DETERMINANTS OF FARMERS' ADOPTION OF IFAD CASP PROGRAM ADAPTATION STRATEGIES IN JIGAWA STATE, NIGERIA

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ABSTRACT
The study analysed the determinants of farmers' adoption to climate change adaptation strategies under the International Fund for Agricultural Development in Jigawa state. Multistage sampling procedure was used to select 321 farmers participating in IFAD-CASP programme as respondents. Data were collected with the use of a well-structured questionnaire. Data collected were analysed using descriptive statistics and inferential statistics. The result of the study showed that mean age was 35 years. About (60.00%) were married, with a household size mean of 7 persons some (58.30%) of the farmers had no formal education. The respondents had a mean of 12 years of farming experience. Majority (100%) of the respondents had contact with IFAD-CASP extension officer, and also (86.44%) got information on climate change from IFAD- CASP extension officer. The result also shows that out of the eight adaptation strategies four of them has higher adaptation, construction of animal drinking point, community nursery establishment, yearly seasonal rainfall prediction and soil and water conservation technology, with a mean score of 2.04, 2.13, 2.72 and 2.5 respectively. Result from the inferential statistics show that six of the predictive variables: age of the respondents, years of farming experience, number of visit by IFAD-CASP extension officer, farmers' perception of IFAD-CASP strategies, membership of cooperatives, access to credit were all positively significant at 5% to influence adapting of IFAD-CASP strategies. It was recommended that promotion of a given adaptation strategies should consider the agro-ecological setting of the area, to expand adult education so that improve education level of farmers., promoting farmer access to credit is vital to secure immediate need of money for the very purpose of purchasing farm inputs and meet the costs associated with using various adaptation strategies.

Keywords: Climate Change, Strategies, Perception, Adaptation.

INTRODUCTION

The effect of climate change in agriculture can be factored on substantial losses, particularly for smallholder farmers whose main source of livelihood is derived from agriculture. There is worldwide consent that climate change is a threat to sustainable development and the effect is being experienced with increasing intensity. Many people are at risk of hunger due to climate change. For example, the United Nation Development Programme (UNDP) observed that when the global temperature increases by an additional 3^0C - 4^0C, the run-off patterns change as well as glacial melt which could cause 1.8 billion people to suffer from water-scarcity by 2080. According to Nzuma,. Waithaka, Mulwa, Kyotalimye, and Nelson, (2010), climate change is expected to have a significant impact on the livelihoods and living conditions of the poor and thus threaten the attainment of the Millennium Development Goals (MDGs) and sustainable development in Sub-Saharan Africa. There are a range of macro-issues that are linked to the effects of

climate change. It is opined that Africa is more vulnerable to climate change given that one third of the poor in the African region are most severely affected by increasing food prices. A study by the Intergovernmental Panel on Climate Change (IPCC, 2007) shows that climate is changing at an accelerated rate and such a change is inevitable. As such, mitigation and adaptation actions are required to reduce any harm as a result of climate change and exploit opportunities to reduce greenhouse gas (GHG) emissions and other factors that may lead to sustained change in the climate.

International Fund for Agricultural Development (IFAD) has worked to help poor people in rural areas that depend on marginal or unfavourable agricultural ecological conditions to effectively manage their natural resources in a more sustainable manner. IFAD aimed to help farmers increase productivity by reducing their vulnerability to as a result of climatic shock. The work was conducted under conditions of change resulting from population densities, deteriorating natural resources, increasing uncertain and unpredictable climate related conditions (IFAD, 2008). In recent years, climate change has become an area of priority for IFAD. The challenge of this kind is that of finding ways to build an in-house capacity on climate change within its operations in order to enhance the effectiveness of the activities it supports and strengthen the adaptive capacity of poor rural communities. Climate change adaptation and agribusiness support programme in the savannah belt (CASP) was approved by the management of IFAD in 2013, (Mbavai, 2013).

Climate Change Adaptation and Agribusiness Support Programmed (CASP) in the savannah belt is being implemented in the savannah belt of Nigeria. CASP is based on the lessons learnt from the complete Community Based Agriculture and Rural Development Programme (CBARDP) and is consistent with the federal government's green alternative policy. The aim of CASP has been to promote agricultural productivity enhancement and integrated climate change resistance adaptation. There is also a private sector orientation component that specialize in the provision of extension services that are built on Community Development Association (CDA) model. The objectives of CASPS are to: pull about 242,000 people out of poverty base on the metric of a daily income of 2.5 US dollar per capital, generate a 30 percent increase in income for targeted households and an increase by 40% the number of farmers with reduce erosion in their cropping system (Mbavai, 2013).

Jigawa State is located in the semi-arid zone of northern Nigeria. The zone is a major source of grains and animal protein. It has a fragile ecology and this makes it highly vulnerable to climatic change. The visible effects of climate change in the state are flood, erosion and drought. The knowledge about these changes is particularly important in that the growth and yield of crops is directly related to the amount of moisture, which in turn is derived from rainfall. Climate change affects the agro-pastoral system, given that animals have to trek long distances in search of grass. Movement by these animals contribute to spread of disease-causing organisms and conflict on available resources. There is therefore the need to establish adaptation methods to attenuate the effect of climate change on agriculture. The broad objective of the study is to analyse farmers' perception of climate change and adaptation strategies with emphasis on IFAD-CASP in Jigawa State.

Study Area

The study was conducted in Jigawa State. The state is located in the north-western geopolitical zone of Nigeria. It lies latitudes 12.228°N and longitude 9.516°E. The state is bordered by Kano and Katsina States to the West, Bauchi State to the east and Yobe State to the northeast. Jigawa State shares an international border with the Republic of Niger, providing unique opportunity for international trade. The State has a total land area of approximately 22,410 square kilometres and a population of

5,590,272 World meter projection 2020. The State also lies within three vegetation zones, the Guinea, Sudan and Sahel Savannah. The climate of Jigawa state represents a typical sub-tropical condition characterised by a hot wet summer and a cool dry winter with an average rainy season of 3-5 month.

Sampling procedure and sample size

In order to analyse farmers' perception and adaptation strategies on climate change at IFAD-CASP Programme in the study area, a multistage sampling technique was employed. The first stage involved the selection of participating farmers in the 14 Local Government Areas that benefited from the IFAD-CASP programme as contained in the list of Community Development Area Officers (CDAs). In the second stage, a purposive selection of seven LGAs out of the 14 participating LGAs was used in accordance with the highest number of participating farmers. Thus, Ringim, Taura, Garki, Suletankarkar, Kiyawa, Miga and Birniwa LGAs were selected for the study. The third stage involved the selection of one community with the highest number of participating farmers out of the number of participating communities in each of the seven (7) selected Local Government Areas. In the fourth stage, 5% of participating farmers were selected and was used to determine the actual sample size, using Yammane's sample size selection and Bowley's proportion allocation formulaeAt the last stage, three hundred and twenty-four (324) farmers were finally selected for the study (Table1).

Table 1: Distribution of respondents by Local Government Areas.

Participating LGAs	Selected LGAs	Participating communities	Selected communities	Number of participating farmers	Number of sampled farmers
Ringim	Ringim	5	Yan dutse	280	56
Taura	Taura	8	Chikawkwaiwa	260	52
Garki	Garki	8	Kaya	220	44
Sule-Tankarkar	Sule-Tankarkar	5	Sule Arewa	200	40
Kiyawa	Kiyawa	8	Bagata	260	52
Miga	Miga	5	Hantsu	200	40
Birniwa	Birniwa	8	Kukawa	200	40
Total 7	**7**	**47**	**7**	**1,620**	**324**

Source: Recognisance Survey 2021.

Method of data collection

Data were collected from the respondents and used for the study using structured questionnaire.

Methods of data analysis

Data for the study was analysed using descriptive statistics and inferential statistic (Heckman's sample selection model) using IBM SPSS Statistic 23. The descriptive statistics was employed to describe farmers' socioeconomic characteristics and Regression analysis was used to analyse the factors influencing the adoption of climate change adaptation strategies.

RESULT AND DISCUSSION

Socio-economic characteristics of Respondents

The socio-economic parameters in the study include age, sex, marital status, educational level, household size, farming experience, source of farm land, farm size, source of credit, source of information on climate change and access to extension officer.

Age: The results in Table 2 shows that the age of respondents ranges between 20 – 69 years with mean age of 35 years. This implies that the respondents were within their active and youthful age. This finding agrees with the result of Mbavai (2013) which indicate that age was significantly associated with acceptance of improve farm practices.

Sex: The results also shows that (73%) of the respondents are male while 27% are female. This result is in line with the IFAD-CASP Programme's objective which provide 30% for women participation. The high percentage of male farmers in the study area is similar to the findings of Mbavai (2013) who reported similar dominance of male farmers in the study on cowpea farmers in Musawa LGA of Katsina States.

Marital status: the results further revealed that 60% of the respondents were married, while 19.66% were single, about 11.86% were widows and 8.47 were divorce. This implies that majority of the farmers in the study area were married. This indicate that family labour were engaged in practicing IFAD-CASP strategies.

Household size: The result in the same Table 2 shows that the respondents' mean household size was 7 persons. The relatively large household size in the study area may be linked to the polygamy system practiced in Muslim dominated communities which play a role in adaptation to IFAD-CSP Climate Change Strategies.

Level of education: The results from Table 2 disclosed that over 58% of respondents in the study area attained Qur'anic schools, while 24% had primary education and secondary education graduates made 16% and only (2%) had tertiary education. The reason for the dominance of Quranic education is associated with the religion of Islam that provide affordable educational to the respondents in the study area.

Table 2: Socioeconomic characteristics of the respondents in the study area

Variables	Frequency	Percentage	Mean
Age (Years)			
20 - 29	102	34.57	
30 – 39	123	41.69	35
40 - 49	44	14.91	
50 – 59	18	6.10	
60 - 69	08	2.71	
Sex			
Male	216	73.22	
Female	79	26.88	
Marital status			
Married	177	60.00	
Single	58	19.67	
Divorced	60	20.33	
House hold size			
1 – 5	103	34.91	
6 – 10	138	46.77	
11 – 15	46	15.59	7
16 – 20	04	1.35	
21 – 25	04	1.35	
Education			
Qur'anic education	172	58.30	
Primary education	71	24.06	
Secondary education	46	15.59	
Tertiary education	06	02.03	

Source: Field Survey 2022

Farming experience: The results from Table 3 show that 53% and 35% were experienced in farming for a period of 1 – 10 and 11 – 20 years respectively. Another 8% had between 21 – 30 years, and 3% had between 31 – 40 years of farming experience respectively with mean farming experience of 12 years. According to Mignouna *et al*. (2011) reported that elderly farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information faster than younger farmers with less farming experience.

Source of Information on Climate Change: The result in Table 3 revealed that IFAD-CASP extension officers, (63.38%), radio (52.88%), friends (24.40%), neighbours ((19.66%), and social media (6.77%). This show that farmers in the study area have sufficient information on climate change which influences the adaptation of IFAD- CASP strategies. It is also in line with the results of the research by Idoma and Mamman (2016) on the need for climate information and knowledge sharing between scientists, policy makers and community institutions in order to enhance practical adaptation approaches at the grassroots level.

Table 3: Farming experience and sources of information of the respondents in the study area

Variables	Frequency	Percentage	Mean
Farming experience			
1 - 10	157	53.22	
11 - 20	103	34.91	12
21 - 30	25	08.47	
31 - 40	10	3.39	
Sources of information			
Extension agents	187	66.38	
Radio	156	52.88	
Family/friends	72	24.40	
Neighbours	58	19.66	
Social media	20	06.77	

Source: Field survey, 2022

Level of Farmers Adaptation of IFAD-CASP Strategies on Climate Change

The result in table 4 shows respondents' adaptation level of IFAD-CASP climate change adaptation strategies and extent of adaptation. The strategies were ranked according to respondents' level of adaptation. Yearly Seasonal Rainfall Prediction (SRP) ranked 1st with 81% and extent adaption mean value of 2.72, then construction of animal drinking point ranked 2nd with 80% and mean value of 2.04, followed by community nursery establishment which ranked 3rd with 75% and mean value of 2.13, while soil and water conservation ranked 4th with 62% an extent mean value of 2.59.

According to the result of the study, the strategies with low adaptation rate and less extent of adaptation were agro-forestry tree fertilizer concept that ranked 5th (45%) with extent mean value of 1.85. Degraded land rehabilitation was 6th (42%) with extent mean value of 1.32, next was half-moon technology concept that ranked 7th (34%) and extent mean value of 1.32 while the last was woodlot establishment that ranked 8th (13%) with extent mean value of 1.92.

The result shows that IFAD-CASP strategies with less technology, less resources needed and does not require a large Farm land have higher percentage of adaptation rate while strategies with high technology, more resources needed and require a large farm land have less percentage of adaptation rate. According to Ayoade and Akintonde (2012), the extent of agricultural innovation adoption level is dependent on the awareness, performance of extension agents and level of acceptance by the farming population.

Table 4. Respondent's adaptation level of IFAD-CASP Strategies on Climate Change

IFAD_CASP	**Adaptation**				**Extent of Adaptation**				
Strategies	Yes	%	No	%	**Rarely (1)**	**Occasionally (2)**	**Frequently (3)**	**Total score**	**Mean (=)**
Construction of animal drinking point	235	80	60	20	58(26.68)	108(45.96)	69 (29.36)	463	2.04
Community nursery establishment	220	75	75	25	52 (23.64)	87 (39.54)	81(36.81)	469	2.13
Woodlot Establishment	38	13	257	87	15 (39.47)	12 (31.58)	11 (28.95)	72	1.92
Degraded land rehabilitation	125	42	170	58	92 (73.60)	27 (21.60)	6 (4.80)	164	1.32
Forestry tree plant fertilizer concept	132	45	163	55	36 (27.27)	79 (59.85)	17 (12.88)	245	1.86
Half-moon pit technology	101	34	194	66	72 (71.29)	27 (26.73)	2 (1.98)	132	1.31
Yearly seasonal rainfall prediction	239	81	56	19	15 (6.27)	37 (15.48)	187(78.24)	650	2.72
Soil and water conservation technique	184	62	111	38	9 (4.89)	58 (31.52)	117(63.59)	476	2.59

Note: Figures in parenthesis are percentages.
*Multiple response.
Cut-off mean score = 2.0.
Source: Field survey 2023

Determinants of Farmers' adoption of IFAD-CASP Climate Change Adaptation Strategies

Result in Table 5 showed the overall likelihood (86.8%) of adoption of IFAD-CASP strategies given the highly significant Omnibus tests (P<0.0005), the measures of the overall performance of the model. The pseudo R square statistics (Cox and Snell R^2 and Negelkerke R^2), were 0.384 and 0.538, indicating that between 38.4% and 53.8% of the variation in adoption levels were explained by the set of variables included in the model. The detail results showed that seven of the predictive variables: Age of the respondent, years of farming experience, number of visits by IFAD-CASP staff, farmers' perception of IFAD-CASP strategies, membership of cooperative, access to credit and farmers' awareness of climate change were prime factors affecting the adoption of IFAD-CASP climate change adaptation strategies in the study area.

Age: The age of the respondent were significance at 5% level with a regression coefficient of 0.154. This result conforms to the *a priori* expectation that adoption of agricultural innovation is enhanced with age and years of farming experience. This result further shows that an increase (unit increase) in the age of the respondent will result in a corresponding increase of 1.166 (in what? Please indicate). This result is in consonance with the finding of Nwaniki (2016) who posited that farmers between 35 and 54 years were more inclined to think about the causes of climate change and were concerned about mitigating them. This according to Searle and Gow (2010), unlike younger people who not surprisingly possess a greater fear for the future, older people are at least concerned about it.

Years of farming experience: Conversely, estimate of years of farming experience shows negative (-0.196) but significant (p<0.005) influences on adoption of IFAD-CASP strategies. This result affirms that for every increase in the years of respondents' farming experience, there will be a reduction in the probability of adoption of IFAD-CASP strategies by a factor of 0.822. This result is at variance with the expectation of the positive impact of increased years of farming experience on adoption. This can be explained on the basis that adoption of new innovation does not necessary depend on experience, but to a large extend 90%, the perceived effect and importance of such an innovation. It can then be adduced that farmers in the study area could adopt these strategies based on the perceived usefulness of the innovations. On the contrary, Atube *et al*. (2021) established that as one becomes more experienced in farming, the probability of adopting improved farming practices increases. However, there is every tendency that farmers will tend to rely more on their wealth of experience to solve issues than adopting new innovations that are alien to them.

Visits by IFAD-CASD staff: The coefficient of the number of visits by IFAD-CASP staff to the respondents was found to be significant at 5% level. That is, the number of visits by IFAD-CASP staff tends to increase positively and significantly the likelihood of farmers' adoption of the strategies by an exponential value {Exp(β)} of 1.524.

Membership of cooperative organization: Estimate of membership of cooperative society was significant (p<0.005), but negatively correlated with the likelihood of adoption of IFAD-CASP strategies. This implies that multiple of increase membership of respondents to diverse cooperative societies rather reduces the chances of adoption of IFAD-CASP strategies by a factor of 0.421 (42.1%). Probable reason for such outcome could be attributed to the fact that adoption of agricultural innovation is in most instance, an individual decision rather than collective. In addition, in a situation where farming activities are decentralised and largely in the hands of small-holders, adoption of any innovation remains the singular decision of the respective farmers given their level of awareness and capacity to adopt same.

Access to credit: Farmers access to agricultural credit had a negative coefficient of -0.705, but was significant ($p<0.005$) to farmers' adoption of IFAD-CASP strategies. This result is negates the *a priori* expectation that access to credit could increase the adoption of agricultural innovation. Other than increase adoption of innovation, increased access to credit tends to decrease proportionally the chances of farmers adoption by an exponential factor of 0.494. To explain such deviation from expectation, it could be reasoned that improved technologies that are brought to the door step of the farmers through IFAD-CASP are freely delivered and finance which is not a determining factor in their adoption.

Awareness of climate change: Being aware of problem is the first step in seeking for solution and awareness of innovation brightens the chances of adoption of strategies that are perceived as solution to the identified problem. Therefore, with a positive coefficient (0.866) of awareness of climate change, adoption of IFAD-CASP adaptation strategies is significantly influenced at 1% percent level of significance. By this result, any increment in the awareness level of climate change by the respondents will increase significantly and consistently, the adoption of IFAD-CASP strategies by a unit factor of 2.390. This result conforms to the *a priori* expectation that increase awareness of climate change increases the likelihood of adoption of climate change mitigation strategies. This result agrees with the finding of Asrat and Simane (2018) where it was discovered that availability of climate information increases the probability of adaptation of climate change mitigate strategies by 7.40%.

Table 5. Factors influencing farmers' adoption of IFAD-CASP Climate Change Adaptation Strategies

Variables	Beta	Std. Error	Wald	Sig.	Exp(B)
Age	0.154	0.090	2.921	0.087	1.166**
Level of Education	0.352	0.267	1.748	0.186	1.422
Marital Status	-0.196	0.408	0.232	0.630	0.822
Years of farming experience	-0.127	0.073	3.039	0.081	0.881**
Annual Income	-0.038	0.030	1.601	0.206	0.963
Household Size	0.002	0.136	0.000	0.987	1.002
Farm Size	-0.463	0.297	2.435	0.119	0.629
Visit by IFAD-CASP extension staff	0.227	0.110	4.217	0.040	1.254**
Perception of IFAD Strategies	0.586	0.237	6.117	0.013	1.797**
Membership of Cooperative	-0.866	0.446	3.763	0.052	0.421**
Access to Credit	-0.705	0.299	5.546	0.019	0.494**
Awareness of Climate Change	0.871	0.168	27.056	0.000	2.390***
Sources of Information	-0.019	0.361	0.003	0.957	0.981
Constant	-6.666	2.786	5.724	0.017	0.001**
-2 Log likelihood	224.950				
Cox & Snell R Square	0.384				
Nagelkerke R Square	0.538				

Note: ***significant at 1% and **significant at 5%

Source: Field Survey, 2022

Conclusion

Generally, the result of this study provides applicable information for policy makers and other stakeholders about the condition of factors influencing farmers' adoption to climate change adaptation strategies promoted by of IFAD-CASP strategies. it discovered the key factors to consider during intervention in order to exploit the available adaptation strategies to promote the adaptive capacity of farmers.

Recommendations

Based on the findings of this study, the following recommendations have been made:

Farmers need to be encouraged to use different media like radio, phone, and television to get access to climate information so that they will be able to respond to climate change. Policies aimed at awareness creation about climate change and adaptation strategies need to be framed considering agro-ecological setting and age for effectiveness of interventions.

Efforts should be intensified to improve awareness and adaptive capacity of farmers through improving provision of extension service, encouraging farmer-to-farmer extension services and motivating using of media is very critical. It is necessary to encourage informal social networks and discussions at farmers' level to enable them to share information and experience which are important for choice of appropriate adaptation strategies.

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