Nordic Journal of African Studies 11(3): 411-430 (2002)

DEVELOPMENT AND CHALLENGES OF BAKOLORI IRRIGATION PROJECT IN SOKOTO STATE, NIGERIA

MOHAMMED KUTA YAHAYA
University of Ibadan, Nigeria

ABSTRACT

The paper examines the Bakolori Irrigation Project in Sokoto State, Nigeria and its impact on the intended beneficiaries of the project. The paper reviewed existing irrigation types in Nigeria and implications for sustainable food security in target communities. Also, it provides an insight into the catalogue of consequences that followed the project. Some of these include farmers' dispossessed of their productive farmlands, fraudulent reallocation processes, inadequate compensation and destruction of economic trees and crops as a result of the irrigation site. Evidences from the project shows that the project brought about certain positive developments in the lives of the target population. However, it was not devoid of undesirable challenges that require considerable attention in development project planning and implementation. These and many other issues surrounding the Bakolori irrigation project raises question on whether the project was a development or a catastrophe? Consequently, suggestions are made on how to design and implement development programmes with an overall view to improving the existing circumstances of the intended beneficiaries.

Keywords: Irrigation, Nigeria, development

1. INTRODUCTION AND BACKGROUND STATEMENT

Development is said to be a complex phenomenon based on several factors that have been alleged to be responsible for under-development. Some of these factors are historical, political, economic as well as cultural. However, there are several synonyms to development such as modernization, improvement and change, liberation etc. Thus, development is multi-faceted and human centered, thus its definition has implication for sustainability and relevance to the people affected by changes inherent in development process. This explains the need for development strategies that bring about total transformation in the quality of life of the people, since the people are not only the most important means to achieve development, but also the ultimate end to development. Hence, development can be defined as all processes that bring about improvement in human life, enhanced environment, healthy living, access to knowledge and availability of sufficient resources for decent living standards, conducive democratic atmosphere necessary for peaceful co-existence and national stability. In this

paper, the focus is on irrigation project that was established as a development project in Nigeria.

Irrigation has been defined as the application of water to the soil for the purpose of supplying moisture essential for plant growth. It is also undertaken to provide an insurance against droughts, for cooling the soil and atmosphere. It equally provides a more favourable environment for plant growth. Irrigation washes out or dilutes salts in the soil and reduces the hazards of piping and softening tillage pans. Irrigation will not be necessary if the distribution of rainfall were ideal for the growing of crops (Baba 1993). In Nigeria, the variations between the north and south are quite significant in terms of agro-climatic conditions and respective agricultural practices. The concept of agricultural development is within the context of several development paradigms postulated by eminent scholars in the field of agriculture, communication, sociology and economics. These postulations reveal that many countries in the developing world are undergoing changes in the agricultural sector both in policy and practice. For instance, the Problem Solver Model has great implications for agricultural development efforts in Nigeria. According to Havelock (1979) the problem Solver Model considers the needs of the clientele whether stated, implied or assumed as one of the several ways to start development[1]. Agriculture is key variable in Nigeria's development effort; this is in view of the predominance of rural majority whose livelihoods are precariously dependent on farming. Hence, development in Nigeria is incomplete without special focus on agriculture.

In agriculture, the change process stresses **collaboration** with the clientele and **diagnosis** of the clientele systems, since the two are essential ingredients of the change process. At this juncture, sustainability is our guarantee. Also, related to the Problem-Solver Model is the Farmer's-First-and Last Model. This is in line with the view of Chambers *et al.* (1985) that postulated a development model that starts and ends with the farm family and the farming system. Generally, it considers the holistic and interdisciplinary appraisal of farm families' resources, needs and problems. It is continuous, with on-farm and with farmers, scientist's experimental stations in a consultancy and referral basis. They further argued that the generated technologies under these systems are better suited to the needs and conditions of rural poor farm families. This assertion is further corroborated by Kearl (1978) in an earlier model that emphasized user-oriented technologies. To this end, the model pays attention to the needs and preferences of rural farm families as well as national production goals. It begins with a systemic process of scientific learning from an understanding of the situation of rural poor farm families i.e. their resources, needs and problems. The model shows that research problems and priorities are

[1] Development in transitional societies is traditionally top-down. This explains the reason why several development programmes often suffer from partial or total rejection as the beneficiaries see such efforts as alien and inconsistent with their peculiar problems and aspirations.

identified by the needs and opportunities of the farm families rather than by the preferences of the development planners.

2. The Irrigation Concept in Agrarian Revolution in Nigeria

Several Irrigation types have been reported in a variety of literature. However, the commonest among these strategies in Nigeria includes both traditional and modern irrigation technologies. Some of the traditional techniques adopted in many farm sites especially in northern parts of Nigeria include: Shadoof, Pump, Gravity or Natural flow and calabash/bucket methods. These are generally referred to as small-scale Irrigation enterprises covering small land area and with less sophisticated Irrigation equipment. Under the traditional system, water sources for this system are mainly residual soil moisture, locally dug shallow wells, ponds and other depressions. There is virtually no government or any external organization's assistance and interference. The system is under local people in response to their wishes and felt needs (Umar 1994).

In another perspective, the Fadama Irrigation concept emerged in one of the World Bank assisted programmes with the launching of the National Fadama Development Programmes (NFDP) in the early nineties. The Fadama concept is an age-old tradition in Hausa land, where Fadama land that is flooded on seasonal basis and valley bottom, which allows for the growth of a variety of crops under small Scale Irrigation farming system. Irrigation system in modern agriculture, however, depend on damming major streams to store and control the flow of water and to allow delivery in the desired amount whenever it's needed. Examples of modern irrigation in general use are surface irrigation, border or drip irrigation; corrugation and sprinkler irrigation (Cox and Akin 1979). In another dimension, the modern irrigation types are further divided into two:

(1) Large-scale (gravity flow irrigation) by which dams or water diversion structures and channels are built to transfer water to the field. This is very common in the dry belt of northern Nigeria and the
(2) Pump irrigation, by which water is pumped either from the groundwater or surface water sources to farm layout.

In an attempt to locate irrigation as an appropriate technology in agrarian revolution in Nigeria, it is wise to clearly define appropriate technology, which is defined as the systematic application of collective human rationality to the solution of problems through assertion of control over nature and all kind of human processes. It is the embodiment and result of systematic, disciplined, cumulative, non-accidental, and non-serendipitous research. In this context, agricultural technology may be viewed as the application of specific technology for the promotion and development of agriculture (Umar 1994). Furthermore

that appropriate technology designed for peasant farmers should comprise the set of objectives or gadgets that will unlock new resources, increase productivity and generate new capacities to produce goods and services on the farms.
The choice for appropriate technology, according to Erhabho and Nwagbo (1985), should be based on the socio-cultural considerations of the farmers with particular reference to simplicity of the technology, such that vast majority of the farmers can put it into practice at reasonable cost and returns such that the technology should minimize total cost and maximize profit. Also, national sovereignty considerations in the choice of the technology should be viewed for national economic consciousness. In addition, the World Bank (1989) recommended that for a project to be appropriate and viable it should be formulated and designed so that it is sustainable under prevailing socio-economic conditions and be seen as an advantage to those intended to benefit from it and the use of national resources efficiently. It has also been recognised that the major infrastructural facilities are only one of the entwined technical, social and economic factors which determine the success of any irrigation project. The users participation and their acceptance of the new technology depend on their involvement in the selection, design and construction of the project. The most serious problem in the irrigation development do not relate to storage and delivery of water alone, but the success of irrigation programme in the long run also covers water resources management, control of salinization and water logging.

One way to formulate technology appropriate and adaptable to farmers' criteria and resource base is by analyzing the socio-economic and biophysical constraints of farmers production. This requires both ecological and economic approach, which formalizes the body of complex relationship implicit in traditional farming systems.

In comparing alternative water lift technologies, many variables must be considered. The rationale choice depends on the resources and environment situation of each farmer. Factors like water supply (source), labour supply, farm size, marketing among others must be considered (Erhabo and Nwagbo 1985; Jamusz 1990). In order to plan sound land and water development programmes, it is important for concerned institution to have clear and accurate information about the present uses of these resources[2].

Agrarian revolution in Nigeria is incomplete without due recognition of the socio-economic implication of irrigation. Therefore, socio-economic status shows a glance of the position of an individual in their social and economic conditions in both relative and absolute terms. Idowu (1986) define socio-economic status of the farmers as the position of individual or group, relative to others in the society. He further stressed that ones social position depends on

[2] It has been all too common in Africa for water development schemes, aimed to improve the lot of one section of the population, to have an adverse impacts on another section whose farming activities were "invisible" to the planners who often times assumed both the problem and solutions to the farmers plights in both relative and absolute terms.

whom one is and with whom one is compared. He also define socio-economic status as the position an individual or family occupies with reference to the prevailing average standard of cultural position, possessions, effective income, material possession and participation in the group activities of the community.

Beckley (1986) viewed socio-economic status as the position, which an individual occupies within a social, cultural and economic context. Therefore, socio-economic status gives a picture of an individual and his family in respect of their relative social and economic standing in the society. Therefore, socio-economic status is what shows educational background, an attainment level, that is their economic, social and cultural well-being. Onwueme and Ugbor (1994) noted that, for one to attain a middle class status in modern society, he must have a good education and income. In Nigeria, education at least at the university level required for entry into the professions and attainment of middle class status.

Patel and Anthonio (1974) in their construction and standardization of scale to measure socio-economic status of rural families in Western Nigeria, included material possessions, social participation and cosmopoliteness as indicators of socio-economic status (SES). It is evident in several studies in Nigeria that various kinds of relationships exist between these variables. The specific criteria, which determine whether an individual or groups has high or low status, depend on the characteristics values in that society. Idowu (1986) stated that specific criteria which largely determines socio-economic status in most societies has being in the order of importance as in occupation, Income and wealth, education, cosmopoliteness, ownership of material possessions, example: real estate, tube well, pump, automobile, house, clothing, farmlands, family name, background, race, and nationality.

In another perspective, Yahaya (1995) postulated that several indicators are used to determine the socio-economic status (SES) of women farmers in North-Central Nigeria. Some of these include; farm size and crop types; possession of different type of animals such as cattle, goat, sheep, poultry, camel and pig; plastered and painted houses and different type of furniture; carpet, floor mat, bed sets, large family bed and spring iron bed; different type of plates (stainless, breakable and aluminium plates), metal spoons and different type of boxes (‘echolac’ cloth box, portmanteau, metal and wooden box types) and jewelry, different type of gold plated and ordinary wrist watches, necklace, bracelet, ear rings and finger-ring.

3. IRRIGATION TYPES IN NIGERIA

Once the need for additional water is estimated in space and time. Engineers turn attention to various possible technical solutions to the problem. The scale of the development may be determined by the relative disposition of land and water resources. This may show that only large-scale irrigation means would be viable, particularly, if expensive head and conveyance works are necessary (World Bank 1989).

The earliest method of irrigation was the impounding of natural floodwater on the flat land bordering rivers, as in Egypt. In the same way, rainfall can be impounded by bundering. But the modern method of irrigation commonly practiced in different scales in Nigeria include:

(1) Sprinkler Irrigation: Through which water can be supplied by overhead irrigation through a rotating sprinkler head, or through a series of holes in a pipe.
(2) Tubewells: In Nigeria, an increasing area is irrigated with water from tubewell. These are investment made on the large holdings. This method is only profitable if surplus labour was available and with help of a pump.
(3) Underground irrigation: This is the water supplied by surface irrigation, 20-30% is lost by evaporation. Consequently, such loses are eliminated by underground system where the water is placed directly in the root zone of a plant, using perforated plastic tubes through which water is pumped under pressure.
(4) Trickle or drip irrigation: This is the method of irrigating higher value crops where water is scarce. The system moves the water in plastic piping through main laterals, sub-laterals and eventually through a very fine tube to each individual plant. It releases a continuous drip of water when irrigation is needed.

Large-scale irrigation (greater than 500 hectares) usually comprises main storage or diversion works, full conveyance and distribution works. If the need arises, embankments for flood protection are also constructed. The main irrigation structures are usually operated by government irrigation agency. They may be under direct state management or allocated by an irrigation authority to small-scale tenants or farmers and a standard cropping pattern is often imposed on the farmers (Olofin 1994).

The greatest socio-economic problem associated with irrigation is low return on capital investment. After farmers have invested heavily in the Fadama system, the expectation is comfortable profit at the end of harvest. He expects that the margin of profit should be commensurate with his investment in money, labour and time.

The agricultural development strategies favoured by most national governments and international organizations during the 1950s and 1960s were those of additional land for irrigation development. They are the important

components of the plan put forward by the United Nations at the World Food Conference in Rome, 1974. The role of agricultural development in developing countries is a crucial one. Without dynamic growth in agriculture, sustained economic growth is unlikely and population growth rates will continue to be very high. Government must acknowledge that industrial policies will fail if they neglect agricultural development. It is only fostering agricultural development that the desired widespread increase in economic well being and effective demand essential for the removal of the food problem hence industrial development will be achieved.

The benefits of irrigation development are numerous. Norman (1996) listed some of the benefit as follows:

(1) Increasing the range of choice of crops and of livestock, thus providing flexibility in decision-making;
(2) Focusing more complete and efficient resource use;
(3) Lessening the danger of crop failure and the range of yield fluctuations, hence reducing uncertainties;
(4) Increasing the capacity of the land for input of other factors;
(5) Increasing the size of total farm business;
(6) Shifting the factor- product curves towards higher input and greater production.

In addition, it is obvious that socio – economic gains are prominent features of Irrigation projects: generally to an agriculturist, irrigation promotes maximum yield per hectare. Since water supply decision is largely made in the political arena rather than market place, there is a great incentive for public support for their own financial gain. Socio-economic considerations may also be one of the advocates of irrigation. With irrigation, it is envisaged that there will be sufficient food availability in areas where irrigation is practiced and more areas of cultivated land with large output are the envisaged merits of irrigation farming. Dry season farming on fadama land has the twin advantage of crop diversification such that if a crop fails or are damaged, other crop will ensure food security and economic returns as dry season crops allow the farmers improve household economic security and investment on one hand and money to buy food in case of crop failure on the other hand. This will boost economic fortunes of farmers and alleviate their problem in the event of adverse conditions or disasters.

Another argument for irrigation project execution derives from above. It was articulated that if all the above becomes the fortune of lots of farmers, they will more likely have the ability to improve production individuals or more people are likely to be influential and end up as contact innovators and persons for development efforts. This is no doubt operation at higher socio-economic status. More material returns in terms of oxen owned by the farmers, dry season farming utilizing motorized pumps and wash boles or tube wells, motor vehicles becoming common means to transport goods to near by and far away markets. Also, cash crop earnings are some of the envisaged indicators or boosts to

farmers' socio-economic status. Irrigation may also enable governments to exercise greater control over farmers cropping decisions through extension services and possibly, make it easier to regulate agricultural taxation.

Indigenous irrigation on fadama has a long history in Northern Nigeria. Impact evaluation report on Nigeria by the World bank revealed that dry season farming on fadama land has been existence for between twenty and fifty years in this part of the country. The simplest indigenous irrigation method is the bucket-lift system or 'shadoof'. According to oral history from rural community leaders, the shadoof method was brought from the Sudan over a century ago by trans-saharan traders. While such devices are low cost and depend mostly on farmers' labour for construction and operation, their irrigation potential is limited to small plots. Water lifting by such devices is labourious and the area, which can be irrigated, is limited to about 0.1 ha per shadoof (World Bank 1995).

From the history of shadoof practice in northern Nigeria, while it can be adjudged as not new, the practice is restricted to a small proportion of farmers two or three decades ago. WHO reported that in Sokoto state for instance, several community leaders stated that only about five to ten percent of the rural households were cultivating their fadama lands in the dry season twenty or more years ago, although, all the villages sampled had some in use at that time. Now, nearly all farmers are involved in recent years. This is an indication of the extent of change, which has occurred over the past decades.

Shadoof practice is one of several irrigation methods in use in dry season farming in northern Nigeria. However, each method is dependent on the economic power of the farmers involved and the level of production. Whichever way, it is an established fact that dry season farming sustained by irrigation is a coping mechanism to extend the length of farming period to boosted agricultural production and productivity.

Since, agriculture in Nigeria is gender sensitive, it is apt to point out the fact that gender definition is crucial in this perspective because a common misconception concerning rural women in Northern Nigeria is that they are all in seclusion and therefore, economically and agriculturally in active. Women in purdah may not and do not, technically "work to earn a living", but many poor families are nonetheless and sustained by the economic activities of wives in seclusion (Callaway 1987). It must however be emphasized that women in purdah do not actually work on the farmland, particularly during their years of childrearing. Women are involved in dry season commercial crop production on family plots not on their own plots. This is why quite often women must take on additional work, but reap no economic security. Nonetheless, it is appreciated that women do involve in dry season farming. This is exemplified in World Bank (1995) study of Sokoto and Kano Agricultural Development Projects that many rural northern women own both upland and fadama land that they inherited from their fathers, in accordance with Islamic tenets. In the case of a woman in purdah, a male relative may be responsible for the day to day management of the farm, but the woman owner has the profit or produce from

the farm. Women who are not under seclusion, or only partially secluded, engage in production tasks such as planting, weeding and harvesting, as well as processing that is common to all women whether in purdah or not. The World Bank report further showcase the proficiency in farming of some women as illustrated by the case of a sixty years old woman from sabiya village who was honoured as the Sarki Noma (best farmer) in the village. The woman has six plots of land, three of them in fadama area, which she inherited. In another case, a forty five years old divorced woman came home to farm. She has both upland and fadama land some of which she has inherited and others were purchased. She hires work bulls for her farm, sometimes jointly with other women farmers.

All of these underscore the importance of irrigation farming in the life of inhabitants of these areas particularly and the economic empowerment in general. This is predicated on the fact that, the women have benefited in some ways more directly. For instance, women made additional money by renting their fadama land during the dry season to other farmers. Also, women traders make more money from their trade since fadama farmers have more money to spend.

4. THE BAKOLORI IRRIGATION PROJECT IN NIGERIA

Bakolori is the name of a rural community in Sokoto State in North Western Nigeria. Sokoto State was one of the largest States in Nigeria until Kebbi and Zamfara States were carved out in 1991 and 1997 respectively.

This location is in the North Western Nigeria shares common boundaries with Niger Republic in the north and Benin Republic in the west. It lies between longitude eleven degrees thirteen degrees East and latitude four degree to six degrees North. In terms of climate and vegetation, Sokoto State is within the Sahel Savannah. The rainfall (wet-season) starts between April and June and ends around October when the dry season sets in.[3]

Given the abundant water resources in the country and its potential for increasing agricultural production in Nigeria, the Federal Government established the River Basin Development Authority (RBDA). The scheme became necessary because of the persistent too short rainy season in many states of the federation. It was against this background that the Bakolori Irrigation Project was commissioned in 1975.

[3] The mean annual rainfall ranges between 500mm to 1, 300mm. The rainfall is usually erratic, unpredictable and associated with periodic drought. There is usually an annual dry-cold and dusty harmattan between November and February. Hence, extreme heat is experienced before the rainfall between March and April and many extend to late June or July with late rainfall.

The climatic condition of Sokoto State explains the need for irrigation particularly for their cereal and vegetable dominant farming system[4]. Farming is undoubtedly, the major occupation in the study location. Though, others are engaged in trading, public service and livestock rearing.

4.1 THE PROJECT

The dam has 450 million cubic metres water storage capacity. The reservoir covers 8,000 hectares and extends some 119km up stream from the dam. By 1979 when the dam was completed, fifteen km-supply canal carries water from the dam down streams of irrigation area where the water is distributed through several hundreds of kilometre secondary and tertiary canals.

United Nations Development Programme (UNDP) and Food and Agricultural Organisation of the United Nations (FAO) originally identified the project, during a soil and water resource survey of the Sokoto Valley in 1969. The actual feasibility was executed by Impresit Bakolori (Nigeria) Limited and its Italian associate, Nuovo Castoro. The contract was initially worth 174 million Naira in 1974 and some 500 million naira in 1982 (400 million U.S. dollars) (Sokoto-Rima River Basin Development Authority 1992)

The original goal of the project was to supply irrigation water to the estimated population in the project area of about forty to fifty thousand farm families. Majority of the people in Sokoto valley are peasant farmers. They engage in both rainfed and traditional irrigation farming in the dry season. They actually account for the bulk of vegetables and spices produced in the area which include among others onion, garlic and tomatoes[4]. The economic significance of this venture cannot be over emphasized. This was with the aim to achieve a dramatic increase in farmers' output. The project was designed to support agricultural and economic development in the region. The food crisis that followed the Sahelian drought and the oil boom provided extra motivation for the implementation of the project. Generally, the expectations of government from the project were very high. It was expected to counter food import, with focus on import substitution. For instance, wheat, rice and sugar accounted for much of the extra-ordinary food import bills in Nigeria at that time[5]. This remains unabated to date. However, contrary to this position, Ken (1985) posited that the issue of irrigation schemes in some of the northern states of Nigerian

[4] Common crops grown include millet, sorghum, maize and rice. Other products like potatoes groundnuts, beans, onions, garlic and leafy vegetable and also grown in commercial quantities.

[5] Majority of the people in sokoto valley are peasant farmers. They engage in both rainfed and traditional irrigation farming in the dry season. They actually account for the bulk of vegetables and spices produced in the area. Common among these items are onion, garlic and tomatoes. The economic significance of farming in this part of Nigeria cannot be over emphasized.

stems from the political necessity of redistributing some of the benefits of the oil boom towards economically less-advanced northern states of Nigeria.

4.2 CATALOGUE AND CONFLUENCE OF DEVASTATION

Considering the lofty dreams and aspirations of the planners of Bakolori Irrigation Project, it succeeded in executing the project. However, its execution has brought about devastating consequences. Beckman (1985) in a critical review of the project provided an insight into what the inhabitants of the project area has suffered since the Italian firm entered the project area in 1975.

During the past far decades in Nigeria, both the state and federal government have embarked upon an ambitions programme of dam construction in Northern Nigeria. It was the intention of both levels of governments to use these reservoirs to support large-scale irrigation farming on fadama and adjacent dry land areas. Out of the over thirty dams constructed in the project states, Bokolori Dam in Sokoto state is the largest. But of most devastating consequences was the failure of the government to carry out social and environmental impact assessment prior to construction of these dams. Worse still, further dam construction is still being planned. World Bank (1995) acknowledged the ecological changes within these highly productive plains being far-reaching, mostly with adverse environmental, social and economic effects. According to the report, for a variety of reasons, irrigation development did not occur at expected rates and presently, most of the reservoirs are either not utilized or are under-utilized for irrigation. The realities or challenges before implementing agencies for these projects are quite different and disturbing from the original concept of the projects anticipated to yield large-scale agricultural increases of economic significance. Ditto (1991) has demonstrated that informal irrigation systems have been found to be more economically efficient than formal one. Barbier et al. (1991) agree in totality in their opinion that, when compared to the net economic benefit of an upstream water development project such as the Kano River Project Phase 1. The economic returns to the flood plain appear to be more favourable. This is particularly the case when the relative returns to the project in terms of water input is compared to that of the flood plain system. The failure to take into account the opportunity cost of the water diversion in terms of the forgone benefits of flood plain production may be leading to serious over-estimation of the net-economic returns to these development projects.

Elucidating more on the ecological devastation of dam construction, World Bank report that the dams have significantly altered the flood plain hydrology. Annual floods still occur, but at reduced intensity and duration. As a consequence, recession agriculture on the flood plain has been seriously curtailed; both in respect to under cultivation and the market value of the crop being planted. The lower river level, lateral groundwater movement toward the river would cause more rapid flood recession that it would have occurred before

the river were regulated by dams and reservoirs. This premature draining of groundwater to the river reduces the amount of residual soil moisture available for dry season cropping.

For instance, in some places where farmers previously cultivated wet season rice, they are now obliged to cultivate sorghum or millet owing to the reduced floodwater and the consequent loss of residual soil moisture. Recharge of the underlying soil structure or aquifer soil layer still takes place, but in a more restricted zone along the river. Since environmental studies were not conducted prior to dam construction, there are no baseline data on the flood plain hydrology from which to make an accurate comparison of hydrological, or even for agricultural changes. However, incidental or anecdotal evidence gained from farmer interviews is beneficial either socially or economically. The impact on areas below the dams, and their impact on cropping were a significant elements in creating interest among farmers in finding alternative means of assuring water supplies for fadamas in the dry season.

The agricultural use of surface irrigation of sub-Saharan Africa, as compared to Asia, has been viewed as under-developed. Efforts at large-scale irrigation development have often resulted in costly failures (Bara scheme in Kenya, Bakolori scheme in Northern Nigeria), often destroying whatever small-scale traditional irrigation been practiced.

One prominent problem in irrigation project is insecure land tenure, which has discouraged peasants investment of labour and capital in irrigated agriculture. Also, lack of market incentives was found to be the result of both low crop price, and lack of co-ordination in production among farmers. Their market information systems often resulted in over-supply and under-supply of perishable vegetables and fruits during the harvesting and off-season farming respectively with corresponding price fluctuations. Lack of storage and transport facilities exacerbated these situations.

The development of sophisticated water control system in Chad, Kano and Sokoto Rima River Basins comprises the largest development schemes currently being undertaking in Africa, stems from the political necessity of redistributing some of the benefits of the oil boom towards the economically less-advanced northern regions of Nigeria (Ken 1985). Furthermore, it was envisaged that these projects aimed at reducing import of rice and wheat, which feed the urban sector. It also helps in earning foreign exchange by exporting agricultural products. Based on the view of Wallace (1979) introduction of irrigated farming is seen as a means of curtailing the annual dry season exodus of rural dwellers, as well as the more permanent drift into the towns.

Olukosi and Isitor (1990) stated that, in the early 1970s emphasis was on the increase of large-scale irrigation, especially in the drier northern parts of Nigeria. The year 1973 particularly marked the beginning of organized government involvement in irrigation development with the development of Chad and Sokoto Rima Basin Development Authorities. He further stated that the irrigation projects established by the River Basin Development Authorities are mostly large-scale schemes. Their establishment involved the spending of

huge sums of money and the employment of alien and capital-intensive technology.

The Food and Agricultural Organization (FAO) of the United Nations (UN) identified Bakolori irrigation project located in Talata Mafara Local Government Area of Sokoto State in 1969. It was recommended as one of the most beneficial projects for economic development in Nigeria. Later on, the project feasibility and design was studied in detail by NUOVO Castro (an Italian firm). The implementation of the project was approved by the federal executive council in 1974.

The contract for the construction of the dam, supply canal and irrigation works was signed in June, 1975 with Impresit Bakolori (Nig.) limited, an indigenous Italian firm, and work commenced the same year. A supplementary agreement for erection of land leveling, diesel power station, gates and gearing, sprinkler system, etc. was signed in June 1977, to cover the remaining part of the project. The total cost of the project indicated in the two-construction agreement amounted to N154 million based on mid 1974 price levels.

Bakolori Dam and supply canal were completed in 1978 and inaugurated the same year in December, on behalf of the Head of State, by the Chief of Staff Supreme Headquarters, Major-General Shehu Musa Yar'adua. The project was designed to supply irrigation water to 11,200 km area by gravity and 12,000 ha area by sprinkler and power capacity of 12,000 KVA of electricity. It also involved in the construction of 200 km road network and assisted farmers by providing them with needed inputs (Sokoto-Rima River Basin Development Authority 1992).

The situation in Bakolori is not only social and economic but also environmental. Biologically there are limits to the time for which crops (other than rice) can tolerate a saturated soil. Ideally, irrigated area should be protected against periodic flood damage. Irrigation water invariably contains small quantities of dissolved salts, some of which are plant nutrients. These salts would however be present only in low concentration but when in large quantities is likely to be toxic to most plants (Yahaya and Ango 2000).

George (1974), viewed complications of irrigation in developing countries to include leaching of minerals in the humid parts, rapid salinization in the arid regions and by greater susceptibility to erosion. The complications of irrigated water in the tropics also include flood, which are more destructive. IITA (1993) and Srhidar (1994) observed that, introduction of small-scale (Fadama) irrigation to our area, expose the rural farmers into the incidence of water borne diseases, as well as malaria, schistosomiasis, onchocerciasis, diarrhea/dysentery and helminthiasis.

A high water table resulted from irrigation impedes the downward drainage and leaching of soluble salts. Hence, to arid climates, a rise in the water table combine with higher evaporation rates can cause salinization. It has been estimated that, the amount of land ruined by irrigation now equals, if it does not exceed that which is potentially irrigable (John and William 1975). Similarly, Erik and Eckholm (1978) observed the problems of water logging and salinity as

a result of irrigation were taking a deadly toll. An estimated area of over two million hectares, a fifth of the annually cultivated area of the Indus plain, was severely affected. Yield was significantly cut by water logging and salinity and in some cases production has ceased altogether.

Baba (1993) indicated that large-scale irrigation schemes involve the use of heavy equipment's, while the small-scale irrigation programmes involve digging the soil in the act of establishing tubewell, wash boles and traditional irrigation wells. All these, seriously affect the soil texture and structure and expose the entire land to desiccation, hence, erosion and leaching of minerals occur.

Too often the traditional agricultural activities of local populations has been ignored or assumed to be of negligible significance to the national economy. Land water has been developed at high cost, and with detrimental impact on the activities of the existing pastoralists, arable farmers and fishing communities. In northeastern Nigeria, a case of reference is the Hadejia-Nguru wetland. In recent years, major upstream water development (Tiga, Chalawa dam and the 20,000 hectares Kano river project in particular) has had a detrimental effect on the water resources of the wetlands (Adams 1986). Significant contributions are made by the wetland and its farming communities to the agricultural production of the region. Contrastingly this is with the highly capital intensive and poorly performing modern Kano River Irrigation Project.

The first devastation farmers suffered was that they were dispossessed of their farmlands. At end about 13,000 farm families located in the flooded Bakolori reservoir were left as landless peasants. Their situation was further worsened when it was discovered that there was no suitable agricultural land in their immediate surrounding. However, the original decision was to give these people cash compensation for loss of their farmland and resettle at the outskirts. Unfortunately, they were not paid the promised compensation for the lost farmland. Instead, the government insisted on finding alternative land for them. This argument was based on the dictates of 1978 Land Use Decree[6]. The farmers however, rejected the 'barren' lands allocated to them. Because, it was heavily eroded, characterized by highlying areas, shallow soils and completely abandoned. As if that was not enough, destruction of farmlands in the irrigation area followed the execution of the project.

Undoubtedly, the construction of the dam involved massive use of heavy machinery for land clearing, land leveling and excavation of soil for the construction of canals and drains. As work progressed, farmlands and economic trees were destroyed. During this period, farmers were left helplessly to battle with the problem of hunger, idleness and deprivation.

[6] The 1978 Land Use Decree stipulates that all lands belong to the states and whoever requires the use of such lands must apply to government for lease which lasts for 99 years. However, in the case of lands required for development activities that are designed for the benefit of the people is free for government's use and only compensation for properties their in are paid for to some extent. Examples are economic trees, crops and buildings etc.

At a time farmers were expecting succor, things turned sour when land reallocation process was marred by fraudulent and sharp practices and enforcement of cropping pattern. Farmers' expectations were short lived when in October 1979 only a fractional part was ready for allocation. However, due to the construction work carried out, it became difficult to identify individual lands, which fueled further conflicts and delays. The principle of reallocation was based on standardization of plot sizes in minimum units of rectangular shapes. Therefore, it was difficult for people to get back exactly the same land as they had given up. Consequently, most of them lost their farmlands to the permanent irrigation sites, reservoir, canals, access roads and service areas such as pumping units. In the process, most of the farmers never receive any plot in return while those who were fortunate had their lands drastically reduced.

Masdar (1979) reported a series of anomalies in the reallocation process. The reallocation staffs were accused of malpractices ranging from extraction of bribe to intervention of influential people in favour of their clients. Also, farmers were forced to grow wheat instead of their traditional crops particularly sorghum. The situation created economic crisis for farmers who were not allowed to plant sorghum, which is a major stable in many households.

The experience of the Nigeria projects, and particularly that of Bakolori, reveals the effect of thrusting large-scale technology on peasants. Land was taken from the peasants and redeveloped for large-scale irrigation. It was subsequently handed back to the peasants. Wheat, rice and vegetables were the main crops cultivated. The central feature of River Basin Development Authority (RBDA) was the exercise of direct control by the state over redevelopment and redistribution of land and the provision of inputs. Indeed, it dictated the crops to be grown. This conflicted with peasants' own priorities and crop preference (Sumit 1990). This was with the fact that clarified the establishment of the projects exposed a much sharper conflict between the state and the peasants. The struggle assumed a fierce character in the 1974-1980 dry season. Peasants stopped contractors from operating for several months and obstructed current farm operations. Indeed, roadblocks were mounted and guarded by detachment of peasants who were armed with cutlasses, bows and arrows and other traditional weapons. The peasants demanded compensation for lost crops and land. They wanted to make their own decision about the crops to be grown, the cultivation methods and timing.

Based on the viewpoint of Beckman (1985), these were subjected to severe criticism because the construction of the dam led to the dispossession of peasants. They refuse to accept the infertile land allocated to them, and demanded cash compensation. Indeed, tens of thousands of farmers had been either permanently deprived of land or prevented from cultivating it for two or three farming seasons. This culminated in the use of para-military police forces which, brutally suppressed the rebellion, burning villages, killing and wounding hundreds of men, women and children Ken (1985) viewed the implantation of large irrigation schemes inevitably means that some people would be dispossessed of their land and houses. The building of Bakolori dam on the

Sokoto Rima Basin displaced some 18,000 inhabitants and resettlement villages often have a poor water supply and poor land. Hence, under Bakolori Irrigation Project, farmers from various communities in the project area became landless and in adequate compensation characterize the entire process. To worsen their situation, economic trees and crops were destroyed with reckless abandon without due compensation. While the manner in which land reallocation was handled was dubious and fraudulent. Also, enforcement of cropping pattern that conflict with established food and economic life of the area was devastation in their lives. Meanwhile, northern Nigeria region where the project took place is one of the worst development regions of the country.[7]

These critical situations resulted in massive uprising for seven months. In the process, police and soldiers were drafted to the area where many farmers were attacked, beaten up and subsequently captured and imprisoned. According to Beckman (1985) some of the aggrieved farmers fought back in formidable force, throwing out daggers, home made deadly weapons, such as dane guns, cutlasses and other dangerous weapons.

Journalists were not spared in the wake of the crisis. Before journalists were allowed to ask questions, they have to swear to Allah (God) that they have nothing to do with Sokoto State Government. At this point, the farmers were fed up of promises and ready to fight and die in the process so as to bring to an end their suffering.

The devastating consequence of this crisis resulted in the death of fourteen farmers, one policeman and fifteen others, and four policemen severely injured. As the crisis escalated by the end of June 1980 not less than three hundred and eighty six people have been killed. The disaster resulted in looting of property, while granaries, houses and vehicles were set ablaze. That is not all, Yahaya and Ango (2000) reported several other environmental degradation brought about by the irrigation project[8]. Hence, Bakolori irrigation project was indeed a confluence of devastation.

5. Conclusions and Recommendations

It is a pathetic situation for development strategies aimed at improving agricultural production potential of peasants, but at the end were left worst than before. In essence, the design of the irrigation project certainly shows that the

[7] It is pertinent to note that the northern states comprise predominantly of an agrarian population. However, the impact of social and economic changes remains marginal, infrastructure development in rural areas still very low. Poverty situation in the region is pathetic; women and children are still marginalized and youth development still hopeless.

[8] It is unfortunate that for over two decades that farmers in Bakolori Irrigation site had to battle with the problem of poor yields resulting from sedimentations, erosion, flooding, crop wilting, poor infiltration and fertility (see Yahaya and Ango 2000)

planners, contractors and government officials by- passed the beneficiaries of the project, which resulted in the catalogue of devastating outcomes.

Some of the evidences from the project suggest that the remote cause of the crisis was that the government and project officials underrated the peasant farmers. Also, handling of compensation issues was grossly inadequate and fraudulent. In view of the above conclusions, it is recommended that

(1) Future investments in agricultural development should be with "human face", where due considerations should be given to the existing circumstances of the intended beneficiaries and future consequences of such development initiatives.

(2) A validated Social-Economic and Environmental Impact Assessment should be carried out a priori to the project implementation. Similar development strategies should begin with a pre-project survey. Inventory and registration of peasant assets and the worth of each item noted and owners compensated accordingly.

(3) Development projects should not only be aimed at economic gains but also at social benefits. Thus, future development paradigm should be designed along the social, economic, political and cultural perspectives to development.

(4) The Indigenous Knowledge System (IKS) of the target audiences of development efforts should form the "bedrock" of such efforts. This will foster acceptability and compatibility among planners and beneficiaries of such development programmes.

REFERENCES

Adams, W. W. 1986.
Traditional Agricultural and Water use in the Sokoto Valley, Nigeria. **The Geographical Journal** 45: 47-58.

Baba, M. K. 1993.
Irrigation Development Strategies in sub-Saharan Africa: A comparative study of traditional and modern irrigation system in Bauchi State, Nigeria. **Ecosystem and Environment** 47-58.

Barbier, E. B., Adams, W. M. and Kimmage, K. 1991.
Economic Valuation of Wetland Benefits: The Hadejia - Jama'-are flood plain, Nigeria. London: Environmental Economic Centre.

Beckley, B. G. 1986.
Assessment of the significance of improved varieties of some selected crops on the SES of peasants farmers in Lagelu LGA of Oyo State, Nigeria. Unpublished B.Sc. project submitted to Department of Agricultural Extension Services, University of Ibadan.

Beckman, B. 1985.
Bakolori: Peasants versus State and Capital. **Nigerian Journal of Political Science**: 4 (2).

Callaway, B. J. (1987).
Muslim Hausa Women in Nigeria: Traditional change. New York: Syracuse University Press.

Cox, A. and Akin, n. 1979.
Agricultural Ecology: An Analysis of World Food Production: Freeman Press: San Francisco.

Chambers, R. H., Jingins, n. and Ghidyal, B. P. 1985.
Agricultural research for resource-poor farmers: The Farmers-first and last model. **Journal of Agricultural Administration** 20: 1-30.

Ditto, S. 1991.
Efficiency of Agricultural Production in Small and Medium Scale Irrigation in Nigeria In*: Issues in African Rural Development*, Doss, C. R. and Olsen, C. (eds.). Arlington, VA; Winrock, Winrock International Institute for Agricultural development.

Doss, C. R. and Olsen, C. (eds.) 1991.
Issues in African Rural Development. Arlington, VA; Winrock, Winrock International Institute for Agricultural development.

Erik, P. and Eckholm, n. 1978.
Losing ground: Environmental stress and world food prospects. Paragon, Oxford.

Erhabho, R. P. O. and Nwagbo, E. C. 1985.
List-cost analysis of small-scale lift irrigation technology: Shadoof and pump in savannah ecological zone of Nigeria. **The Nigeria Journal of Agriculture** 3 (1&2): 18.

George, B. 1974.
World Food Resource. London: Billing and Sow.

Havelock, R. G. 1979.
Planning for Innovation: Though Dissemination and Utilization of Knowledge. Centre for Research and Utilization of Scientific Knowledge, University of Michigan, Ann. Arbor.

Idowu, O. S. 1986.
The relationship of socio-economic status (SES) of the farmers to the knowledge of adoption and communication behaviours and other characteristics of maize farmers in Oyi LGA of Kwara State, Nigeria. Unpublished B.Sc. project submitted to the Department of Agricultural Extension Services, University of Ibadan.

Jamusz, R. R. 1990.
Irrigation in Africa: Irrigation a viable Development Strategy? **The Geographical Journal** 156 (part 2): 175-179.

John, L. and William, W. F. 1975.
Food, Agriculture, the Environment, and Man. Blackie, Scotland.

Kearl, B. 1978.
An Overview of Communication in Agricultural Development Projects. **Development Communication Report** 2.

Ken, S. 1985.
Farm Labour. Cambridge.

Kolawole, A., Scoones, I., Awogbade, M. O. and Voh, J. P. (eds.) 1994.
Strategies for the Sustainable use of Fadama Lands in Northern Nigeria. Isola Ola and Sons, Zaria.

Masdar, P. 1979.
Sokoto River Basin Development Authority. Monthly Report.

Norman, W. R. 1996.
Indigenous community managed irrigation in Sahelian West Africa. Illinois, U.S.

Patel, A. U. and Anthonio, Q. B. O. 1974.
Construction and Standardization of a Scale of Measuring Socio-Economic Status (SES) of Rural Farm Families in Western Nigeria. **Journal of Economic and Social Studies** 16.

Olofin, E. A. 1994.
Dam construction and Fadama Development. In: *Strategies for the Sustainable use of Fadama Lands in Northern Nigeria*, Kolawole, A., Scoones, I., Awogbade, M. O. and Voh, J. P. (eds.), pp. 113-117. Isola Ola and Sons, Zaria.

Olukosi, J. O. and Isitor, S. U. 1990.
The economics of wheat production in Nigeria. Paper presented at the National Seminar on Prospects for Wheat Self-Sufficiency in Nigeria, NISER, Ibadan.

Onwueme, M. S. and Ugbor, O. 1994.
Education and Society: The Sociology of Education. Nigerian Educational Research Association, University of Benin, Nigeria.

Sokoto-Rima River Basin Development Authority 1992.
Annual Report (1992)

Srhidar, M. K. C. 1994.
Health hazards of Fadama farming. In: *Strategies for the Sustainable use of Fadama Lands in Northern Nigeria,* Kolawole, A., Scoones, I., Awogbade, M. O. and Voh, J. P. (eds.). Ola and Sons, Zaria.

Sumit, R. 1990.
Agriculture and Technology in Developing Countries, India and Nigeria. Sage Publications, India.

Umar, F. B. 1994.
Factors affecting the adoption of small-holder irrigation technology by Farmers in Jega LGA of Kebbi State, Nigeria. *Unpublished M.Sc thesis*, University of Ibadan.

World Bank 1989.
Option and Investment Priorities in Irrigation development. Nigeria Sector Review 1987.

1995
Nigeria Impact Evaluation Report: Kano and Sokoto States Agricultural Development Project. Report No. 14767 – UNI.

Wallace, T. 1979.
Rural Development through Irrigation: Studies in town on the Kano River Project. CSER, ABU, Zaria, Nigeria,

Yahaya, M. K. 1995.
Determination of Agricultural Information Needs and Media use Pattern of Women Farmers in North-Central Nigeria. *Unpublished Ph.D thesis,* University of Ibadan, Nigeria.

Yahaya, M. K. and Ango, A. K. 2000.
Analysis of socio-economic and environment impacts of Bakolori Irrigation and Fadama Development Projects in Sokoto / Kebbi water shed in Northern Nigeria. Lessons for irrigation Planners in semi-arid Regions. *Book of Abstract of the X^{th} International colloquium for the optimization of Plant Nutrition* held in Cairo, Egypt April 8-13, 2000.