



Original Article

Assessing the farmers' awareness and practices of irrigation water conservation techniques in Kano – Nigeria

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ABSTRACT

Irrigation water conservation methods are strategies for reducing water demand and increasing its availability. This research assessed the level of farmers' awareness and practices of irrigation water conservation methods in Kano State, Nigeria. A survey was conducted in twenty (20) irrigation projects located at various local government area within the state. Structured questionnaire was used in collecting information from the farmers using Kobo collect application and descriptive statistic was used to analyses the data obtained. Based on the result obtained from the survey 85.68% of the respondent's uses dams as their source of irrigation water while 10.59% and 3.73% uses tube well and river as their sources of water, respectively. The survey revealed that 74.12% of the farmers do not experience decline in water supply while 25.88% of farmers encounter shortage of water supply, and this may result from seepage loses, present of weed or siltation of the conveyance canals at the upstream of the schemes. However, about 62.94% of the responded were unaware and do not practice any water conservation techniques while 27.84% and 9.22% were applying manure and rice straw, respectively to conserve moisture as a means of water conservation. It was concluded that the irrigation water conservation is poorly practiced by the farmers in Kano State and it is based on this note that government, water users' associations and other stakeholders should provide a policy that encourage farmers to adopt some water conservation techniques and concepts for optimum utilization of water resource.

1. Introduction

Irrigation is the process of applying water to soil, primarily to meet the water needs of growing plants. Water from various sources such as rivers, reservoirs, lakes, or aquifers is pumped or flows by gravity through pipes, canals, ditches or even natural streams and abstract by irrigators to enhancing crop production. According to [1], irrigation contributes to about 40% of the world's food production on 20% of the world's crop production land [2]. Water availability is the most crucial factor particularly in water-stressed regions of the world which necessitated the need

to develop and adapt various water conservation methods. The concept of water conservation encompasses the policies, strategies and activities to sustainably and efficiently manage world's limited freshwater to meet agricultural and municipal as well as environmental requirements [3]. Conservation of water in the agricultural sector is essential since irrigated agriculture accounted for about 70% of freshwater use globally [4]. Several irrigation methods are available and the selection of one depends on factors such as water availability, crop, soil characteristics, land topography, and associated cost. It is, therefore essential to employ water conservation techniques in agricultural sector. In irrigated crop production, optimal

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water efficiency means minimizing losses due to evaporation or subsurface drainage. Flood irrigation is the oldest and the most commonly use, is often very uneven in distribution, as parts of a field may receive excess water in order to deliver sufficient quantities to other parts. Overhead irrigation, using center-pivot or lateral-moving sprinklers gives a much more equal and controlled distribution pattern. Drip irrigation is the most expensive and least-used type, but offers the best results in delivering water to plant roots with minimal losses [3]. Moreover, water resource is becoming scarce due to increase in population, industries, and agricultural activities and due to low rainfall. This has led to serious competition and conflicts of the water resources amongst users globally. Since more than two-thirds of the water withdrawn from the earth's rivers, lakes and aquifers is used for agriculture activities [5]. Therefore, conservation of water in agricultural sector is no longer an option but necessity. It is in view of that, this study aimed at conducting survey on farmers' awareness and practices with regards to irrigation water conservation techniques practiced by in Kano state Nigeria. It involves the use of structured questionnaires and targeting farmers that are currently into

practices of farming operations.

2. Materials and Methods

2.1 Study Area

The survey was conducted in 20 irrigation projects or sites located at three senatorial zones of Kano State. Kano State is located in the north-west region of Nigeria, and it has a total land area of 20,131 km² (7,773 sq mi), which represents 3.13% of the entire total area of the country (Figure 1). Kano State is bounded on the west by Katsina State, on the south-west by Kaduna State, on the east by Jigawa State and south-east by Bauchi State. It is a part of the Sudano-Sahelian region of the country and comprises of 44 local government areas, which divide into three geopolitical zones, namely Kano Central, Kano South and Kano North. The climatic condition of the area is; annual average minimum and maximum temperatures are 20.5°C and 33.9°C, maximum relative humidity of 82% and minimum relative humidity of 23% and an annual average rainfall of 890.40mm [6, 7].

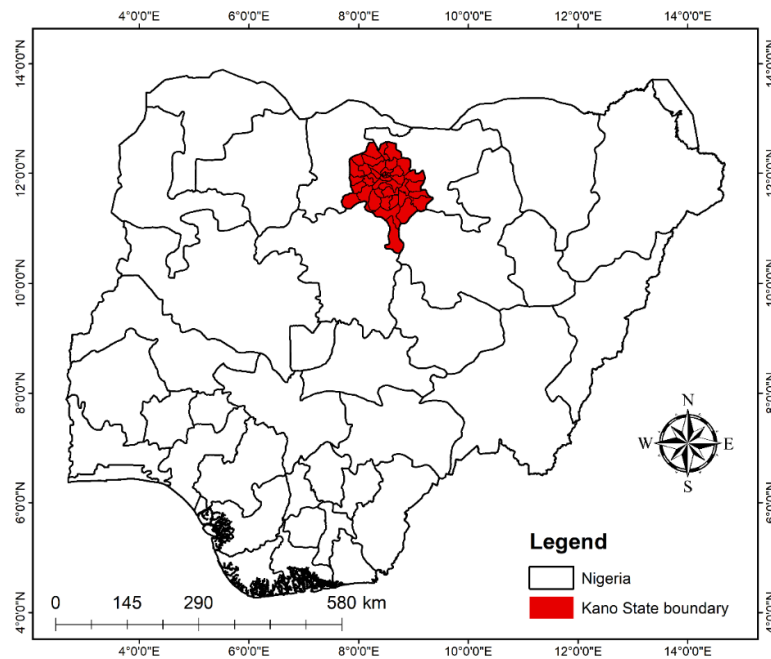


Fig 1. The study location

2.2 Methods of Data Collection

During the survey on the awareness and practices of irrigation water conservation techniques at the study area data was obtained using questionnaires in an electronic system with an application software named as 'Kobo collect'. Kobo collect was used to collect the data from the farmers in the study area, 510 questionnaires were randomly distributed to the farmers at three senatorial

zone. Most of the farmers could not read in English, the questionnaire was interpreted to them by enumerator and the answers were recorded in that application. The Questionnaire consisted of information on the irrigation water conservation techniques currently practiced in their farms.

Kobo collect is an electronic system of data collection that have higher accuracy, easy for analysis and can be track for both location and time of data collection. Data does not

need to be transferred from paper to computer before it can be analyzed, some analysis can be applied within minutes of the data being collected it is much more accurate enumeration error are minimized because of the data validation that can occur in real time as data is collected. Transcription errors are entirely eliminated, it optimized for humanitarian work it work offline, it is easy to use (enumerators can be trained within minutes), and can be rolled out backup and integrated with other data. Moreover, Kobo collect is fully compatible and interchangeable with open data but delivers more functionality such as an easy to use for question libraries and integrated data management. In addition to low cost of expenditure, it also makes life easier for the user in collect and analyze data simultaneously.

2.3 Statistical Analysis

Analysis of data collected from the respondents was

conducted and subjected to descriptive statistic such as frequencies and percentages. Moreover, histogram was also plotted to further analyze the data and to summarize the data in such a way as to enable the attainment of the stated objectives of the study which includes providing answer to the investigated problem from where conclusions could be drawn.

3. Results and Discussion

3.1 Distribution of farmers according to senatorial zones

Table 1 shows the distribution of farmers according to senatorial zones. As shown from the table, 50% of the respondents were from North senatorial, followed by central with 26.47%, and 23.53% for the South senatorial zone of Kano state. This result shows that the majority of Kano state irrigation schemes are located in the North zone of the state.

Table 1. Distribution of farmers according to senatorial zones

Senatorial zone	Frequency	Percentage (%)
Kano North	255	50.00
Kano Central	135	26.47
Kano South	120	23.53
Total	510	100

3.1 Farmers' Awareness on Irrigation Water Conservation

From the survey, it was discovered that there is lack of awareness on the proper management and conservation of irrigation water from the farmers in the study area as presented.

3.2 Practices of Irrigation Water Conservation

3.2.1 Source of irrigation water

Table 2 shows the proportions of the sources of water used by the farmers during dry season for their agricultural activities. It is found that 85.68% of the respondents used dams as their source of water whereas, those using tube-wells and rivers 10.59% and 3.73%, respectively. This result shows that during dry season, majority of Kano State farmers depend on dam as their source of irrigation for their farming operations. This may be due to availability of many dams constructed by the previous administrations of the State. The study revealed that some farmers have access to the water freely or pay little charges.

Table 2. Sources of irrigation water in Kano State

Source	Frequency	Percentage (%)
Dams	437	85.68
Tube-wells	54	10.59
Rivers	19	03.73
Total	510	100

3.2.2 Adopted Method of irrigation system

Table 3 present the results of method of irrigation adopted by the farmers in the study area. It was found that all the respondents practiced surface method of irrigation. The results shown that 55.49 % of the respondents adopt basin

system of irrigation, while 31.76 % and 12.75 % of the farmers are using furrow and border irrigation systems, respectively. The result revealed that most of the farmers in the study area used basin irrigation system, this is due to the fact that basin irrigation is the suitable system for most crops they plant in the area as explained by the farmers.

This result shows very low or no water saving irrigation methods (micro irrigation practices) in all the irrigation schemes around the State. However, there is a need to

educate the farmers on water saving techniques to save water and to convert the effect of climate change.

Table 3. Method of irrigation system adopt

Method	Frequency	Percentage (%)
Basin	283	55.49
Furrow	162	31.76
Border	65	12.75
Total	510	100

The table 4 presents the local water conservation measures practiced by the farmers in the study area. It was discovered that 62.94 % are not practicing any of the local water conservation measures. Whereas 27.84% and 9.22% of the farmers re respectively applied manure and rice straw in their field as the means of conserving moisture in the soil. It is evident that most of the farmers do not have the idea in conserving the irrigation water in their fields,

this might be because only 25.49% of the respondents complained about the scarcity of water as is affecting their production while 74.51% are not facing water scarcity throughout the season as presented in the figure 2. The result shows that majority of the farmers in the study area had sufficient amount of water that is the reason why their crops are not affected by water scarcity.

Table 4. Adopted method for water conservation.

Water conservation	Frequency	Percentage (%)
No conservation	321	62.94
Manure spreading	142	27.84
Rice straw	47	9.22
Total	510	100

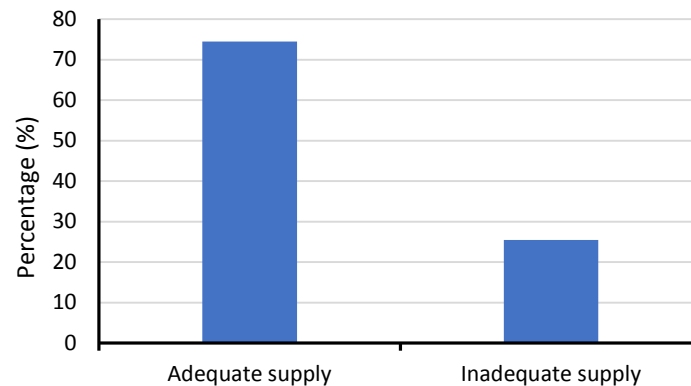


Fig 2. Farmer's response regarding the water supply

Figure 3 shows the results of the farmers' level of education. It can be observed that majority of the farmers had no western education, which made it difficult or almost impossible for them to manage the water their used. Good education propels heads of farmers to adopt innovation and technologies that are vital for enhancing irrigation farming. The level of education affects the type of decision farmers take in irrigation farming and determines the level of opportunities available to improve livelihood strategies and

managerial capacity in irrigation which can make it difficult or almost impossible for them to manage the water the efficiently. The findings agreed with the study by [8], that level of education can enhance productivity in agriculture. Also, education can boost farmers' confidence to adopt an improved irrigation technology thereby saving water.

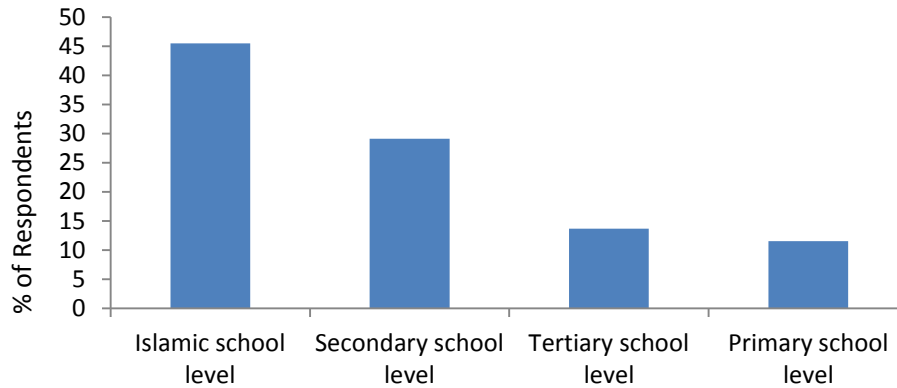


Fig 3. Respondent's level of education

4. Conclusion

Survey on the farmers' awareness and practices of irrigation water conservation techniques was conducted in the three senatorial zones of Kano State. Based on the results obtained, water conservation techniques were found to be poorly practiced in the study area because majority of the farmers lacks awareness on water management

strategies. It was discovered that the surface water application is method adopted by the majority of the farmers which lead to the imprudent water application. Therefore, there is need to create an awareness to the farmers in the study area with regard to water conservation and management strategies in order to effectively and efficiently utilize the water resource.

Conflict of Interest

We the authors of this paper declare that there is no conflict of interest.

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