Abstract: The present level of irrigation system and poor output level of agricultural and horticultural products have triggered the need to look for a better management strategy under the current irrigation system. In order to suggest a feasible option, this study examines the present irrigation management structure in Benin-Owena River Basin Development Authority in Nigeria. Questionnaire and in-depth interviews were used for data collection. Data were analyzed using descriptive statistics. Results indicated that majority, (86 %), of the farmers were educated, 77 % were practising commercial farming, 50 % of the farmers have been practicing irrigation for over 20 years and 60 % adopted sprinkler methods, followed by drip (27%) and the most rarely used was basin with 3 %. The sources of water used were 30 % of stream, 29 % of well and 7 % lake. Findings indicated that (30 %) of the farmers were trained and visited by the workers of Benin-Owena River Basin Development Authority, (20 %) of the farmers were helped in their irrigation development, and only a few of the workers of Benin-Owena River Basin Development Authority (10 and 15 %) that assisted the farmers one way or the other were the professional expert in irrigation and related fields. Majority, (70 %), of the farmers were not fully integrated into the activities of the river-basin irrigation management structure. Hence, Benin-Owena River Basin Development Authority should be restructured to incorporate the irrigation stakeholders into the river-basin irrigation management structure.

Keyword: Evaluation, irrigation, irrigation development, River basin, Benin-Owena

1. INTRODUCTION

Irrigation refers to the artificial application of water to the soil for the purpose of supplying moisture essential for plant growth. Irrigation is also practiced in order to provide an insurance against droughts, for cooling the soil and atmosphere thereby providing a more favourable soil environment for plant growth; protecting plants against frost, to wash out or dilute salts in the soil, to reduce the hazard of soil piping, and in preventing soil consolidation (Gupta and Gupta, 2008; Suresh, 2008; Sahasrabudhe, 2013). In a dry condition or periods with drought, irrigation becomes the only possibility for crop production on farmland (FAO, 2000).

Irrigation allows a farmer to grow their crop “all year round”, in other to increase crop yields. It could be “surface or sub-surface irrigation. Surface irrigation simply involves applying water to the surface of land and it is often called flood irrigation whereas sub-surface (seepage) irrigation involves applying water below the ground level”. The latter class is mostly used where water table is high, while the former is common to the areas with low water table. Irrigation methods include furrow, border strip, basin, corrugation, sprinkler and drip. Irrigation depends upon some parameters such as water quantity and quality, suitable soil and good management. Proper application of water would ensure sustained high yields of crops per unit area of land. When the water supply is less than adequate or costly, the aim must be to obtain the best possible yields per unit of water in combination with carefully selected agronomic and managerial practices. Historically, River Basin development Authorities (RBDAs), established progressively between 1973 and 1984, play an important role in water resources development, dam construction, irrigation and water supply, operation and management of the public irrigation within the authorities’.

According to the Act that established them, they were charged with the following functions:

i. To undertake comprehensive development of both surface and underground water resources for multi-purpose use.

ii. To provide water from reservoirs and lakes under the control of the authority for irrigation purposes to farmers and recognized association as well as urban water supply authority concerned.

iii. To control pollution in rivers, lakes, lagoons, and creeks in authority’s area in accordance with laid out standards.

iv. To resettle person affected by the works and schemes specified under special resettlement schemes.

v. To develop fisheries and improve navigation on the rivers, lakes, reservoirs, lagoons and creeks in the authority’s area.

vi. To undertake the mechanical clearing and cultivation of land for the production of crops and livestock etc.

vii. To undertake large-scale multiplication of improved seeds, livestock and tree seedlings for distribution to farmers and for afforestation schemes.

viii. To assist the state and local governments in the implementation of rural development works (construction of small dams, provision of power for rural electrification schemes, establishment of grazing reserves, training of staff) in the authority’s areas (Erhabor, 2002; Ogunmika, 2008).

According to some researchers the irrigation development in Nigeria date back to 1918 when flooding occurred in Sokoto and Rima rivers (Erhabor, 2002; Nwa and Martins, 2002; Ogunmika, 2008). The concept of river basin originally referred to as drainage basin represents a system of interconnected system of water tributaries that flow towards a single outlet. Mody (2004) reported that the concept of integrated river basin management...
has its root in a collective effort to make water use economically, productively, socially equitable and environmentally sustainable for all users within the basin.

The security of any nation depends upon the availability of food for its citizenry. Food is derived from agriculture, and there is a need for food security for the survival of the populace. Agriculture is a key activity that involves the cultivation of crops and rearing of livestock. Agriculture depends upon the soil and water which are the gift of nature. In Nigeria, despite the abundance of land for cultivating crops, the agricultural systems are seasonal in nature (Nwa and Marthins, 2002). Agricultural system in Nigeria depends upon the rainfall and insignificant application of conventional irrigation. However, the use of micro irrigation systems is gradually gaining prominence.

Knowledge about the status, the social and institutional dimensions of competing uses of water resources provides a better understanding of the supply and demand challenges facing irrigated agriculture all over the world. In order to complement the ideal of sustainable irrigated agriculture through the river basin development authority and propose intervention, this study examines the present irrigation practices management structure in Benin-Owena River Basin Development Authority (BORBDA) with a view to identify where the irrigation management gaps are and to use the lessons deduced from it to suggest an alternative irrigation management structure for Nigeria. It is envisaged that an improvement on the present irrigation management arrangement could alleviate the present level of irrigation problems as well as improve the country's ability to meet its present and future food production.

2. MATERIALS AND METHODS
2.1 Site Description
Benin-Owena River Basin is situated in the South Western part of Nigeria. It is responsible for two states (Ondo and Ekiti). It is one of the branches of the River Basin Development Authorities (RBDAs). It falls within longitudes 50 15’E and latitudes 70 42’N. level. Information is as shown in Fig. 1.

![Fig. 1: Location of Benin-Owena River Basin Development Authority](image)

2.2 Data Collection
The farms locations in the two states (Ondo and Ekiti) were collected from the Ministry of Agriculture in their respective states and River Basin Authority. In examining river basin irrigation management gaps in Nigeria, the study based its findings on responses obtained from two semi-structured questionnaire surveys. On the first survey, questions were targeted at irrigation experts in the Benin-Owena River Basin Development Authority and other questions were targeted at practicing farmers. The rationale for the choice of farms for study was as follows: The farms under investigation were located in six senatorial districts in the states; twenty local governments (Ten local government areas per state) were chosen as representative of selected locations and eighty (80) farmers were selected. Questionnaire and Schedules were administered to farmers. The information contained in the questionnaire covers: Educational qualification, Farming system, Source of water used for their irrigation, Type of irrigation practices, source of energy used for irrigation, type of labour used for irrigation, number of irrigation applied per day, Period of being into irrigation farming, role of Benin-Owena River Basin Development Authority (BORBDA) to the farmers, professional areas in Benin-Owena River Basin Development (BORBD) and Integration of farmer in the RBDA scheme (see Appendix).

2.3 Data Analysis
SPSS program version 17.0 was used for statistical analysis. The statistical inference was made at 0.05 (5%) level of significance.

3. RESULTS AND DISCUSSION
The results on the Educational qualification, Farming system, Source of water used for their irrigation, Type of irrigation practices, Distance of the water source to the farm, source of energy used for irrigation, impact of the irrigation on crops, type of labour used for irrigation, Irrigation input from government agency, Period of being into irrigation farming, manpower development, funding of irrigation scheme and integration of farmers are presented in Fig. 2 to 12 respectively.

3.1 Educational Qualification
This distribution reveals that 68 (86 %) of all the respondents (80 farmers) have minimum educational qualification (Fig. 2). Secondary School Certificate had the highest with 38 (48 %) followed by Higher National diploma/Bachelor of Science (HND/BSc) with 21 (26 %), while Primary Six had the least with 10 (12 %). Almost all, of the farmers 79 (99 %) responded. There were not significant differences (p ≥ 0.05) among the values of educational qualification.

**Fig. 2:** Pie chart showing the educational qualification.
3.2 Farming system
The majority, 62 (77 %), were commercial farmers (Fig. 3).

3.3 Source of Water used for Irrigation
The sources of water used were borehole, stream, river and lake; Most of the farmers, 26 (33 %), used stream, followed by 23 (29 %) who used well, while only 6 (7 %) farmers used lake (Fig. 4). There were not significant differences (p ≥ 0.05) among the values of sources of water used.

3.4 Types of Irrigation Methods
Types of irrigation methods and their respective frequencies are presented in Fig. 5. The majority, of the farmer (47 i.e. 60 %) adopted Sprinkler methods, 21 (27 %) used drip, while 8 (10 %) and 3 (3 %) used Furrow and Basin respectively. The usage of Sprinkler and Drip irrigation methods may be attributed to the awareness of the importance of water conservation and level of training received coupled with their educational background. There were not significant differences (p ≥ 0.05) among the values of irrigation methods used.

3.5 Sources of Energy used for Irrigation
The result presented in Fig 6, showed that the majority, 65 (83 %) of the farmers used generator, while 13 (14 %) and 23 (3 %) used electricity and solar respectively. There were not significant differences (p ≥ 0.05) among the values of energy used for irrigation. Inadequate use of electricity could be attributed to high usage of generator which impacts negatively on the profit they make from farm produce.

3.6 Frequency of Irrigation per Day
The frequency of irrigation per day is presented in Fig. 7. The majority, 55 (70 %) of the farmers irrigated their farm once per day, while 19 (24%) and 5 (6%) farmers irrigated twice and three time per day respectively. There were significant differences (p ≥ 0.05) among the values of the frequency of irrigation per day. This could be attributed to the type of crop grown and availability of water.
3.7 Types of Labour used for Irrigation

Majority, 56 (71 %), of the labour used were skilled, while the remaining were unskilled. There were significant differences (p ≥ 0.05) between the types of labour used for irrigation. This could be attributed to the level of the training received and the educational background of the farmers (Fig. 8).

![Fig. 8: Pie chart showing the type of labour used for irrigation.](image)

3.8 Year of involvement of the farmer in Irrigation Farming

Majority, 40 (50 %), of the farmers had been involved in irrigation farming for more than 20 years, while 5 (6 %) of the farmers in the studied areas have been operating between 0 – 5 years (Fig. 9). This shows that the majority of the farmers know the importance of irrigation and they have utilised it for the enhancement of agricultural production.

![Fig. 9: Pie chart showing the operational periods of involvement in Irrigation farming.](image)

3.9 Role Benin-Owena River Basin Development Authority Played to support Farmers

There were not significant different (p ≥ 0.05) between the role plays by BORBDA. A few, 24 (30 %), of the farmers were trained and their farms visited, 16 (20 %) were helped in irrigation development using modern irrigation technology and 12 (15 %) were helped in the maintenance of their farms. Four farmers (5 %) were assisted with input supply and this could be attributed to lack of fund and limited number of experts (Fig. 10).

![Fig. 10: Pie chart showing the role Benin-Owena River Basin Development played to support farmers.](image)

**Keys:**
- TFI = Training the farmer on irrigation
- VF = Visiting the farmers
- SI = Supply of input to the farmer
- DISF = Development of irrigation scheme to the farmer
- OF = Other Functions

3.10 Professional areas in the RBDA

The findings revealed that the 59 (75%) experts in the other professional areas are almost three times as many as 20 experts in the sensitive professional areas (i.e. irrigation experts, 12 water quality experts, corresponding to 10% and 15% respectively (Fig. 11).

![Fig. 11: Pie chart showing the professional areas in the RBDA.](image)

**Keys:**
- IE = irrigation Expert
- WQE = Water quality Expert
- OTHERS

3.11 Integration of Farmers into RBDA management scheme

The result showed that 24 (30%) of the farmers were integrated into RBDA management scheme while 55 (70%) were not (Fig.12). According to Jasper (2003) irrigation management system without the participation of stakeholders (Farmers) in decision making, resource planning and management will be highly ineffective.

![Fig. 12: Pie chart showing the Integrated of the farmer into RBDA management scheme.](image)
4. Conclusion
Direct observation shows that:
1. Irrigation farming is developing and it is gaining prominence.
2. Low level of assistance in the area of input supply to the farmers may be attributed to inadequate finance, transparency, accountability, undue political interference, unreliable service delivery and general systemic failure.
3. Farmers (respondents) perceptions indicate that there are no irrigation management structures at a sub-basin level. Moreover, the farmers are not incorporated into the present river basin-based irrigation management platform.
4. There is dearth of experts in irrigation and related fields

5. Recommendations
River Basins Development Authorities Act, especially; irrigation laws, should be reviewed to include provisions that will:
1. Establish sub-basins and irrigation management structures within all the senatorial districts
2. Establish, operate and regulate stakeholder based irrigation platforms at both Basin and sub-Basin level.
3. Establish irrigation division in each local and state government level with at least four irrigation experts and other professionals related to irrigation.
4. Conduct or carry out land preparation, evaluation and irrigation development for practicing farmers as part of the responsibilities of River Basin Development Authority

References

Appendix: Questionnaire
Technical Survey of Irrigation Practice and Its Management Programme in Benin-Owena River Basin Development Authority

Please note that your response would be treated with confidentiality
Farmer Code: …………….LGA:……………………………
A. Farmer’s Background
1 Farmer’s Name:
Sex ……………. Age……………………
Address:……………………
Status:………………Owner……………………
Manager:………………
Owner/ manager………………
(1) What is your educational level?: (i) BSc/HND (ii) Secondary School Leaving Certificate (iii) Leaving Certificate (iv) None
(2) What Farming system are you practicing?: (i) Subsistence (ii) Commercial
(3) What are the Sources of Water used for Irrigation?: (i) Stream (ii) River (iii) Well (iv) borehole (v) Lake
(4) What Type of Irrigation system are you applying on your farm?: (i) Furrow (ii) Basin (iii) Border strip (iv) check (v) Sprinkler (vi) Drip
(5) What are the Sources of Energy used for Irrigation?: (i) Wind (ii) Solar (iii) Electricity (iv) Generator
(6) What is the water application rate per day that you adopt on your farm?: (i) one per day (ii) Twice per day (iii) Trice per day (iv) Four times per day (v) Five times per day
(7) What type of labour do you use on your Farm for Irrigation?: (i) Skilled (ii) Unskilled
(8) How long have you been using irrigation on your farm?: (i) 5 years (ii) 10 years (iii) 15 years (iv) 20 years (v) 25 years (vi) 30 years (above 30 years)
(9) What type of support did you receive from the Benin-River Basin Development Authority?: (i) Fertilizer (ii) Irrigation Equipment (iii) Training on irrigation (iv) Money (v) Others
(10) What are the categories of profession and their field of specialization in your organization?
(11) Are you satisfied with the type of relationship that you have with the leadership of BORDA and at what level?
(12) Do you have any suggestions?