized in table 4.

Larger proportion of those with partial access to fertilizer remarked that they have to lobby and tip officers' in-charge of fertilizer distribution either at the State Ministry of Agriculture or Local government before they are able to get few bags allocated to them and still not at the regulated price. Other inputs: seedlings, chemical/pesticides and extension services are only accessible readily or partially to those that can afford the price. The supervising agency has not been rendering these services since the re-establishment of the organization in 1994 and abiding by the new mandate which removed agricultural production and its allied services from its mandate. This has in one way or the other created some problems for the farmers. Once the inputs are inadequate one should not expect an adequate and bounty harvest.

Agricultural credit facility is another major input that the farmers do not have access to. Only about 8 percent of the farmers claimed to have access to agricultural credit facility and another 26.7 percent have partial access to this input. Majority of the farmers did not have access to agricultural credit. The source of credit has always been from friends, family and co-operative society. It is true that commercial banks and other finance houses have agricultural credit facility but it is not accessible to the farmers in the study area. They could not meet up with the conditions for which Bank credit facility can be given to them. They all wish to take advantage of the credit to assist them in procuring other farm inputs to increase crop production and improve quality.

The scenario presented above does not encourage more farmers to participate in the irrigation farming. In the final analysis, the projects are ineffective, inefficient and are unable to achieve the set objectives, the farmers are wallowing in abject poverty and unsustainably low crop yield from their farms. For instance the average yield per hectare has been less than 4tons per hectare since the year 2000 (table 5). This is extremely low compare with yield on irrigation fields in other tropical environment.

Vicious Cycle in Irrigation Agricultural Systems in Nigeria

The consequences of public run irrigation system operates water pricing and land policy that does not cover the cost of operation and maintenance of the system talk less of full capital cost of operation and maintenance, for

instance, a farmer pays a token of N500 per plot per season at the project under investigation. This leads to a serious constraint of the irrigation agency and inherent physical deterioration of irrigation schemes which affects delivery of the major input water supply. A fundamental issue is that some farmers believed that RBDAS were established as a social service to communities to facilitate rural development. Burt the mandate and objective of river Basin Development has changed to pursuing development of water for domestic activities in cities and irrigation in rural communities. The inefficiency on the part of the agency is also caused by institutional constraint like the lack of accountability on the part of the irrigation agency to assure quality supply. In fact, there has been no link between irrigation qualities provided, revenue generated and staff uprightness. There has been lack of proper coordination as a result of abrupt change in policy and mandate.

Lack of farmers' involvement results in inappropriate designed irrigation system, which leads to poor irrigation service often, dissatisfies the farmers. Since inception irrigation projects in Nigeria in particular and developing world in general came through 'Industrial Approach' of colonial powers, in which decision makers and investors are seeking to introduce irrigation in the hope of meeting objectives not shared by the local society. Crops are selected in advance, water sharing between plots rather than between farmers, the stress is placed on economies of scale. This implies that the farmers must sow during the period set by the engineers who designed and managed the scheme and they must till, weed and harvest at the time determined by the later (Geet Diener, et. al. 1991).

The unreliable supply and distribution of irrigation water leaves many farmers dissatisfied and unwilling to participate. Furthermore, the poor service affects the farmers' ability and activities since it leads to low yield and income (Oriola, 2006).There is no doubt that there is limit to personal savings particularly in rural area where the people are wallowing in abject poverty. Therefore, the investment is expected to be low and the consequent output will also be low.

Breaking the Cycle in Irrigation System

The vicious cycle has to be turned to virtuous cycle through multifaceted reform programme which the government has embarked on in Public Private Partnership initiatives. One of the elements of the vicious cycle that should be transformed is farmers' empowerment and private partnership which will

make irrigation self sustaining with capability of providing efficient irrigation service. This has to be accompanied by fundamental changes in institutional framework. Once this is done appropriate water pricing can be put in place such that retail price of water can generate enough revenue for the maintenance of the project and discourage waste. This will also reduce environmental degradation in form of water logging and salinity.

The Institutional reform includes:

- Make the project authorities financially accountable by according them operation autonomy
- Associate the user farmers with the decision making process in the project at various level
- Entrust the user association with tasks of managing the system in their area of operation as well as collecting the water charges on the basis of a workable formula linking the rate with the quantity of water consumed.
- Allow private sector to take over the renovation maintenance of part of the project or whole project of the project where feasible and to manage the system by charging commercial rates.

To reduce the government recurrent cost and increase revenue level and the users' role the reform should

a create a formidable water users association
b transfer of system maintenance and repair to the water users association
c reduce cost on establishment, repair and maintenance
d improve water use efficiency and better system performance
e bestow higher role on the user organizations and lesser role on government.

Conclusion

Several facts characterized irrigation practice and food securities in Nigeria, among them are

- Poor and grossly inadequate services by irrigation agency
- Poor revenue from irrigation which cannot meet the cost let alone aiding further investment
- Low farmers productivity which consequently lead to low crop yield

- Poor access to inputs like micro credit and fertilizer and demoralizing

All the above demand for a reform and this is what can turn irrigation agriculture around and put it in its proper position in food security. The reform can be achieved by ensuring that farmers are recognized and empowered to take up responsibilities in irrigation operations and maintenance. This will challenge them and make them more enthusiastic and business like.

Accountability and proper pricing should be done to water supply and distribution. This will cut low wastage and reduce land degradation. The farmers' recognition and involvement in decision making at all levels will surely make the system trance parent and will facilitate proper accountability. With all these, there is hope that irrigation agriculture in Nigeria will be able to recover operation and maintenance expense and be on sustainable path of food security.

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Table 1: Food Demand – Supply Gap (000mt Grain Equivalent Value)

Year	Food Utilization	Food Output	Demand – Supply Gap
1990	40531	35311	-5220
1991	71497	36745	-34752
1992	75571	38855	-36716
1993	90504	45143	-45361
1994	93581	45808	-47773
1995	96284	48590	-47794
1996	101569	51276	-50293
1997	104487	52725	-51762

Source:- After Akuh (2000)

Table 2: Food Import In Nigeria (1990 – 2000) N'million

Year	Food imports	Total Import	Food as % of Total Import
1990	3,474.5	45,717.9	7.60
1991	3,045.7	87,020.2	3.50
1992	12,840.2	145,911.4	8.80
1993	13,952.4	166,100.4	8.50
1994	13,837.0	162,788.8	8.50
1995	88,349.9	755,127.7	11.70
1996	75,392.0	562,626.6	13.40
1997	100,728.3	845,716.6	11.91
1998	99,863.8	837,418.7	11.93
1999	103,691.6	857,130.2	12.10
2000	114,593.4	962,970.2	11.90

Adapted from Arosanyin (2006)

Table 3: Irrigation Farming Equipment at Oke-Oyi Project

QUANTITY	EQUIPMENT	CONDITION	REMARK
	WEIRS		
2	**47m Long**	**Silted**	**Needs**
	50m Long	**In good condition**	**Refurbishment**
			Newly constructed
1	ISUZU VA N	**Worn- out engine**	
	(Utility Vehicle)		**Needs overhauling**
3	TRACTOR		
	M.F.375E	**Old**	
	FIAT 56-70	**In good condition**	**Needs Replacement**
			Newly Supplied
2	PUMPING MACHINE		
	One at phase II	**Old**	
	One at phase III	**Old**	**Needs Replacement**
			Needs Replacement
250	IRRIGATION PIPES		
50	**6'' Galvanized pipe**	**Partially O.K**	
110	**4'' Galvanized pipe**	**In good condition**	
60	**3'' Lateration**	**In good condition**	**Not sufficient**
10	Hydrant Gate	**In good condition**	
6	**6'' Elbow Joint**	**In good condition**	
4	**6'' End Cap**	**In good condition**	**Not sufficient**
1	**6'' Foot Valve**	**In good condition**	**Not sufficient**
5	**8'' Foot valve**	**In good condition**	**Not sufficient**
	Raingun	**In good condition**	**Not sufficient**
			Not sufficient

Source:- LNRBDA Oke-Oyi Project Office (200).

Table 4: Accessibility of Farmers to Irrigation Farm Inputs in Percentage

Irrigation Inputs	Not Accessible	Partially Accessible	Readily Accessible
Irrigated land	-	29.4	70.6
Irrigation water	16.2	59.3	24.5
Fertilizer	5.9	75.2	18.8
Seedlings	43.9	20.9	35.2
Chemicals (Pest / Disease)	40.4	24.0	35.6
Extension services	68.8	20.4	10.8
Agric credits	44.4	36.7	18.9

Source:- Oriola , 2007

Table 5: Maize Production At Oke-Oyi Irrigation Scheme

Farming Season	Area Cultivated in Ha	Amount in Tonnes	*Av. Output in Tonnes Per Ha*
1995/96	50	280	5.6
1996/97	38.5	80	2.07
1997/98	18.5	75	4.05
1998/99	20.6	85	4.13
1999/2000	40	180	4.50
2000/2001	50	45	0.9
2001/2002	50	80	1.6
2002/2003	65	120	1.8
2003/2004	65	150	2.31
2004/2005	70	160	2.29
2005/2006	80	210	2.63
2006/2007	70	180	2.57

Source :- L.N.R.B.D.A Oke-Oyi Irrigation Project Office 2007