

Full Length Research Paper

Irrigation agriculture: An option for achieving the millennium development goals in Nigeria

E. O. Oriola

Department of Geography, University of Ilorin, Ilorin, Nigeria. E-mail lolaoriola2003@yahoo.com.

Accepted 4 May, 2009

This paper reports the prospect of irrigation agriculture in transforming the dream of attaining the Millennium Development Goals to reality in Nigeria. Efforts of government at revitalizing agriculture before and after 2000 were highlighted. It identifies the poor attitude of Nigerian government towards productive agricultural system and the continuous importation of consumer goods that could otherwise be produced in the country as a reason why an average Nigerian farmer is wallowing in abject poverty. The irregular and erratic rainfall distribution over the country was observed as a mitigating factor against efficient agriculture system in Nigerian and irrigation was examined and conceptualized as an option for efficient agricultural system in Nigeria. Since there is a strong link between the MDGs and agriculture, a Millennium Development Goal attainment model was presented. It is opined that attaining high and sustainable food production through responsiveness of private sector and other stakeholders in irrigation will lead to higher income for farmers, such that they now have access to basic needs including farm inputs and pay other costs. At this level, hunger will vanish and attaining the MDGs will be easier and our dream will come true.

Key words: Agriculture, access, irrigation, food crisis, stakeholders, basic needs.

INTRODUCTION

Agriculture has been identified as a critical component in successful attainment of the Millennium Development Goals (MDGs) by all nations. This is because all the goals have link with agriculture. But the current global food crisis and the upward trend in global food prices (Benson et al., 2008) in the last quarter of this decade makes it a dream in Africa and Nigeria in particular. African continent have all it takes to combat poverty and food insecurity in the environment. The land is blessed with human and natural resources and vast agricultural potential. It has 23% of the world's land of which less than 25% is cultivable and not more than 5% is irrigated (Viet et al., 1995). Food and Agricultural Organization (FAO) estimated 9.5 million Ha of African land to be under irrigation. Sudano Sahelian region accounts for 2.3 million hectares (F.A.O, 1988). At least 65% of the economically active population of Africa is currently engaged in agriculture. Yet, hunger and poverty are ravaging the land and militating against the dream of achieving the MDGs.

Nigeria has one of the best agro-ecology to grow variety of crops. The country is endowed with an environment characterized by fair to good soils. Nigeria's cultivable land has been estimated to about 71.2 million hectares but less than 50% is put to use due to water constraint (Aremu and Ogunwale, 1994). Table 1 shows the

estimated Area planted and Output between 2004 and 2007. The Output per hectare has been reducing due to erratic rainfall distribution and lack of access to farm inputs among other factors.

With 77% of her population engaged in agricultural activities, yet the nation is facing food crisis. The situation is so critical that the nation has become a food deficit country. For example, importation of consumer goods increased from N662,884.58 million in 2002 to N756,849.36 million in 2004 and N2,086,152.06 in 2007 (CBN, 2007). However, modern irrigation technology has offered the opportunity to cultivate more land all the year round. The aim of this paper is to present a model that can adequately propel maximum food productivity, remove hunger from our society, reduce poverty and translate the dream of attaining the Millennium Development Goals to reality.

GOVERNMENTS' EFFORTS AT ACHIEVING HIGH FOOD PRODUCTION

Production before year 2000

Some 35 years ago precisely in the 70s, Nigerian government gave priority agriculture. The Government introduced the National Food Operation programme and the Ni-

Table 1. Estimated planted agricultural land (2004 - 2007).

Year	Area Planted in ('000)Ha	Estimated Output('000)	Output per Ha
2004	43,561.6	11359.8	2.61
2005	90,075.0	121146.3	1.34
2006	99,307.7	130574.1	1.31
2007	104,233.1	139395.1	1.34

Source: - Computed from CBN Report (2005, 2006, 2007).

Table 2. Contribution of agriculture to the total gross domestic product (2000 - 2007).

Period	Total GDP(#billion)	Agric share of GDP	% Share of agric in total GDP
2001	431.78	182.66	42.30
2002	451.71	190.37	42.14
2003	495.01	203.01	41.01
2004	527.58	216.21	40.98
2005	561.83	231.46	41.19
2006	595.82	248.60	41.72
2007*	632.86	267.06	42.20

Source: - CBN (2005, 2007) Note GDP at 1990 constant basic prices. *Provisional figures.

gerian Agriculture and Cooperative Bank was established to fund agriculture and assist farmers. This again was the period of farm settlement schemes; the Operation Feed the Nation (O.F.N) and Green Revolution. O.F.N was fashioned in 1976 to revolutionize agricultural sector of Nigerian economy, whose contribution to the economy was declining. To make the programme effective, farmers most especially in the rural areas were taught farming practices and agriculture was made compulsory in all secondary schools. In addition, eleven River Basin Development Authorities (R.B.D.A) were established to facilitate irrigation agriculture as an attempt to expand farmland. Also, farm settlements were established for cash and food crops to reduce food importation.

Government's efforts between 1981 and 1985 yielded good fruit as the contribution of agriculture to GDP rose from 21.1 - 35.4% (CBN, 1987). This was the result of the implementation of Green Revolution Programme of President Shehu Shagari Administration, which complements the River Basin Development Programme.

Rural Infrastructure Development programme was one of the priority programmes of the Military Administration under General Badamosi Babangida. In 1986 the Military government established the Directorate of Food, Road and Rural Infrastructure (DFRRI). The Directorate was to open up rural areas for effective agricultural activities and boost food production. The effort raised the contribution of agriculture to GDP to 39.9%. The trend changed since 1991 and the contribution has been decreasing. Since then the country has been depending on food importation as an option to meet the food demand of the populace. This was the period of 'essential commodity' and the beginning of high level of corruption in high places in the

country. Contractors collect money for contracts which were not executed; fictitious importation of food and machinery for agriculture, the River Basin Development Authorities became conduit pipes for siphoning money. This was the situation until 1999 when a democratic government was sworn in.

Production after year 2000

The new democratic government headed by President Olusegun Obasanjo has so many policies and programmes; reorganizing, restructuring, privatizing institutions and agencies and be in partnership with Institution and organizations in the private sector to make impact. All these have positive impact on agricultural production and consequent improvement in the contribution of agriculture to total gross domestic product (Table 2). The table shows a sharp increase in contribution from 24.6% between 1996 and 2000 as against 42.20% in 2007.

As appreciable as all these efforts are, not less than 65% of Nigerians are yet food insecure (Mohammed, 2008). Similarly, as beautiful and fulfilling as all the programmes and policies were, they could not achieve their set objectives. This is because of over dependence on oil which has become the major foreign exchange earner for the country on which the economy relies so much. Despite the fact that we have all it takes to produce enough food; the government has not been responsive to effective food production that can meet the demand of the people, rather interest has been in importing food even those food items that can be produced abundantly. Achieving hunger free society and reducing poverty is not an issue of right policies or programme, but that of a

strong political will and absolute patriotism on the part of our leaders and those to implement the policies and execute the programmes. These days, corruption is a major cause of poverty in the country.

THE PLIGHT OF AN AVERAGE NIGERIAN FARMER

The fact is that an average Nigerian farmer is inadequately informed, he has low level of formal education and is wallowing in abject poverty. Although, they have informal education with high level of indigenous knowledge of their environment, soil and land in particular, production is still at subsistence level. More than 65% of the population lives in the rural areas where access to productive resources and employment is critical. They do not have the tools they need to be more productive farmers. The World Bank Records had 325 million people in Sub-Saharan Africa living on less than \$1 per day (World Bank, 2004a), there is no doubt that the entire Nigerian farmers are inclusive. Since they live below the poverty line, they are plunged into a vicious cycle (Oriola, 2009). Because of their population (over 65%), they form the largest group and have strong hold of the sector. Unfortunately, they are not adequately informed. Their literacy level is low. As such, they lack of adequate knowledge of modern techniques and agricultural practices, which can propel production and yield to meet the current increasing demands by ever increasing population. Adoption of modern techniques and technology is usually a serious problem in agriculture. More productive agriculture is vital for productive gain in agriculture can boost the income of rural people both on and off the farm. This is to the extent that gains in agricultural productivity lead to lower food prices.

The scenario presented above serve as the basis for a pragmatic intervention especially, for irrigation agriculture, which according to Oriola (2006) is capable of generating employment and sustain food productivity and at the end, attains the millennium development goal 1 which is hoped to propel other goals.

Food security entails producing food that will go round every citizen both in quantity and quality. To achieve this, agriculture production needs to be enhanced with:

- i) Adequate knowledge of the environment.
- ii) Climatic condition, the market and its operation.
- iii) Types of insecticides and pesticides.
- iv) Crop treatment.
- v) Be aware of prices and its mechanism.

It is the combination of these variables that influence food production, its sustainability and food security.

IRRIGATION AS AN OPTION

Irrigation has been described as a condition necessary for insufficient rainfall and or poor distribution of rainfall in

agriculture producing area (Punial and Pande, 1979). Similarly, Daniel (1990) observed a dry condition due to evaporative demand of the atmosphere which continuously create stress for plants and therefore require water supplements for the period.

Common to the two definitions and views among very many others is the involvement of artificial or conscious effort to augment soil water supply during a period of deficit or in areas of deficit. Irrigation projects are therefore designed to help reduce the dependence of crop growth on precipitation, which to a large extent is uncontrollable by man. Adoption of irrigation in such areas has ensured improved harvest and encouraged crop diversification.

According to Food and Agricultural Organization (FAO, 1988), irrigation has put smiles in the face of many people in semi arid and arid regions where crop production without irrigation is inevitable. In Egypt, 80% of the food requirement comes from irrigated lands (FAO, 1988). The benefits brought about through the introduction of irrigation are undeniable. It has been possible to increase and protect harvest and grow crops that could not otherwise be cultivated under conditions of extreme drought. Irrigation also calls for increased use of labour, leading to higher quality of life for farmers, increasing their income and eliminating the uncertainty that comes from variable yearly and seasonal rainfall.

Irrigation tries to meet additional requirement of crops during the wet season and supplies water to farmland during dry periods. This is because precipitation is irregularly distributed throughout the year most especially in the tropics. So, it is assumed that some water obtained from rainfall during the wet season is stored in dams and weirs against dry periods most especially in arid regions. In other words, irrigation system is aimed at increasing and improving agricultural yield, particularly in semi-arid and arid environment. Furthermore, Worlf (1995) observed that irrigation has made higher and more reliable yield possible, as crops can be planted more than once in a year within the tropics, apart from bigger and reliable yield as against yearly cultivation, which is often at the mercy of the seasonal rainfall (S.R.RB.D.A, 1984). Dobermann et al. (1996) reported that irrigated rice accounted for 75% (363 million tones) overall rice production in Asia in 1990.

Vermilion (2004), reported that 40% of world food and 60% of its grains is produced under irrigation and land under irrigation had increased drastically from 94 million hectares in 1950 to 240 million hectares in 2000. This is expected because of the increase in world population and the need to expand agricultural land under the threat of climate change.

Nigeria has 2.5million hectares of irrigation farmland but just about 220,00 hectares were cultivated in 2002 (Table 3).

Conceptualizing irrigation agriculture

Kirschenmann (1991) observes that irrigation agricultural

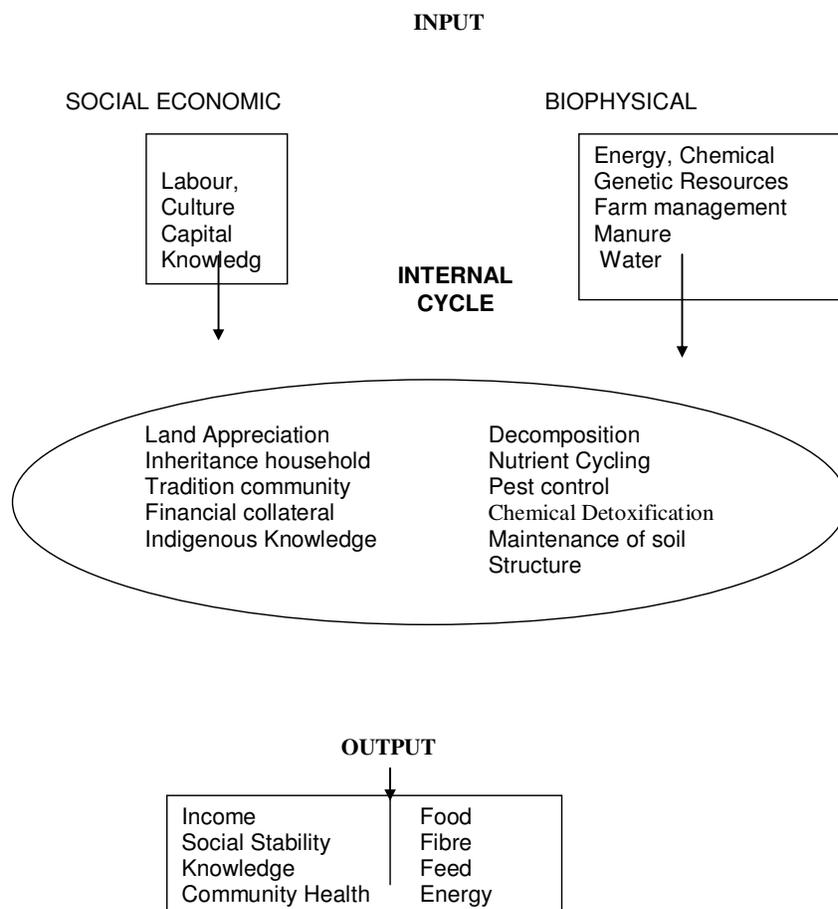


Figure 1. Conceptual model of an irrigation farm. Source: Adapted from Edwards et al. (1993).

Table 3. Nigeria Irrigated land 2002 - 2005.

Year	Area irrigated
2002	220,270
2003	220,270
2004	185,000
2005	191,660

Source: - CBN Annual Report 2006.

farm hinges on the interaction of ecological, social and economic parameters. The farmland is treated like an organism consisting of many complex interrelated sub-organisms, all of which have distinct biological limits. Economic performance is dependent on the characteristics of the local organism and thus, requires a holistic system approach to resource management (Figure 1). For a farm to persist and be productive, the components should be integrated and holistic. The conceptual model for an irrigation farm presented in Figure 1 is a mass flow consisting of two parallel path of flow through the farm. One path is a socio-economic flow inputting labour, culture,

capital, knowledge or information. The second path is biophysical and the inputs are energy for operation, agro-chemical for fertilizer, pest control and crop residue. These inputs are familiar and conventional agricultural components whose values are not often optimized and integrated.

The internal processes (cycling) within the farm are important in maintaining its natural resource base and its ability to support continued production. Thus, the ability to produce food and income is tied to internal processes. The output is fulfillment of livelihood, such as income, good health, knowledge and social stability.

MILLENNIUM DEVELOPMENT GOALS ATTAINMENT MODEL

To achieve the Millennium Development Goals, countries were expected to articulate policies, strategies and plans which will facilitate the achievement of the eight MDGs which according to Rosegrant et al. (2006) include,

- 1) Eradication of extreme poverty and hunger.

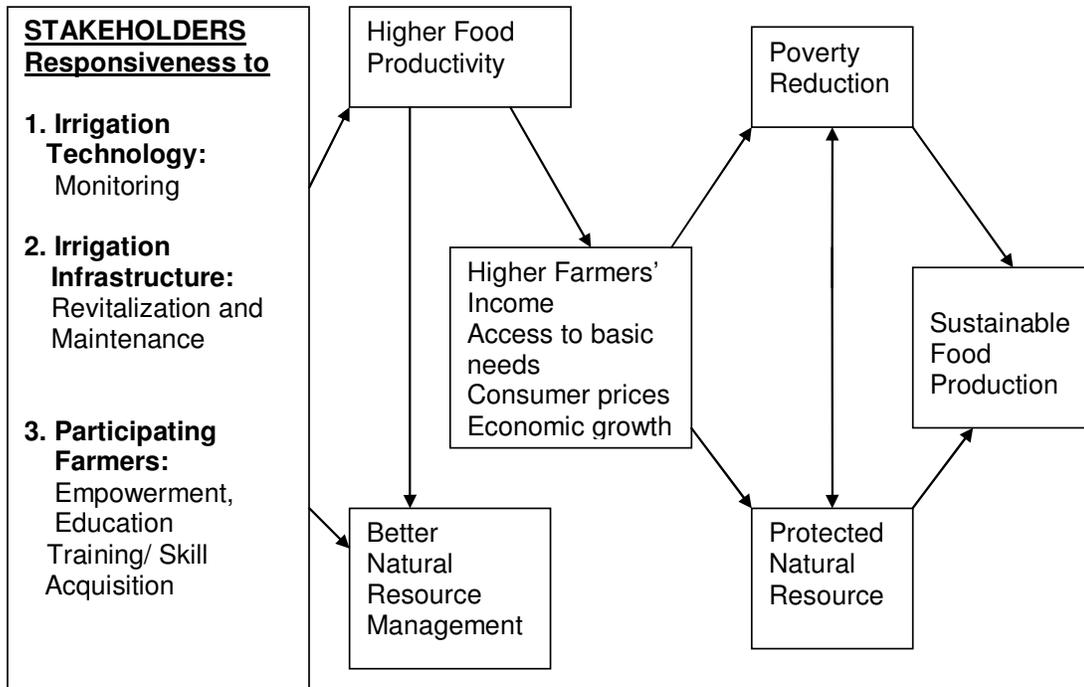


Figure 2. Millennium development goal 1 framework.
Source: - Adapted and Modified from Kerr and Kolavalli (1999).

- (2) Achievement of universal primary education.
- (3) Promotion of gender equity and empowerment of women.
- (4) Reduction of child mortality.
- (5) Improvement of mental health.
- (6) Combat HIV/AIDS, malaria, and other diseases.
- (7) Ensure environmental sustainability.
- (8) Develop a global partnership for development.

The response to food insecurity and poverty reduction depend to a large extent on the policy and programme related reaction of government and policy makers. If the nation is to attain the MDGs, the government should take agriculture seriously, crop production must not only be boosted but the political will by government should manifest. High commitment and not lip service should be given to agriculture most especially irrigation at the three tiers of government.

The political will should be targeted at pragmatic intervention as described in Figure 2 below. The model is presented with a view that government intervention in form of integration of all stakeholders and the Private Partnership into irrigation system will make irrigation projects more efficient. This will also facilitate the rejuvenation of irrigation schemes, revitalize the moribund ones and make them operate efficiently and in full capacity.

An irrigation scheme has three basic components: the technology, the infrastructure and farmers. All these work together for the maximum output from the system.

Figure 2 shows a model for understanding the effects

of the responsiveness of stakeholders in monitoring the interrelationship of the components of irrigation system and how its action will influence higher crop production and better natural resource management for higher income for participating farmers and facilitating access to basic needs, help in reducing poverty, protect the environment, and attain sustainable food production.

Implications for attaining millennium development goals

The model presented in Figure 2 serves as a pivot to achieve the MDGs and for it to be operational, there should be a serious government intervention in agricultural sector and irrigation system in particular and this should be in line with the five variables identified earlier in section 3 through the agencies such as River Basin Development Authorities, Agricultural Development projects and other stakeholders (Farmers Associations and Farmers' Cooperative societies). This implies that:

- i) The government is to formulate the policies for the system, set targets and provide enabling environment for the actors, and for the Public Private Partnership to be functional and effective.
- ii) The private partner(s) should serve as the funding agents, who will see to the recovery of the cost, oversee the smooth running and regular maintenance of the facilities (irrigation infrastructures)
- iii) The agencies are to serve as monitors, who should

see to the implementation of the policies and reforms as planned for the desired result.

Appropriate and adequate measures to achieve the above will spin higher productivity and higher income for participating farmers. Higher income will reduce unnecessary disturbance and over exploitation of the natural resource and have a better approach to the management of the resource. As the farmers imbibe irrigation skills and better informed, the irrigation environment will be managed better, salinization and waterlogging will be controlled; fertilizer and pesticides will be applied appropriately with the assistance of the extension service providers who are also part of the stakeholders. There is no doubt that access to basic needs including farm inputs will be better most especially when farmers associations and co-operatives are encouraged, supported and empowered by the private partners whose major activities are to fund and maintained irrigation infrastructures for high productivity. The private sector according to Rosegrant, et al. (2006) is to support timely and efficient availability to fuel agricultural development and growth.

The cumulative effect will transform the system into higher productivity one, which will lead to higher income, it will become easier for farmers to pay the wages of the laborers, and prices will become affordable for consumers goods. Stephen et al. (2002) observed that as farmers' income increase, farm households spend much of their income on a range of consumer goods and non-farm services. This will improve their standard of living. Cumulatively, there will be economic growth and this will definitely reduce poverty. With poverty reducing as income increases and the people having better access to basic needs, the natural resources will begin to enjoy some protection and finally the food production will become sustained and hunger will vanish from the land. Once this level is attained, MDG 1 is attained and there is prospect for all other goals to be attained and our dream translates to reality because the linkage of MDGs with agriculture is very strong.

Conclusion

Achieving the Millennium Development Goals in Nigeria depends greatly on the governments' commitment to agricultural sector and their readiness to transform the sector particularly irrigation. Unfortunately, it has become difficult for government alone to bear the burden of irrigation alone. The private sector and other stakeholders are very relevant in revitalizing irrigation system especially by funding, operating, maintaining irrigation infrastructures and making other farm inputs readily available to participating farmers. Such a response is a serious step at increasing food production, increasing farmers' income and

their purchasing power. Once this level is attained, our dream will become a reality.

REFERENCES

- Aremu JA, Ogunwale SA (1994). Comparative Analysis of Small and Large-Scale Irrigation Schemes in Northern Nigeria in AO Sanda, SB Ayo (eds), Impact of Irrigation on Nigeria's Environment, Fact Finders Int. pp. 165-185.
- Benson T, Nicholas M, John P, Miguel R, Joachim vB (2008). Global Food Crisis: Monitoring and Assessing Impact to Inform Policy responses. International Food Policy Research Institute (IFPRI) Food Policy Report. 34pp.
- CBN (1987). Central Bank of Nigeria Annual Report and Statement of Accounts for the Year ended 31st December 1987.
- CBN (2005). Central Bank of Nigeria Annual Report and Statement of Accounts for the Year ended 31st December 2005.
- CBN (2006). Central Bank of Nigeria Annual Report and Statement of Accounts for the Year ended 31st December 2006.
- CBN (2007). Central Bank of Nigeria Annual Report and Statement of Accounts for the Year ended 31st December (draft).
- Daniel H (1990). Irrigation of Agricultural Crops, Agronomy Monograph, No. 30.
- Dobermann SA, Cruz PC, Cassman KG (1996). Fertilizer Imputes, Nutrient Balance, and Soil Nutrient Supplying Power in Intensive, Irrigated Rice System. I Potassium uptake and K. balance. Nutrient cycling in Agro ecosystems. 46: 1-10.
- Edwards GA, Grove TC, Harwood RR, Pierce Colfer OJ (1993). The role of Agro Ecology and Integrated Farming System in Agricultural Sustainability, Agric. Ecosyst. Environ. 46(1-4): 99-121.
- FAO (1988). Irrigation and Water Control, Annex III African Agriculture the next 25 years, Food and Agricultural Organisation, Rome.
- Kerr J, Kolavalli S (1999). Impact of Agricultural Research on Poverty Alleviation: Conceptual Framework with Illustrations from the Literature, EPTD Discussion 56: 43-45.
- Kirschenman F (1991). Fundamental Fallacies of Building Agricultural Sustainability, J. Soil Water Conserv. 45(1): 118-213.
- Mohammed I (2008). Road Map to Attaining Food Security in Nigeria. Nigerian Tribune, Monday, 5th May 2008.
- Oriola EO (2006). Exploration of Irrigation Projects: A Panacea for Unemployment. In H.A. Saliu, A.A. Ogunsanya, J.O. Olaniyi and E. Olu-doyi (eds). Democracy and Dev. in Nig. Econ. and Environ. Issues Concept Publ. Lagos, Nig. 2: 285-301.
- Oriola EO (2009). Breaking the Vicious Cycle in Irrigation Farming System for Sustainable Food Security in Nigeria, Afr. Res. Rev. 1(3): 234-245.
- Punial PC, Pande BB (1979). Irrigation and Water Power Engineering 5th Edition.
- Rosegrant MW, Claudia R, Benson T, Xinshen D, Danielle R, James T, Maxim T, David O (2006). Agriculture and Achieving the Millennium Development Goals. World Bank/IFPRI Report. 74pp.
- SRRBDA (1984). The Bakalori Irrigation Project, Visitor's Brochure, Sokoto Rima River Basin Development Authority.
- Stephen H, Peter H, Thomas R (2002). Strategy for Stimulating Poverty Alleviation Growth in Rural Nonfarm Economy in Developing Countries. EPTD Discussion paper No. 92.
- Vermillion DL (2004). Collective Action and Property Right for Sustainable Development: Irrigation Alternative Action and Property Right Vision, 2020 IPFRI.
- Viet P, Nagpal T, Fox T (1995). Africa's Wealth, Woes Worth, Issues and Ideas Series, World Resour. Institute Wash. D C.
- World Bank (2004). Partnership in Development: Progress in the Fight against Poverty, World Bank, Wash. D C.
- Worif P (1995). The Problem of Sustainability of Irrigation System, Appl. Geogr. 45/46: 55-62.