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Impact assessment of Komadugu-Yobe Basin Wetlands Development Initiative Project on farmers livelihood in Jigawa State, Nigeria

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Abstract. *Umar B, Akpoko JG, Musa MW. 2019. Impact assessment of Komadugu-Yobe Basin Wetlands Development Initiative Project on farmers livelihood in Jigawa State, Nigeria. Bonorowo Wetlands 9: 1-8.* This study assessed the impact of the Komadugu-Yobe Wetlands Development Initiative project on income, agricultural production, and the standard of living of the people. Primary data were obtained by the use of a structured questionnaire that was administered to 456 respondents comprising the project participants and non-participants. Descriptive statistics, logistic regression, and the Chow test analyzed the data collected. The findings on the socio-economic variables revealed that the mean age of the participants was 36 years and participants were younger in terms of age distribution; the participants were relatively more educated than the nonparticipants, the participants were also organized into viable associations under the project, and the average years of farming experience of participants was 15 years while the nonparticipants had about 14 years. It was also found that the majority (85.5) of the participants have not benefitted from credit facilities. The logistic regression analysis shows that the socio-economic characteristics such as age (0.022**), level of education (0.000*), farm size (0.018*), Household size (0.224*), membership of cooperatives (0.022*), and access to credit (0.023**) were the essential variables that predicted farmer participation in the project. The results of the Chow test show that the F-calculated values on income, crop output, and living standards were higher than the F-tabulated values. It has been concluded that the Komadugu-Yobe Basin Wetlands Development Initiative project positively impacted the project participants. It is recommended that the project should register more participants as the activities of the project had impacted positively on the lives of the participants, to provide more employment opportunities for the youth in the area. Access to loans happened to be a factor that militates against enhancing crop production in the study area. It is recommended that farmers in the study area be linked with financial institutions or government agencies by the project to access loans to boost crop production in the area. The Government should revive extension activities which play a significant role in extending information to farmers as the ratio of an extension agent is very low; when extension problems are solved, crop production in the area would be enhanced.

Keywords: Basin wetland, farmers livelihood, Komadugu-Yobe

INTRODUCTION

There has been a growing realization of wetlands' ecological, socio-economic, climatological, and even strategic importance during the past two decades (Maltby 1996). Consequently, the imperative to conserve and utilize wetlands sustainably has also increased, particularly in developing countries whose economies depend heavily on the wise use of resources such as those provided by wetlands (Aminu-Kano et al. 1993; Organization for Economic Cooperation and Development,1995). Despite the dramatic increase in the appreciation of their values in Nigeria, wetlands remain one of the most threatened and critical ecosystems (Moses 1990).

Wetlands are areas where the soil is covered by water, or water is present either on or near the soil surface all year or for a different period during the year, including during the growing season. Wetlands are also economic drivers because of their crucial role in fishing, agriculture, hunting, and recreation. The areas include swamps, marshes, and bogs. Characteristics of wetlands can vary widely because of differences in soils, topography, water chemistry, climate hydrology, vegetation, and other factors.

Komadugu-Yobe Basin Wetlands Development initiative project is a donor-funded project introduced in 2007 for empowering the inhabitant of the wetlands to harness their well-being. The project activities range from clearance of typha grass using a mechanical and manual approach, skill acquisition on pomade, dye, beads for women, Farmer-Pastoralists Conflict resolution, and dyking the river banks to improve the lives of the inhabitants (KYB-WDI 2007). The wetland creates a strategic ecosystem in the Sudan-Sahelian zone due to the annual inundation of the flood plains of the rivers and those of their several non-contributing channels (Roggeri 2001).

The Hadejia-Ngruru wetlands are an area of flood plain that extends in the north-eastern Sudan-Sahelian zone of Nigeria. The wetlands thereby support the livelihood systems of approximately 1.5 million people in this otherwise sparsely populated region. This support is performed through various functions of the wetlands and the exploitable natural resources that the ecosystem provides (Oguntala 1996). The wetlands constitute a natural barrier to the southward advancement of the process of desertification, which is a significant threat in the region, and flooding of the wetland contribute to recharging of the

groundwater that supplies the wells and boreholes in and around the wetlands without which the supported communities would have to disperse (Dugau 1995). The groundwater also supports the unique ecosystem of the area. The wetlands facilitate nutrient recovery in Fadama farms, which support higher agricultural productivity in the region and improve micro-climatic conditions in and around the area. Floodwaters of the wetlands provide natural irrigation for rice and ground moisture for recession agriculture, which are significant elements of the region's economy.

Fodder is provided for over 250,000 herds of cattle during critical periods. These cattle support a trade that has an annual turnover of N416 million in the livestock market dotted in and around the wetlands and keep a yearly catch of over 6,000 metric tons of fish with a market value of N45.4 million and which are exported to national markets like Onitsha and Lagos (Thomas et al. 1993). The wetlands provide plant resources harvested as fuel, timber, fiber, and medicines (Thomas et al. 1993).

Over 3 millionaires have generated annually from doum palm fronds which find their way to national markets as well as support a large variety and several birds and other animals that are illegally and in an unregulated manner for sale and subsistence and facilitate the production of large quantities of honey, which are collected from both improved and natural beehives. The aesthetic atmosphere of the wetlands encourages eco-tourism, which has placed the area on the map of the tourism world (Aminu-Kano et al. 1993).

The specific objectives are to describe the socio-economic characteristics of the participants in the project, assess the impact of the Komadugu-Yobe Basin wetlands development initiative on farmers in the study area, examine the socio-economic factors influencing farmer's participation in the Komadugu-Yobe Basin wetlands development initiative project, and identify the constraints to farmer's involvement in the project in the Study area.

MATERIALS AND METHODS

Study Area

Jigawa State lies between latitude 11.00^{oE} to 13.00^{o} North of the equator and longitude 8.00^{oE} to 10.15′ East the Green, which is meridian and covers a land area of 22,410 square kilometers, as shown in figure 1. It was created from Kano State on 27th August 1991. The land surface is generally undulating, giving way to Jigawa|, a Hausa word referring to vast loamy and non-marshy soil favorable for cultivating crops like groundnut, guinea corn, millet cassava, rice, wheat (Central Information Authority 2006).

The State is bordered in the south by Bauchi State, in the west by Kano State, in the east by Yobe State, and in the north by Yobe and Republic of Niger. Most of the State (Jigawa) lies within the Sudan vegetation zone. Jigawa has an arduous climate with considerable fluctuation in temperature and humidity. Humidity at times rises to 100%, with the average daily maximum and minimum temperatures being 33.10^{o}C and 15.0^{o}C, respectively (CIA 2006).

The harmattan is at its highest during December and January, blowing thin dust over the State from the Sahara Dessert (CIA 2006). The temperature can fall to as low as 10oC at this period, with average rainfall ranging from 653.00-889.00 millimeters. The year is divided into a well-marked rainy season between June and September and a dry season from October to May.

In 2006, the Population of Jigawa State was 2,829,929, and the projected population of the State in 2015 will be 4,348,649 going by the population growth rate of 3.25 %. The predominant occupation in the state is farming. It is one of the priorities of the government of Jigawa to boost this sector by increasing the production of food and cash crops to cope with the rapid population growth. The government intervenes to use the Hadejia Jama'are River Valley that runs through the state to provide irrigation facilities for optimum food production and the establishment of agro-allied industries (CIA 2006).

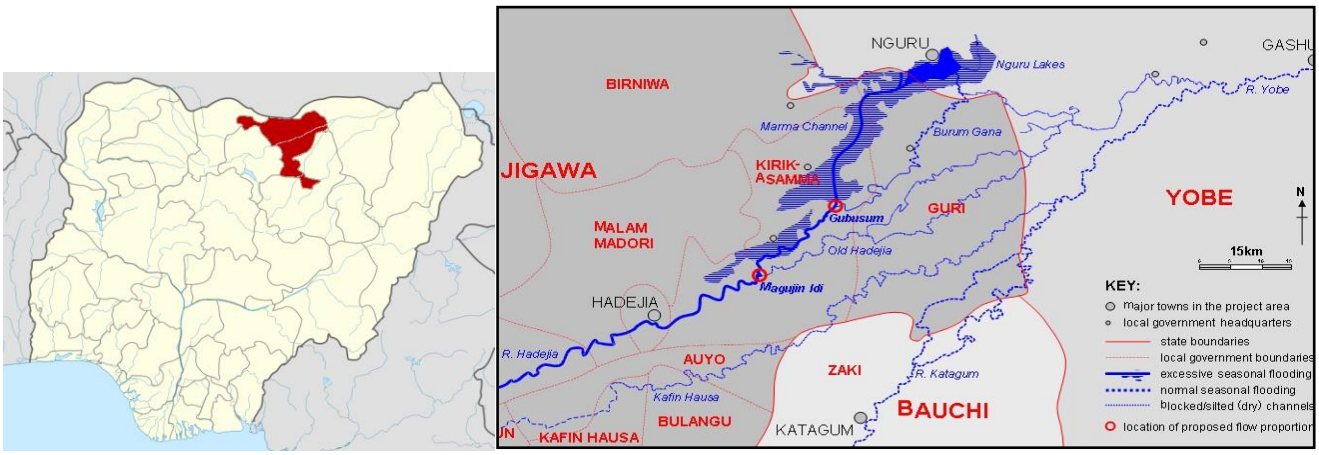

Figure 1. Map of the HN Wetlands showing LGAs covered by the project, Nigeria

Table 1. Showing sampling procedure and sample size and of the respondents

Village	Population	Participants	Non-participants	Sampling rate%
Marma	850	43	43	10
Likori	600	30	30	10
Guri	750	37.5	37	10
Dawa	700	35	35	10
Matara Uku	800	40	40	10
Dagilfanni	890	44.5	44	10
Total		230	229	

Sampling technique and sample size

The study employed a multi-stage sampling procedure. In the first stage, three out of eight Local Governments Areas (LGAs) in the Hadejia Zone were selected. These were Kirikasamma with a population of 191,523, Birniwa with 193,334 (wetland areas), and Guri with 115,018. The criteria for the selection were based on the fact that the three LGAs were the wetland areas of the Komadugu-Yobe wetlands Development Project (KYB-WDI) in Jigawa State. In the second stage, two villages known for intensive activities were selected from each of the three LGAs.

Hence, six villages were chosen for the study: Marma, Likori from Kirikasamma LGA; Matara uku, Guri, Dawa from Guri LGA, and Dagilfanni from Birniwa LGA. A pilot survey of the area identified 459 participants and non-participants. Marma and Likori had a population of 850 and 600, Matara Uku and Dagilfanni 800 and 890, and Guri and Dawa 750 and 700 (Federal Office of Statistics 2014). From these figures, 10% of the population was used as the matched samples of participants and nonparticipants, as shown in Table 1.

Data collection

The study used primary and secondary data obtained through a structured questionnaire administered to the Komadugu-Yobe Basin wetlands Development Project participants and nonparticipants. During the survey, the questionnaire was given by interviews with the respondents by using enumerators in the local language (Hausa).

Data analysis

Descriptive statistics, including averages, percentages, standard deviation, and frequency counts, were used to summarize, classify, and tabulate data on farmers' characteristics and other variables in the study. Descriptive statistics were used to achieve objectives i, and iv, and the Chow test was employed to achieve specific objectives ii. Logistic regression was employed to achieve objective iii.

Chow test

Statistical and econometric analysis of whether the coefficients in two linear regressions on different data sets are equal? It is also often used to determine whether the independent variables have other impacts on various population subgroups.

$$\text{F-Chow} = \frac{(Sc - S_1 + S_2 / k)}{(S_1 + S_2)/ (N_1 + N_2 - 2k)}$$

Where:

Sc: Sum of squared residuals from the combined data

S_1: Sum of squared residuals from the first group (participants)

S_2: Sum of squared residuals from the second group (nonparticipants)

N_1: Number of observations for participants

N_2: Number of observations for nonparticipants

K: Total number of parameters

Measurement of variables for the chow test for objective II

In this study, the impact was measured by the participants' income and living level changes.

Income. This is the amount of money in naira generated by the farmers from the sales of their produce. (i)

Level of living. For this study, livelihood means the standard of living of the participating farmers and that of the nonparticipants. This was measured by the number of goods owned by a household such as motor cars, motorcycles, bicycles, houses, radio, TV, cushion chairs, refrigerator, handset, the amount spent on health care per year, the amount spent on administration of children per year, total expenditure on food and clothing per year. (ii)

The logistic regression models for objective III

The logistic regression model was employed to achieve objective iii. The logistic regression model is one of the binary choice regression models. A dichotomous regression variable is considered the dependent variable, and this dichotomous variable is related to a set of independent variables that are hypothesized to influence the outcome. Hence the model allows one to predict a result from a set of paired variables. In this study, the outcome variable, i.e., participation is binary (i.e., participants and non-participants), were assigned 1 for participants of the project and 0 for nonparticipants. The model included all predictor variables useful in predicting the response variable to accomplish the goal. Several different options were available during the model creation. However, Menard (1995) recommended that backward stepwise regression appeared to be the preferred method for survey and exploratory analyses and was used to analyze the data generated for objective III. The analyses began with a full or saturated model, and variables were eliminated from the model in an interactive process. After eliminating each variable, the model's fit was tested to ensure that the model still adequately fit the data. One of the primary uses of logistic regression in the study provided knowledge of the relationship and strengths of influence among the variables, i.e., the impact of the socio-economic characteristics and institutional factors on farmer participation.

The logit model, characterizing the influence of the socio-economic and institutional factors is specified as follows:

$$(Y_i = 1/X_j, j = 1\ldots10) = F(Z_i) = \frac{1}{I + e^{-zi}} = \frac{ez_i}{ez_i + 1}; \; i = 1\text{-}180) \quad \ldots (1)$$

Where:

$$Z_{i=} \alpha + \beta_1 x_{j1} + \beta_2 x_{j2} + \text{----------} + \beta_9 x_{j9} \quad \ldots\ldots\ldots\ldots (2)$$

L F : (.) = cumulative logistic distribution

To obtain the value of Z, the likelihood of observing the sample needs to be formed by introducing a dichotomous response variable such that:

$$Y_i = \begin{cases} 1 \text{ if ith is a participant} \\ 0 \text{ if } i^{th} \text{ is a non-participant} \end{cases}$$

x_{ij}: 1-9 were the socio-economic and institutional factors of the ith farmers defined as:

X_1 : Age (years)
X_2 : Educational level (years)
X_3 : Farm size (ha)
X_4 : Family sizes
X_5 : Sex (male=1, female=2)
X_6 : Years of farming experience (years)
X_7 : Extension contacts (Number of visits)
X_8 : Membership of cooperatives/associations (years)
X_9 : Access to credit facilities (Amount)
X_1-X_9 : the coefficient to be explained

Independent variables

Age. This is the number of years an individual has spent from birth to study time.

Educational level. This refers to the capacity of an individual to acquire western education knowledge and be able to read and write. Education level was measured by determining the actual number of years spent in school and was scored as follows: Adult education 1, Primary education 2, Secondary education 3, and Tertiary education 4.

Farm size. This refers to the total land area under cultivation measured by the farmer's total number of hectares cultivated.

Household size. This is the total number of people in one household. It is expected to affect the livelihood of participants.

Sex. The biological characteristics for identifying an individual as either a male or female, measured by scoring male 1, female 2.

Farming experience. This refers to the actual number of years put in farming activities. It is expected that farmers would gain more experience as they spend more years in farming activities.

Extension contacts. This is a meeting the respondent has had with extension officials. The role of extension is to create awareness among farmers, enlightenment, and demonstration of innovations and to compare the benefits of the innovations. It was measured by the number of visits or contacts with extension workers of the Komadugu-Yobe Basin Wetlands Development project and scored as follows if visited by an extension agent 1 and 0 if otherwise.

Membership of cooperatives/associations. This represents the membership of farmers in any association. Membership in social organizations facilitates awareness, economic empowerment, and participation in the KYB-WDI activities. It was measured by the number of years the farmer belongs to the associations organized by the KYB-WDI project at the time of the study, 1 was scored if a farmer belongs to any association and 0 if otherwise.

Access to credit facilities. This represents a farmers' access to a loan received either in cash or in kind. Access to credit has excellent potential to influence farmers' interest in innovations. It is, therefore, expected that the more farmers have access to credit, the higher the probability of their participation in the project's activities. It was measured by the total money borrowed from financial institutions, credit availability 1, and non-availability 0.

Dependent variable

Participation is the number of project activities a particular farmer involves. The project's activities were a mechanical and manual clearance of typha grass, Dyking of the river banks, farmer-pastoralist conflict resolution, Skill acquisition on pomade making, beads making.

RESULTS AND DISCUSSION

Socioeconomic characteristics of the respondents

The socio-economic characteristics of the respondents examined by the study were age, level of education, farm size, farming experience, sex, household size, extension contact, membership of cooperatives societies, and access to credit.

Age distribution

The age distribution of the respondents was between 20-51 years. The result in Table 2 shows that 1.7% of the participants fall within the range of 20-30 years, 10% fall within the range of 31-40 years, 77.4% fall within the range of 41-50 years, and 10.9% fall within the range of 51-. The age distribution implies that age played a significant role in crop production and is expected to positively influence their participation in the project program in the study area.

Level of education

As many as 21.3% of the participants acquired adult education, 31.7% acquired primary education, 41.7% acquired secondary education, and 5.2% acquired tertiary education. On the other hand, for statistics, the non-participants, 52.4% acquired adult education, 27.1% acquired primary education, 20.5% acquired secondary education, and no one among the non-participants received tertiary education. The result indicated that the level of education of both participants and nonparticipants was low. This could be attributed to adult education being emphasized in the study area. It indicates that the

respondents lacked the formal education required to comprehend complex new technologies.

The study by Centro Internationale de majoramanto de maize Y Trigo (CIMMYT),i.e., international maize and wheat improvement center (1995), had confirmed that education was important for easy understanding of improved methods of agricultural production and make farmers more receptive to advice from extension agency or be able to deal with technical recommendations that require a certain level of numeracy and literacy.

Farm Size

Because farmland is an important resource for improving the living conditions of farmers and fighting against poverty, farm sizes were examined in the study area. Most of the participants (73.9%) possessed farms of less than 2 hectares (Ha), 20.9% possessed 2-4 hectares (Ha) land, and 5.2% of the participants had above 4 hectares (Ha) of land (Table 2). In contrast, 83.0% of the nonparticipants possessed less than 2 hectares (Ha), 10.5% of the nonparticipants had 2-4 hectares (Ha) of land, while 6.6% of the nonparticipants had above 4 hectares of land. The result showed that both participants and nonparticipants owned smallholdings, in line with the Federal Office of Statistics (1999) findings that farm size affects adoption cost, risk perception, labor requirement, human capital, and tenure arrangement.

Household size

Table 2 shows that the area was dominated by small households, whereby 37.8% of the participants had 1-3 persons, 59.1% had 4-6 persons, and 3.0% of the participants also had 7-9 persons. Hence, there would be more people to cater for, which means more pressure on their income hence their participation in the KYB-WDI project. This result is tallied with the International Fund for Agricultural Development (IFAD 2001) findings.

Sex

All the project participants were male, which signifies that culture played a significant role in the area as women were not allowed to farm by themselves. Moreover, women were not allowed to be interviewed by enumerators. It is believed that when women were allowed to cultivate, there would be no successor bumper harvest in crop production.

Farming experience

Table 2 demonstrated that the participants (66.67%) and nonparticipants (20.83%) have been in farming for less than ten years; 20.6% of the participants had farming experience between 11-25, while 12.50% had the experience of between 11-25 years. Also, those who had farming experience of more than 25 years comprised 12.73% of the participants and 66.67% of the nonparticipants. The years of experience are expected to translate into a better understanding of the program, invariably resulting in better income. It is expected that respondents would make sound decisions regarding resource allocation and management of their farms.

Table 2. Socioeconomic distribution of participants and Nonparticipants

Variables	Participants frequency	Percent-age	Non participants frequency	Percent-age
Age				
20-30	4	1.7	Nil	Nil
31-40	23	10.0	104	45.4
41-50	178	77.4	101	44.1
51-60	25	10.9	24	10.5
Education				
Adult	49	21.3	120	52.4
Primary	73	31.7	62	27.1
Secondary	96	41.7	47	20.5
Tertiary	12	5.2	Nil	Nil
Farm size (ha)				
Less than 2	170	73.9	190	83.0
2-4	48	20.9	24	10.5
Above 4	12	5.2	15	6.6
Household size				
1-3	87	37.8	46	20.1
4-6	136	59.1	142	62.0
7-9	7	3.1	23	10.0
10-12	Nil	Nil	15	6.6
13-15	Nil	Nil	3	1.3
Sex				
Male	230	100	229	100
Female	Nil	Nil	Nil	Nil
Farming experience (years)				
Less than 10	80	66.67	25	20.83
11-25	115	20.6	40	12.50
Greater than 25	35	12.73	164	66.67
Extension contacts				
No	97	42.2	197	86.0
Yes	133	57.8	32	14.0
Membership of cooperatives				
No	8	3.5	47	20.5
Yes	222	96.5	182	79.5
Access to credit				
No	214	85.5	16	14.17
Yes	16	14.5	213	85.83
Total	230	100	229	100

Extension contacts

Respondents who had extension contact fell in the range of 57% from the participants, while 42.2% of the participants had no extension contact (Table 2). The result indicates that more than half of the project participants had extension contact. This shows a need for more visits by the extension workers to the project participants to enhance crop production in the area.

Membership of cooperatives

Cooperative groups are organized to promote special interests or meet certain needs that individual efforts cannot achieve. They contribute to disseminating new ideas, practices, and products and sourcing for loan and farm inputs. Table 2 revealed that 3.5% of the participants did not belong to any organization, while 96.5% belonged to a cooperative society. This indicates that the more farmers participated in cooperative societies, the better the idea, knowledge, and benefit derived from, among others.

Access to credit

Table 2 showed that 85.5% of the participants did not have credit facilities, while only 14.5% enjoyed credit facilities. This phenomenon indicates that the project's impact on participants would have been more when the participants were able to access loans from a lending institution as a loan plays an important role in enhancing crop production.

The participants had more farming experience with a mean value of about 15 years, while nonparticipants had about 14 years (Table 4). Therefore, with more experience in farming, they are less likely to oppose the adoption of new technologies. Farmers' knowledge could also generate more confidence. Thus, the farming experience could positively affect farmers' decisions.

The mean extension visit to the participants by an extension agent was 2.42. This indicated that the necessary agricultural information flowed through the extension agents to the contact participants, while the nonparticipants derived agricultural information from fellow farmers.

The result of membership of cooperatives societies showed that participants belonged to social organizations registered under the project. Thus, the farmers under the project were adequately organized for easy access to credit facilities, indicating that the more farmers participated in cooperative societies, the better the idea, knowledge, and benefits among members. The results on access to credit facilities indicate that project participants have not benefitted from credit facilities (Table 4).

Impact of KYB-WDI Project

The second objective of the study was to assess the impact of the KYB-WDI project on crop output, income, and the farmers' standard of living.

Analysis of the impact of KYB-WDI project on crop output, income, and standard of living

The Chow test model was used to compare outcomes of the response variables between participants and nonparticipants to determine the projects' impact on crop output, income, and people's standard of living. The entries table 4 shows that the F-calculated on output (2418.23) was greater than the F-critical value (4.12); F-calculated on income was 5608.46 and was greater than the critical F-value (4.12); and the F-calculated on the standard of living (62965.91) was also greater than the critical F-value (4.12), all at 5% level of probability. This indicates that the value of the F-calculated for income, crop output, and standard of living was greater than the F-tabulated. This implied that the KYB-WDI had a positive impact on crop output, income, etc., and the beneficiaries' standard of living.

The findings supported the development and social impact assessment perspective, which stated that whenever project beneficiaries are adequately motivated through the provision of functional extension delivery services, the tendency for increased crop productivity, income, and standard of living of the people is assured (Sanginga 1999).

Table 3. Distribution of respondents by socioeconomic factors

Variable	Respondent type	Number	Mean	SD
Age (years)	Participants	230	46.44	6.087
	Nonparticipants	229	52.21	5.462
Education level	Participants	230	38.52	9.220
	Nonparticipants	229	18.16	9.220
Farm size	Participants	230	3.49	1.710
	Nonparticipants	229	2.11	0.990
Farming experience	Participants	230	15.0	6.330
	Nonparticipants	229	14.0	7.940
Household size	Participants	230	5.86	2.284
	Nonparticipants	229	8.02	4.487

Table 4. distribution of respondents by institutional factors

Variable	Respondent type	Number	Mean	SD
Extension contacts	Participants	230	2.42	1.533
	Nonparticipants	229	0.41	0.831
Membership of coop	Participants	230	1.34	0.476
	Nonparticipants	229	1.08	0.276
Access to credit	Participants	230	0.19	0.391
	Nonparticipants	229	0.14	0.351

Table 5. Results of the chow test on crop output, income, and standard of living

Group	Variable	Residual	N_1+N_2	K	F-cal	F-table
Pool	Standard of Living	2017.52	55	16	62965.91	4.12
Participants	Standard of Living	556.96				
Non-participants	Standard of living	1126.49				
Pooled	Income	178.29	559	16	5608.46	4.12
Participants	Income	4.46				
Non-participants	Income	123.71				
Pooled	Crop output	77.41	559	16	2418.23	4.12
Participants	Crop output	9.14				
Nonparticipants	Crop output	54.77				

Test of hypothesis using Chow test

The result of the Chow test indicates that there was a significant impact on crop output, income, and standard of living of the participants as the values of the F-calculated were greater than the F-tabulated values. Therefore, the null hypothesis was rejected.

Socio-economic factors influencing farmers' participation

The third objective of the study was to determine the socio-economic factors influencing participation in the project. Table 4.6 shows the result of the logistic regression analysis of factors influencing participation. The results of the analysis indicated that the variables, age (0.050), level of education (1.666), membership of Cooperatives (1.916),

and access to credit (1.519) were found to be significant at 1% \] level. Farm size (0.315), Household size (-0.053) were found effective at a 5% level. However, farming experience (-0.012) and extension contact (0.346) were insignificant. This study is in line with those reported by Okwole (1998), Maskey and Weber (1996), and Edi et al. (2007), who noted that age, social participation, access to credit, farm size, and level of education influence participation. This is contrary to the findings of Oni (1991) and Nicholas (2002) on household size, formal education, and farming experience.

This is evident from the study that the participants had acquired more than the nonparticipants, implying that farmers with more education become less opposed to adopting innovations. Similarly, participants were organized into social groups by the project. They indicate that the more farmers participate in cooperative societies, the better the idea, knowledge, and benefits among members. On the other hand, farming experience, household size, and extension contact were inversely related to participation since the values of the coefficients were negative.

Based on these findings in table 4, age, level of education, farm size, membership of cooperatives, years of membership, and access to credit were the most important variables that predicted farmers' participation; they also had a strong influence on participation in the KYB-WDI project. Therefore, greater participation in the project activities may be assured when farmers are properly organized. Similarly, if they are motivated through access to credit facilities, education, membership of the association by KYB-WDI, it would likely increase crop output and higher participation in the project.

Overall, the study has justified diffusion and adoption theory which provides valuable insights on the factors studied and how these factors influence the participation of farmers in the project activities and innovations introduced by the KYB-WDI project. The theory's proponents stated that program interventions are bound to be influenced by certain socio-economic and institutional factors that must be identified.

Constraints encountered by farmers in the KYB-WDI Project Area.

The fourth objective of the study was to identify the constraints encountered in the KYB-WDI project area. Despite the contributions of the project to improve rural livelihoods, income, and crop output, it was found that the project participants' faced some challenges; the major constraints faced by respondents were ranked in the following order by the respondents: low capital outlay; low prices of farm produce; disease and weed infestation; water shortage; and lack of transportation (Table 7) these are discussed in details as follows:

Low capital outlay

A shortage of capital-constrained farmers. About 21.3% of the participants complained of a lack of capital to invest in large-scale farming or adopt farm technologies requiring huge capital investments. Lim and Douglas (1998) emphasized that; poverty in rural areas is still a significant barrier for small-scale farmers. Therefore, if poverty alleviation measures were not adequately implemented in the area, farmer participation could be affected. If participants in the KYB-WDI project could access loans from financial institutions, then the tendency for improved production may be assured.

Low prices of farm produce

Since farmers had no stand market to sell their produce, which gave rise to an influx of market middlemen in the project area, 31.7% of the respondents complained of low market prices for their farm produce. The implication was that farmers are at the expense of these middlemen who take advantage of the situation to get a higher income than the farmers.

Table 6. Logit regression estimate of socio-economic characteristics of the farmers and institutional factors influencing participation

Variables	Coef-ficient	SE	Z	Level of Sign
Constant	-4.490	3.1941	-1.41	0.160
Age	0.050	0.0220	2.28	0.022**
Level of education	1.666	0.3364	4.95	0.000*
Farm size	0.315	0.1336	2.36	0.018*
Farm experience	-0.012	0.0412	-0.30	0.767
Household size	-0.053	0.0437	-1.22	0.224*
Extension contacts	-0.347	0.2293	-1.52	0.130
Membership of Association	-1.325	0.5803	-2.28	0.022*
Years of membership	0.872	0.2307	3.78	0.000**
Access to credit	1.519	0.6680	2.27	0.023**
Access to credit				
Sample size	459			
Log likely hood function	-67.656164			
Ch-squared value	-146.6			
Degrees of freedom	-15			
Prob > chi	20.0000			
Pseudo R^2	0.520			

Note: P <0.01, ** P<0.05

Table 7. Constraints of farmers in the KYB-WDI project

Constraints	Frequency	Percentage
Low Capital outlay	49	21.3
Low prices of farm produce	73	31.7
Disease and weed infestation	96	41.7
Water shortage	12	5.2

Summary

This study was conducted to assess the impact of the Komadugu-Yobe Basin Wetlands Development Initiative (KYB-WDI) project on farmers in Jigawa state. Primary data were obtained using a structured questionnaire administered to participants and nonparticipants of the project. The results are summarized below:

The study showed that the respondents were between the minimum age of 20 years and a maximum of 51 years, with an average of 35. Still, the participants were younger than the nonparticipants, and participants might have a stronger interest in the project activities than the older ones.

It was found that the respondents had a low level of formal education, but the participants were relatively more educated than the nonparticipants. The farm holdings of the respondents were small, with an average of fewer than 2 hectares per farmer. It was found that the average years of farming experience of participants was 15 years while the non-participants had about 14 years. It was also found that the mean household of the respondents was nine persons per household head. The participants had extension contacts. The participants were also organized into a platform of viable associations under the project. At the same time, the nonparticipants were left to manage their social groups, and also revealed that both the participants and nonparticipants had rarely benefitted from the credit facilities; this means that the participants could have more opportunities to enjoy credit facilities from the Government and commercial banks if there was a concerted effort by the state Government and agricultural extension service delivery system.

The result of the logistic regression estimates indicated that Household size (-0.053), farming experience (-0.012), and extension contact (-0.347) negatively influenced participation. Age (0.050), education (1.666), membership of cooperatives (1.916), access to credit (1.519), farm size (0.315) positively influence participation. A unit increase in these variables could lead to increased participation in the project by their corresponding exponentials (probabilities).

The result of Chow test showed that crop output (2,418.23), income (5,608.46), the standard of living (62,965.91) was at a 5% level of probability since the calculated values are higher than the table values, the hypothesis tested in the study was rejected.

Despite the significant impact of the KYB-WDI project, faced with certain constraints that could limit their performance, these constraints were ranked according to the participants' responses. The majority, 41.7 of the respondents, reported disease and weed infestation, 31.7 of them indicated low prices of farm produce, 21.3 low capitals outlay, and 5.2 water shortages.

It could be concluded that the KYB-WDI project had a positive impact on participants as the calculated F-values for income, crop output, and standard of living of the participants were greater than the F-tabulated values. Hence the null hypothesis that the KYB-WDI project has no positive impact on participants was rejected.

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