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Water Resources Development: Opportunities for Increased Agricultural Production in Nigeria

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Abstract: Agriculture has been the backbone of the economy in Nigeria providing employment and source of livelihood for the increasing population and accounting for over half of the GDP of the Nigeria economy at independence in 1960. However, the role it plays in the regional and economic development of the country has diminished over the years. This downward trend has been attributed to many factors. The crop section has been more dependent on rain-fed and production has been seasonal (limited). With the increasing food demand in Nigeria, the country has available water resources and potential for increasing the volume of crop production towards meeting the food and nutritional requirement of the rapidly increasing population and guarantee food security in the country. The study articulates the possible effect of water resources development on increased volume of agricultural crop production in Nigeria. The study revealed that there are opportunities for water resources development in the country through irrigation to supplement the water requirements and needs of farmers for agricultural production activities in many areas in the semi-arid and arid regions. Available data shows that there are available land and water resources that could be developed to support the production of food and agricultural development with opportunity for increased productivity. However, while, the water resources are unevenly distributed in the country, there is need for the efficient use and management of the available water resources and increasing the productive use especially in the northern region of the country where there is increasing incidence of drought and competing need for water among the different sectors of the economy. The study also made possible recommendations for policy formulation to address the current problems facing the agricultural section in conjunction with the requirement for the development of the water resources.

Key words: Water resources, opportunities, agricultural production, economy, Nigeria

INTRODUCTION

Agricultural has been the mainstay of the economy in Nigeria and many of the African countries, providing employment and source of livelihood for their increasing population. The history of agriculture in Nigeria is intertwined with the political history of the country and can be assessed from the pre-colonial, colonial and post-colonial periods. The pre-colonial society in the country thrived on agriculture as the main stay of the traditional economy and the period of the colonial administration brought a great impact on agricultural development with emphasis placed on research and extension services (CBN, 2000). In the colonial era, agriculture was regarded as the backbone of the economy with most the foreign exchange earnings at the time derived from export of agricultural products. At independence in 1960, it accounted for over half of the GDP of the country's economy and was the main source of export earnings and public revenue before the emergence of the oil sector and exploration of crude oil began in the country. With agriculture as an occupation providing both formal and informal employment in which about 38% are females (CBN, 2000), its role in the economic and regional development of the country is of significant importance. The total cultivable land in the country is estimated at 61 million hectares, which represent about 66% of the total area of the country (Aquastat, 2005), relating to adequate availability of land resources for agricultural production coupled wit the availability of human labour resources.

However, the agricultural sector has suffered a relative decline in the preceding years after independence due to the dominance of oil sector in the economy and in the GDP (Aigbokhan, 2001). While, agriculture holds immense potential for enhancing and stabilizing the country's foreign exchange earnings and guaranteeing

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food security in the country, the past 3 decades have witnessed a steady decline in this role. Nigeria, which was once a large net agricultural produce exporter now imports food and attempts to revive the agricultural sector as a dominant sector, have been unsuccessful. With the increasing human population in the country and increase in demand for food, there are challenges for the development of the sector by boosting and increasing the volume of food production towards meeting the increase in food demand and guarantee food security in the country without reliance on external food imports. This can come through the development of the water and land resources, which are major inputs in the agricultural production process and annexing the surplus and under-utilized human labour resources from the increasing population growth, available in the country. However, these steps must be taken without compromising the sustainability of the industry and environmental resources including water and land resources, which are vital inputs in the production process.

This study specifically examines Nigeria's water resources, in terms of resource profile and strategies adopted over the years towards optimal exploitation, management and utilization for increased agricultural production against this background, the problems militating against effective management of country's water resources taking into account irrigation programmes and projects and rural households' welfare are highlighted. The ultimate objective is to identify a number of critical factors, which must be taken into account in designing appropriate strategies for sustainable utilization of nation's water resources to enhance agricultural production.

ECONOMIC IMPORTANCE OF WATER RESOURCES DEVELOPMENT FOR AGRICULTURAL SECTOR GROWTH

The development of the water resources in Nigeria holds immense potential for development and growth of the agricultural sector and overall economic growth. With water a major input in the agricultural production process, its availability is vital for the success of the farmers in their production effort and achieving increased food supply.

Crop production requires availability of water at the right time in the right quantity and quality. For good agricultural output, water is a necessity, as the crops require water for vegetative production in carrying dissolved nutrients from the soil into their body tissues for use (FAO, 2003). However, with drought a frequent occurrence in the northern region of Nigeria and some part of the south and west, with the region susceptible to climate abnormalities, incessant changes in the rainfall regime will require adequate provision made available through alternative measures such as irrigation. While, the economy of the region is also intrinsically and inextricably tied to agriculture, any climatic calamity does adversely affect the socio-economic activities in the region with mounting pressure on available water and other resources in the face of a fluctuating rainfall regime.

The development of the nation's water resources thus offer new potentials and opportunities at achieving food security and increased revenue for the farmers and as well ensuring the development of the agricultural sector for economic growth of the country.

In Nigeria, as in many other sub-Sahara Africa (SSA) countries, water is generally regarded more or less as a nature -given resource. It is also seen a public good in urban cities. However, the form in which water is usedeither in terms of consumption or production activities is not free in the strict economic sense. For Instance, water that is treated for human consumption has a measurable economic value deriving from the scarcity value of non-nature - given resources that are used in producing it.

We can also consider water as a unitary resource, since, all water in the hydrological cycle forms part of one whole. Consequently, any intervention by man or nature, at or on one part of the cycle has a definite impact on another phase of the cycle. Excessive extraction of groundwater for instance has the potential of reducing base flows to river. The diversion of surface water may reduce the recharge ability of ground water, just as the discharge of waste water affects water quality. And ultimately, water quality determines the dynamics of the ecology (Sharma *et al*., 1996), with its interrelated natural systems such as land and forests. Generally, as human interventions intensify through the effect of rapid population growth, poverty and poor land use practices, water ecosystems such as rivers can be fundamentally altered in terms of increased deforestation, soil erosion and run-off, as well as possible modification, in the long-run, of micro climes. The loss of vegetation for instance may contribute to loss of soil and water quality, impede river flows and increase sedimentation processes (Orubu, 2006). It is within this context that the management of water resources should be ideally set within a broader frame work of land use and level of economic activities with man and sustainable agricultural development as the primary factors of concerns.

In the typical African rural community, particularly in arid semi-arid areas, it is the poor who are most affected by lack of access to water to support their livelihood

through farming. They are also the ones that are most adversely affected by drought-induced farmines. This scenario indicates that there is a tribute relationship between the availability of water for household consumption and other productive uses on the one hand and poverty reduction, food security and hence sustainable agricultural development. Water of insufficient quantity and quality leads to water related diseases. Inadequate rainfall and absence of irrigation facilities reduce agricultural production and threaten food security and both factors work to intensify the problem of poverty (Orubu, 2006). Understandably, the designing and implementation of an appropriate water resources management strategy is fundamentally significant if any meaningful efforts to reduce poverty, enhance food security, productive living and sustainable agriculture in Nigeria.

WATER RESOURCES ENDOWMENT OF NIGERIA

Availability of water resources as part of the production inputs also constitutes a major criterion to the development of the agricultural sector in the country. With evidence of availability of adequate water resources in the country, the development of the country's water resources for irrigation, control of floods for prevention of inundations of fertile lands along river banks and the delta areas and the increasing of water use efficiency and productivity are required for the full exploitation of the agricultural potential in Nigeria. Water resources in Nigeria.

The Nigerian freshwater environment consists of a number of rivers and their food plains, streams, lakes and wetlands, with the rivers and streams relatively evenly distributed all over the country. Annual rainfall is however highly variable across the different regions, varying from about 250 mm in the extreme north of the country, to about 500 mm in the south. Rainfall constitutes a significant source of water with annual renewable total estimated at about 319 billion cubic meters during the mid-1980s (Aminu, 2000; CBN, 2000). The distribution of average annual renewable water across the different Hydrological Areas (HAS) is as shown in Table 1.

As from Table 1, both the Benue (Upper and Lower) and Lower Nigeria HAS constitute the largest source of annual renewable water in Nigeria. The Niger River is of great significance in the management of water resources, not only in Nigeria, but also in other countries in the West African sub-region. It is one of Africa's 55 international rivers, traversing such countries as the Republic of Benin, Burkina Faso, Chad, Coted' Ivoire, Guinea, Mali, Niger, Nigeria and Sierra Leone. Within the context of co-operative management of water resources, it is important for us to note, that shared rivers save implications for the perception of water rights, as well as on the issue of national security and sovereignty.

The Benue is another major river in Nigeria. Other than the Niger and the Benue, the country has well over 40 rivers and streams (Orubu, 1995; Oboli, 1971; Majasan and Young, 1997). There are also the large lakes, including the Chad and Kainji. The Nigerian sector of the Lake Chad has a total surface area of about 550,000 ha, while, the Kainji Lake, has a total surface area of about 127,000 ha. These water bodies support a multiplicity of economic activities, including fishing, cropping, transportation and recreation. Most importantly, all these freshwater bodies are the source of water for a large irrigation activities in water scarce region of Nigeria. The River Niger is also the major source of hydroelectricity.

Generation in the country and its delta is recognized as one of Africa's major wetlands. The Niger delta occupies the largest proportion of the total land area of the geographic south-eastern part of Nigeria. It supports a wide variety of fish and other aquatic resources. It is also rich in petroleum and gas resources (Orubu, 2006). The available water resources and withdrawal in the year 2005 are summarized in Table 2.

Nigeria is rich in both surface and ground water resources. The average total precipitation in the country is 1150 km yaer^{-1} with total precipitation of 1062,336 km^3 year^{-1} for the whole country. The total water resource available in the country is estimated at 286,200 km^3 year^{-1}. This shows that the country has abundant water resources available for use when compared to the total water withdrawal of 8000 km^3 year^{-1}, leaving a potential balance of 278,200 km^3 year^{-1}. However, it is unevenly distributed across the different region of the country with surplus in some regions and scarcity in other regions. This gives challenges for efficiency in use and productivity improvement in the water scarce regions.

WATER RESOURCES AND IRRIGATION DEVELOPMENT IN NIGERIA

The annual rainfall across the different regions of the country varies greatly with an average mean rainfall of 10 inches in the extreme northern part and over 160 inches in the south-east and western region of the country (Aminu, 2000). While, agriculture can be carried out independently (with rain) without any supplementary irrigation activities in the southern region, the northern region of the country required irrigation either partially (supple-mentary), or on a full-scale basis for crop production activities and increased productivity with irrigation permitting double

Table 1: Distribution of annual average yield of surface and ground water in Nigeria

Hydrological area	Average surface water annual yield 10° (m^3)	Average ground water annual yield 10° (m^3)
Chad Basin	8.20	5.60
North West	22.40	4.30
Upper Lower Benue	83.00	11.40
West Littoral	35.40	9.00
Lower Nigeria	85.90	13.40
North Central	32.40	8.20
Total	267.30	51.90

Source: Adapted from Orubu (2006)

Table 2: Water resources and withdrawal in Nigeria 2005

Water resources	Year	Amount /unit
Average precipitation	2005	1150 mm $Year^{-1}$
Total precipitation	2005	1062,336 km^3 $Year^{-1}$
Internal renewable water resources	2005	221,000 km^3 $Year^{-1}$
External renewable water resources	2005	65,200 km^3 $Year^{-1}$
Total water resources	2005	286,200 km^3 $Year^{-1}$
Irrigation water requirement	2000	1650 km^3 $Year^{-1}$
Water withdrawal		
Agriculture	2000	5507 km^3 $Year^{-1}$
Domestic	2000	1687 km^3 $Year^{-1}$
Industrial	2000	810 km^3 $Year^{-1}$
Total	2000	8000 km^3 $Year^{-1}$

Source: Aquastat (2005)

cropping and ensuring sufficient water for the wet season and dry season cropping with good potential for increase yields of plantation crops, irrigated agriculture can make a large contribution to food security and accounts for a high share in water abstraction, about 20.6% in Nigeria (Aquastat, 2005).

Irrigation development in Nigeria has been centred on institutional strengthening of irrigation agencies and farmers groups, development of down-stream irrigation and drainage facilities, technical support to River Basin Development Authority in programme initiation, design, implementation, operational and maintenance as well as provision of support services and operational guidelines to the river Basin Development Authorities. With a good network of rivers and water bodies in the northern region, there are a number of irrigation projects in Northern Nigeria (FAO, 2006) include the South Chad Irrigation project, Kano River irrigation project, Middle Rima Valley Irrigation Project and the Doma Irrigation project among others.

South chad irrigation project: This irrigation project, which comprises Phase 1 and 2, is coordinated by the Chad Basin Development Authority. It is situated south of Lake Chad; about 120 km north of Maiduguri and the project is planned for the development of 67,000 ha of irrigable land, which is to be undertaken in 3 stages. Stage 1 covers a total of 22,000 ha, stage 2 covers 27,000 ha and stage 3 a total of 18,000 ha. There is also work presently going on, on an additional 413,394 ha out of which 35,127 ha have been developed and already in use by farmers with other irrigation schemes at various levels of completion.

Kano river irrigation project: The irrigation project has a total of 22,000 ha of irrigable land out of which 15,000 ha has been fully developed and operational since, 1983. Work is speedily going on the remaining balancing of 7,000 ha with major structures already put in place for the irrigation project.

Doma irrigation project: This irrigation project is coordinated by the Upper Niger River Basin Development Authority and has a total of 2,000 ha of irrigable land out of which 1,600 ha has been developed and operational with installation of sprinkling irrigation component. The water for the irrigation project is been sourced from the Doma Dam and the project is aimed at developing the water potential of the dam for irrigation purposes, public water supply and hydropower generation.

Middle rima valley irrigation project: This irrigation project is coordinated by the Sokoto Rima Valley Basin Development Authority and the irrigation project has a total irrigable land of 20,000 ha. It is being developed in phases with the first phase having a capacity to irrigate 8,170 ha of land.

Hadeija valley irrigation project: The irrigation project is coordinated by the Hadeija Jama are River Basin Development Authority with about 3,000 ha of land already in use for irrigation activities. An estimated 120,000 farm families are gainfully employed in the irrigation project.

Bakolori irrigation project: The irrigation project is coordinated by the Sokoto Rima River Basin Development Authority and has a 5.5 km dam with a storage capacity of 450 million m^3. The total irrigable land under the irrigation project is 23,000 ha of land out of which 15,000 ha is for sprinkler irrigation and the remaining balance of 8,000 ha for gravity irrigation but plans are underway to convert the sprinkler irrigation to gravity.

In all, an estimated 2.1 million ha of land comprising of 1.6 million ha from surface water and 0.5 million from ground water has been developed in the country (Aquastat, 2005).

IRRIGATION DEVELOPMENT AND POTENTIAL IN NIGERIA

The development of irrigation schemes started during the colonial period in Nigeria. Between 1855 and 1924, the famine in the northern region of the country directed attention to irrigation as one of the means of increasing agricultural food production. The series of famine and

event of the first world war in 1912-1914 also stimulated the desire to use irrigation to solve food problems of the dry north in particular and Nigeria in general (Nwa, 2003). An experimental irrigation farm, the Baro Experimental farm was started in 1908 with the objective to test the performance of certain crops during the dry season using irrigation with the installation of a diaphragm pump to lift water from the river to irrigate the farm with record performance said to be satisfactory (ibid).

Irrigation schemes and projects in Nigeria consist of 3 categories namely the public irrigation schemes, which are government-executed schemes, the farmer-owned irrigation projects and the residual fadama or floodplains. An FAO further classification of irrigation schemes based on land mass size in Africa made the following classification namely very large-scale schemes (over 10,000 ha); large-scale schemes (from 1000-10,000 ha); medium-scale schemes (from 100-1000 ha) and small-scale schemes (less than 100 ha) (Moris and Thom, 1990).

The large scale and medium scale irrigation scheme in the country are controlled by the River basin development Authority with a current estimate of 119,350 ha under the 2 schemes while, the combined area equipped flood recession cropping area making a total of 9775,031 ha water-managed area (Table 3) (Aquastat, 2005). However, while, the irrigation potential for the country stands at 2,330,510 ha, the actual irrigated land is less than 1% of the cultivated land thus making the contribution of irrigated agriculture to crop production very small (ibid).

Table 4 give information on the equipped area for irrigation and actually irrigated area in some of the RBDAs in the country. The higher value for Hadejia Jam'are of the actually irrigated area in comparison to the equipped areas is a reflection of the fact that water from the canal for the irrigation scheme is used to water farm lands outside the irrigation scheme while, many of the schemes that has low values of actually irrigated area are located in the southern part of the country where the demand for irrigation services due to the low incidence of drought and high rainfall value (Aquasat, 2005; Nwa, 2003). The equipped area value for Hedejia Jamare, Sokoto Rima and Chad Basin in the Table 4, represent the importance of irrigation to their individual regional location, which is in the Northern part of the country where the incessant changes in the rainfall pattern and frequent drought occurrences has necessitated the need for alternative measures for water supply for agricultural use. However, the low value of the actually irrigated values for these irrigation schemes except Hedejia Jamare give indication of the under-utilization of irrigation facilities in the schemes which calls for an increased understanding of the benefit of irrigation to crop production in these regions and utilization of available resources efficiently and effectively.

Table 3: Irrigated Area in Nigeria (2004)

Irrigated area	Year	No. ha
Surface irrigation equipped	2004	23867
Sprinkler irrigation equipped	2004	50
Localized irrigation equipped	2004	0
Equipped lowlands (wetlands, flood plains, mangroves etc.).	2004	5500
Non-equipped flood recession area.	2004	681,918
Total Water-managed area	2004	97531

Source: Aquasat (2005)

Table 4: Equipped and Actually Irrigated Areas in the River Basin Development Authorities for the Year 2004

RBDA	Equipped area	Actually irrigated	Actually irrigated as % of equipped area
Anambra-Imo	3941	10	0.3
Benin-Owena	317	0	0.0
Chad Basin	26,180	1000	3.8
Cross River	364	40	11.0
Lower Benue	1310	70	5.3
Hedejia Jamare*	18,475	21000	113.7*
Niger Delta	187	0	0.0
Lower Niger	1344	115	8.6
Upper Niger	3697	722	19.5
Ogun-Osun	512	110	21.5
Sokoto Rima	27,580	5290	19.2
Upper Benue	8410	783	9.3
Total	92,317	29,140	31.6

Source: Aquastat (2005)

Table 5 shows that the rate of irrigation development is low in the country compared to the irrigation potential of the country (2,330,510 ha); nevertheless, the rate of development witnessed in the period 1993-2004 compared to the period 1984-1993 is a positive result of the increased relevance of irrigated agriculture to the agricultural sector development in the country. However, comparing total value of actually irrigated area in Table 5 with quantity of grains produced in Table 6 there is indication that irrigated agriculture has not benefit much from the higher rate of irrigation development witnessed in the period 1993-2004 with the decreased number of tonnage of grains produced in the period 1999 compared to 1989.

While, Irrigated crops represent about 8% of the total crop production output in Nigeria (FAO, 1997), various types of crops are grown in irrigation schemes with hardly any type of crop that cannot benefit from irrigation. Table 6 shows the total product of irrigated grain crops in Nigeria in 1989 to be 1,852,200 tons and 135,000 tons in 1999, respectively, the table however, revealed that vegetable crops especially tomato, pepper, cabbage and onions among others are benefiting more from irrigation particularly in the northern part of Nigeria where they are specifically grown in irrigated plots throughout the year (Oluwasemire *et al*., 2002).

While, Table 6 shows that rice has the highest tonnage production in 1989 with a figure of 714,000 ha, its production has suffered a set back in the country with a

Table 5: Extent of Formal Irrigation Development in Nigeria, 1965-1993

Year	Irrigated area (Ha)	Rate of development (ha year^{-1})
1965	12200	N/A
1970	14570	474
1978	2000	679
1980	30,706	5,353
1984	36,163	1,364
1993	6900	3,649
2004	293,117	N/A

(N/A: not available); Source: Nwa (2003) and Aquastat (2005)

Table 6: Irrigated Crops in Nigeria in 1989 and 1999

Irrigated crops	Quantity in 1999	Quantity in 1989	Unit
Total Irrigated grain production	13500	1,852.200	Tons
As a % of total grain production	0.6	14.2	(%)
Harvested Crop under Irrigation	N/A	95000	Ha
Rice	700	71400	Ha
Tomatoes	2800	5200	Ha
Wheat	1900	5000	Ha
Potatoes	400	2600	Ha
Onions	2000	2300	Ha
Pepper	1600	8000	Ha
Sugar Cane	800	2600	Ha

Source: FAO (1995) and Aquastat (2005)

figure of 7,000 ha cultivated in 1999 with irrigation, which may be due to increased importation of the food item with the imported brand having better quality than the local brands. The increased production of rice experienced in 1989 was also as a result of the restriction on its importation at the period thus encouraging its local production, but with the restriction removed at the later years, it lead to the discouragement of local producers in its continuous production (Okolo, 2004). However, with the new initiatives aimed at boosting local rice production in the country coupled with increased import duties on the imported brand to discourage its consumption in the country, it is expected that its production locally will increase in the coming years.

IRRIGATION DEVELOPMENT AND THE CHALLENGE FOR INCREASED WATER PRODUCTIVITY

With the increasing need for water resource and irrigation development in the country, there are also challenges for increased water productivity for more efficient and effective use of the resource. The availability of water has been an important factor in economic and social development throughout human history, as freshwater is the most fundamental resource in sustaining life (Obeng-Asiedu, 2004). Water also plays a key role in the development and functioning of society and this recognized as a high priority resource for sustainable development. The amount of water available for use and its quality are directly linked to economic activities, urban and industrial growth and development, lifestyle and consumption patterns and is a key determinant of population growth and distribution and density, social and political organization (Nwa, 2003; Obeng-Asiedu, 2004). With increasing population around the world and most particularly in the sub-Saharan African, there is increasing demand and competition for freshwater for human consumption, industrial and agricultural production and generation of hydropower. With the increasing problem of water scarcity and aridity of the northern region of Nigeria, the available water resources must be used in an efficient way to meet the increasing demand of water users. Water is a limiting factor to improving agricultural production in this region, thus maximizing water productivity is viewed as a good strategy for on-farm water management and ensuring water security. Meeting the water demand for food production to achieve food security, rainfall and irrigation must encompass the efficient use of the resource and increasing the water productivity towards achieving a higher yield.

Crop water productivity relates to increasing crop yield per unit of water consumed and this depends on a number of factors such as crop genetic material, water management practices, agronomic practices as well as the economic and policy incentives to produce with improved water productivity (Kijne *et al*., 2003). Water productivity can be expressed in physical or in economic terms as partial factor productivity. Physical productivity is the quantity of product divided by the quantity of input and this is usually expressed in mass or monetary terms for comparison purposes (ibid). Economic productivity on the other hand uses valuation techniques to derive the value of water, income derived from water use as well as the benefits also derived. Increasing water productivity for agricultural use has a significant role to play in reducing the competition for the increasing scare water resources, prevention of environmental degradation and provision of food security.

There are a number of different strategies that can be used to improve water productivity at the farm level, irrigation system and basin-level. Increasing the productivity of per unit of water consumed can be achieved through improving water management practices in use, improving non-water inputs, lessening of non-beneficial evaporation, reducing water flows to sinks, minimizing salination of return flows, shunting polluted water to sinks, reusing return flows, reallocating water from lower-value to higher-value uses, improving management of existing facilities as well as addition of more storage facilities (Obeng-Asiedu, 2004).

Crop water productivity varies with location depending on factors such as cropping pattern, climatic conditions, irrigation technology, field water management and infrastructure as well as on labour, fertilizer machinery inputs (Kijne *et al*., 2003). With agricultural crop production predominantly rain-fed in many parts of the country, which are often characterized by low yields and large on-farm water losses during occasional period of heavy rains, there is challenge for improvement in crop water productivity and water conservation techniques. With increased competition for freshwater resources, there is prediction that investment in agricultural infrastructure and research will have higher payoff than only investments in new irrigation systems in order to accelerate the increase in water productivity towards ensuring food security for the future (Obeng-Asiedu, 2004). Kijne *et al.* (2003) however, opined that sustainable increases in water productivity can only be achieved through integrated fram-resources management approach which combines water conservation, supplemental irrigation, better crop selection, improved agronomic practices and political and institutional interventions. This also includes the efficient use of rain water to achieve higher crop water productivity and increase ground water recharge (ibid).

Challenges to the development of irrigation in Nigeria: There are records of massive investment in irrigation projects in the past in Nigeria that have failed to produce the expected results. Some of the factors that contributed to the failure include high overhead and management cost, underestimation of construction costs, inaccurate irrigation cost/benefit analysis, technical and management problems (Carsell, 1997). While, many of these problems are attributed to large scale irrigation projects, there are also a few number of small scale irrigation schemes that have been rather costly and bad at meeting the needs of the poor (ibid). Irrigation performance in Nigeria and Africa is generally adjourned to be poor and often characterized with inefficiency and poor management (Nwa, 2003).

One significant problem facing irrigation development in Nigeria is the cost of investment. An FAO report reviewed that the average cost for large scale irrigation development in Nigeria with an estimated per capital income of 1000 dollars, is estimated to be 15,000 US dollars per hectare in 1993 with the annual operation and maintenance cost varying between 50 US dollars per hectare for gravity systems and 290 US dollars per hectare for pumping systems and up to 800 US dollars per hectare for sprinkler irrigation system (FAO, 1997). Investment in the agricultural sector in the country has been low with many investors uncertain of the inconsistent policy changes in the country thus creating an atmosphere for insecurity for their investment in the sector. While, irrigation development requires huge amount of funds for investment especially in the semi-arid and arid regions where the development of irrigation schemes often require the construction of dams, many of the private investors most times cannot raise the required amount of capital often needed for this type of investment thus leaving the role to government and international donor agencies. In situations where the investors are capable of raising the required funds for such type of investment, insecurity of guaranteeing returns to their investments do inhibit them from making such type of investment. However, while, government often makes effort at developing large-scale irrigation schemes, the problem of poor management, inefficiency and poor maintenance of the irrigation facilities do rendered lot of government owned irrigation schemes unsuccessful in the country.

A review of previous project feasibility reports also indicated that many of the proposed irrigation projects in the country lack adequate preparation of topographic maps, soil and land classification surveys as well as misinterpretation of hydrological information rendering the projects unsustainable (Nwa, 2003). Some of the established projects showed poor performance in the form of decreasing crop yields, low return on investment, increasing salinity, rising water table and water logging problems among others most of which were due to poor operation and maintenance (ibid).

For a success story in irrigation development in Nigeria, all the traditional problems associated with irrigation must be addressed with adequate machinery put in place for good management of government controlled irrigation schemes in the country. Large scale irrigation scheme beneficiaries must be well informed and oriented to carry out joint/group management of their irrigation schemes with adequate management and maintenance structure put in place. Current research must also aim at addressing the problem of increasing salinity, rising water table and water-logging problem in irrigation scheme sites across the country for sustainability of the irrigation schemes.

Requirement for water resources development and management in Nigeria: The full exploitation of the agricultural potential of Nigeria requires the development of the water resources of the country as one of the strategies, inform of irrigation projects which is however, capital intensive under a long range program and the indoctrination of the farmers in radically different agricultural techniques (FAO, 1997). With water

representing a major resource input for agricultural production and the recognition for the need for irrigation development to permit double cropping in the northern region and parts of the western region towards ensuring sufficient water for crops and increased productivity, water resources development and management structures must be put in place to achieve this aim.

While, an FAO document signified that the development of irrigated agriculture in Nigeria will signify a radical change in farming practices (FAO, 1992) the establishment of the first irrigation division in the northern region in 1949 (Enplan, 2004) saddled with the responsibility of investigating, designing and constructing irrigation schemes as well as collection of hydrological data signified positive steps towards realizing this goal.

With current available data indicating agriculture as the single largest contributor to the well being of the rural poor sustaining 70% of the labour force and 90% of the rural poor as well as contributing 30% of the GDP with 90% coming from the rural smallholder sector (IFAD, 2001), guaranteeing the livelihood security of these people requires the development of the nation's water resources and adopting good management techniques for the management of the resources for sustainability and also increasing its productive use.

Water resources management in simple terms relates to having the right amount of water available for a particular use at the right time and with the right quality and this has become imperative due to the growing demand for water and the need for planning in the use of water. The management of water resources requires quality and quantity management of the resource and with water use involving diverse areas such as domestic, agriculture, industrial, recreation, navigation, power generation among others, efficient management of the resource will reduce competition among the various users of the resource. Water resource management policies in Nigeria should principally focus on the development of the resources for irrigation and management of the irrigation schemes and projects for enhanced agricultural production.

At the national level, the Federal Ministry of Water Resources (FMWR) is the government agency responsible for the development, use, management and control of the nation's water resources. The objective of the water resources sectors include harnessing underground and surface water supply for irrigation, navigation, recreation, hydropower generation and water supply for domestic and industrial use. The ministry also participates actively at the international level in ensuring rational use and management of water resources common to the nation's riparian countries with a number of bilateral technical cooperation agreements with other countries in the area of information exchange, capacity building and efficient resource management of their common trans-boundary water resources.

However, with records of inefficiency and poor management of the nations water resources with increased water pollution and water related problems in many areas in the country, the new vision of FMWR is the provision of sustainable access to safe and sufficient water resources in meeting the cultural, social and economic needs of every Nigerians towards enhancing food security, poverty eradication and public health while, ensuring the integrity of the nation's freshwater ecosystems (Orubu, 2006). This is expected to be achieved with the proposed adoption of the integrated water resources management for comprehensive planning, facilitation and creation of and enabled environment for integrated conservation, development and management of the various water-users for the preservation of the quality and quantity of the freshwater ecosystems (ibid). There is also a water resources development master plan on the drawing table for water resources development in the country to ensure the optimum water resource use for development activities in the country and meet the socioeconomic demand for water use for all regions in the different range of water activities including irrigation and drainage, domestic water supply and sanitation, hydropower generation, inland navigation and inland fisheries. Genuine efforts must be made to develop these and a credible legal structure to deal with cases of willful destruction of water facilities. For shared water resources, appropriate framework must be put in place to develop cooperative water resources management schemes among riparian in order to avoid and/or resolve water resources related conflicts easily. There is also the need for preparation of water development projects properly before implementation and the dependence on external resources by adopting simple technologies, developing local skills for operation of irrigation dams and machines.

CONCLUSION

In this study, we have examined the Nigerian water resources sector, outlining its key features and the efforts made by government over the years to step up the supply of water for various consumptive uses. The efforts of government were channeled mainly through the instrumentality of the development plan, the rolling plan and the annual budget of government under the agency of different intervention institutional structures such as the RBDAS, ADPs, DFRRI and the ministry of water resources. By and large the proposition of the land area

under irrigation since, the 1990s has remained virtually constant. In the typical Africa rural community, particularly in arid, semi-arid areas, it is the poor who are most affected by lack of access to water to support their livelihood through farming. There is an intricate relationship exists between availability of water for agricultural uses and other productive uses on one hand and the issues of health and disease, poverty reduction, food security and hence sustainable agricultural development. Water of insufficient quantity and quality leads to water related diseases. Inadequate rainfall and absence of irrigation facilities reduce agricultural production and threaten food security and both factors work to intensify the problem of poverty. Understandably, the designing and implementation of an appropriate water resources management strategy is of fundamental importance, if any meaningful efforts to reduce poverty, enhance food security and economic growth in Nigeria, of which improved agriculture is pivotal. Essentially the management and development of water resources in the country has been almost an exclusive responsibility of government. The time is therefore ripe to seek the cooperation of all the relevant stakeholders, including NGOs, the Private Sector and the community-based organizations (CBOs) in a coordinated manner towards sustainable exploitation of the country's water resources for improved agricultural production.

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