ASSESSMENT OF SOCIOECONOMIC CONSTRAINTS OF CLIMATE SMART AGRICULTURAL STRATEGIES AMONGST RICE FARMERS IN NASARAWA STATE

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ABSTRACT
Despite high level of rice production and Government interventions through Climate Smart Agricultural Strategies (CSA) in ensuring food available and accessible to all in Nigeria. Climate change continues to be a hug bottleneck to rice producers. This study seeks to assess socioeconomic constraints of climate smart agricultural strategies amongst rice farmers in Nassarawa State. To achieve this, 2 LGAs each were purposively selected out of the three Zones from which 100 rice farmers were randomly selected. The data obtained were analyzed using descriptive statistics and Likert Scale Type. The study revealed that 80% were male and about 92% were married. Majority (90%) have basic education while about 55% were reported to have 11 - 20 years' rice farming experience with mean years of 17. Mean farmers age were 37 while 40% were between 31 – 40 years of age with 53% having farm size of 4 – 6 hectares. CSA strategies awareness level was about (98%) while majority (96%) were reported to adopt this CSA Strategies. Scarcity of water during dry season, lack of improved storage facilities, inadequate data and CSA information, high cost of input for rice production and inadequacy in dissemination of CSA information were ranked 1st, 2nd, 3rd, 4th and 5th, respectively as the most socioeconomic constraint affecting rice production in the study area. It was recommended that women and youth farmers should participate more in rice production, rice farmers should acquire the know- how on each CSA strategies adopted for optimal utilization and Government and stakeholders should intensify in promptness and efficient CSA strategies information dissemination to the farmers in timeliness. Lastly Government should provide inputs adequately at low cost and at the appropriate time to farmers to ensure high outputs.

Key words: Constraints, Climate-Smart, Rice, Production, Likert-Scale

INTRODUCTION
Globally, Climate change poses significant threat and challenges to agricultural productivity, particularly in vulnerable regions such as Nigeria and precisely Nasarawa State. In recent years, climate-smart agricultural (CSA) strategies have emerged as innovative approaches aimed at enhancing resilience, improving food security, and reducing greenhouse gas emissions in the face of climate variability. However, the adoption of these strategies is often hindered by socio-economic constraints, which can impede farmers' willingness and ability to implement climate-smart practices. Research has shown that factors such as limited access to financial resources, inadequate agricultural education, and poor infrastructure can significantly restrict the implementation of CSA strategies among smallholder farmers (Adeleke et al., 2020). Additionally, prevailing socio-cultural norms and land tenure issues may further exacerbate the reluctance to adapt to new agricultural practices, especially in regions where traditional farming methods are deeply rooted (Ojo, 2021). Understanding these socio-economic constraints is

essential for developing targeted interventions aimed at promoting the adoption of climate-smart technologies that can lead to sustainable agricultural practices and improved livelihoods among rice farmers in Nasarawa State. Despite the significant number of researches carried on climate smart agriculture in the aspect of adapting, mitigating and reducing the Carbon dioxide emission into the environment, limited research has been carried out to assess the socioeconomics constraints of climate smart agricultural strategies in ensuring less effect of climate change on farmers. This study considered the following objectives to describe the socioeconomics characteristics of the respondents, assess the level of awareness of climate smart Agricultural strategies, examine the adoption level of climate smart agricultural strategies in the study area, and to identify the constraints to climate smart strategies in the study area.

METHODOLOGY

Nasarawa State is located within Latitudes 8º 32'and 8º 42' N and Longitudes 7º 34' E and 7º 45' E. The State shares boundaries with Kaduna and Plateau States to the North-East, the Federal Capital Territory (FCT) to the North-West, Benue state to the South, Taraba State in the South-East and Kogi State to the West. The State is made up of thirteen Local Governments Areas and they are grouped into three Agricultural zones of Central, Southern and Western zone respectively. The State lies within the middle belt of the country within the Guinea Savannah vegetation. The State has a land area of 12,000 square kilometers. Nasarawa State Bureau of Statistics (NSBS), (2022). The 2006 population census pegs the state's population at 1,869,377, but projected to 2023 be about 3,089,795 with a population growth rate of 3.0% (NSBS, 2022). It has a mean temperature range from 25º C in October to about 36º C in March, with annual mean rainfall of 1311.75cm. Agriculture is the dominant occupation of the inhabitants of Nasarawa State. Some of the major agricultural products in the state include maize, sorghum, millet, rice groundnut cowpea, soya beans, sesame, melon, yam, cassava, sweet potato, mango, cashew, sugar-cane, oil palm, cattle, sheep, goats, poultry, pigs and fisheries. Nasarawa state (the home of solid minerals) is blessed with numerous solid minerals such as Beryl, Tourmaline, quartz, columbite, granite, limestone, barytes, glass sand, marble and salt (NSBS, 2022). The state is an agrarian state with large percentage of the populace engaged in farming and agro-allied activities. The soil texture is sandy-loan and very fertile for crops like rice, sorghum, cowpea, cassava among others that are cultivated in the study area.

Sampling Techniques and Sample size

A Multi-stage sampling technique were used in selecting representative farming households in Nasarawa States from which primary data were collected for the study area. A two stage sampling procedure were used for the study. The first stage involved purposive selection of 2 LGAs from the 3 zones where rice production is predominant in both States. The second stage was a simple random selection of 5 villages from each the 2 LGAs from which 10 respondents each were selected. Taro Yamane's formula was adopted and modified from Adamu, *et al. (*2024) to obtain a scientific sample size at 0.05 confidence interval from the sample frame to get a total sample size of 100 for the study. A well-structured questionnaire which was designed in kobo toolbox and data collected using Kobocollect application were used. Objective I and II were analyzed using descriptive statistics while objective III used adoption index and objective IV were analyzed using Likert scale type.

Method of Data Collection and analysis

The Study used Primary data which were obtained from a well-structured questionnaire, Data for the study were analyzed using both descriptive, adoption index, and Likert type scale. Descriptive statistics such as frequency, percentages, and means were used to describe the socioeconomic characteristics of rice farmers, adoption index were used to ascertain CSA strategies adoption in the study area while Likert type scale were used to affirm the constraints to adoption of CSA strategies of the farmers. The constraints of CSA Strategies on rice production were captured using ten perceptional statements measured by a 5-point Likert type scale of 5 = very severe constraint, 4= severe constraint, 3= Not sure, 2= Not severe constraint, and 1= Not very severe constraint.

Adoption index

The index of adoption of CSA strategies by farmer was measured using the adoption index. The index was computed individual farmers. Adoption index is denoted by (Bi) as presented in (Sambo and Godfrey 2022) and modified in equation (1) below:

$$Bi = \sum \left(\frac{Ri}{RT}\right) \quad (1)$$

Where:

Bi = Adoption index of CSA strategies by ith farmer;

Ri = Number of CSA strategies adopted by ith farmer; and

RT = Total number of CSA strategies available to the ith farmer

i = (1……n)

For this study, an index of ≤0.33 indicates no adoption while an index of ≥0.55 indicates adoption. Some of the climate smart agricultural strategies in the study area include:

(1) Crop diversification; (2) Practice of crop rotation; (3) Sustainable land use management (integrate land, water and environmental resources); (4) Zero/minimum tillage; (5) Contour farming; (6) Terraces; (7) Mulching; (8) Early planting; (9) Mixed farming; (10) Intercropping to maximize space; (11) Intercropping rice with legumes; (12) Adjusting planting dates; (13) Agroforestry; (14) Planting hybrid crop varieties; (15) Improved flood and drought tolerant crop varieties; (16) Disease resistant varieties; and (17) Cover crops methods.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The socioeconomic characteristics of the respondents considered for this research include; Gender, marital Status, Educational Status, Farming Experience, Age of respondents, and farm size of the respondents. The Result in Table 1 revealed that majority about (80.0%) of the respondents were male, majority about (92.0%) were married with about (90.0%) were reported to have basic education. This conform with the finding of Anugwa *et al.* (2021) who affirmed that male are more in rice production, married and have basic education.

Table 1: Socioeconomic Distribution of the respondents in the study area

Parameters	Frequency	Percentage	Mean
Gender			
Male	80	80.0	
Female	20	20.0	
Marital Status			
Single	8	8.0	
Married	92	92.0	
Educational Status			
Primary	50	50.0	
Secondary	40	40.0	
Tertiary	7	7.0	
Quaranic	3	3.0	
Years of Farming			17
Experience			
≤ 10	20	20.0	
11-20	55	55.0	
21-30	23	23.0	
≥ 31	2	2.0	
Age of Farmers			37
≤ 20	3	3.0	
21-30	24	24.0	
31-40	40	40.0	
41-50	28	28.0	
≥ 51	5	5.0	
Farm Size (ha)			5
≤ 3	10	10.0	
4-6	53	53.0	
≥ 7	37	37.0	

Source: Field Survey, 2024

More so, the study showed the years in rice farming experience which were ranged. The result revealed that about 55.0% were between 11-20 of rice farming while the mean age of the respondents was 73 and the age range, 40.0% of farmers fall between ages of 31-40, while 28% were between 41-50 this implies that the labour force were within their active ages, this will have direct reflection on their adoption and level of production. The result for farm size showed that about 573.0% have farm size of about 4-6 hectare, while about 37% were above 6 hectare of arable land for rice production. This implies that they majority farmer were producing in small scale. The level of awareness for climate smart agricultural strategies were showed in Figure 1 below. The result revealed that Majority about 63.0% of the respondents were aware of the CSA strategies in the study area while 35% affirmed to be very aware of CSA strategies. This implies that significant numbers of farmers were aware of these strategies. This finding agreed with Opeyemi *et al.* (2021) who founds that majority of rice farmers in Nigeria are aware of climate smart agriculture. On the other hand, adoption level of the CSA strategies was also ascertained in this study.

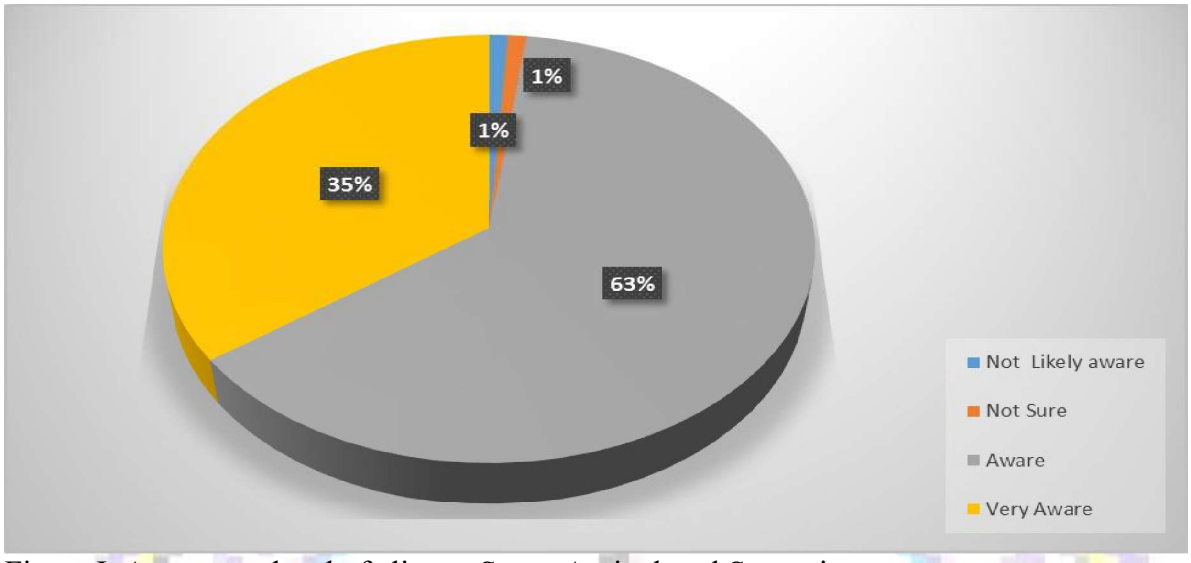

Figure I: Awareness level of climate Smart Agricultural Strategies

The result in Figure 2 showed the adoption index of CSA Strategies in the study area. The result revealed that majority about (96.0%) adopted the CSA strategies significantly with index ≥ 0.55 while 4.0% with index ≤ 0.33 did not adopt CSA strategies. The high level of adoption implies that sizable number of the respondents have aimed at ensuring an improvement in their rice production in order to maximize an output despite the effects of climate change. According to Cassim, *et al.* (2017), farmers have greater benefits when they adopt multiple strategies, because some strategies can serve as complementary to one another and enable the farmers to explore and thrive in the event unstable climate occurrences.

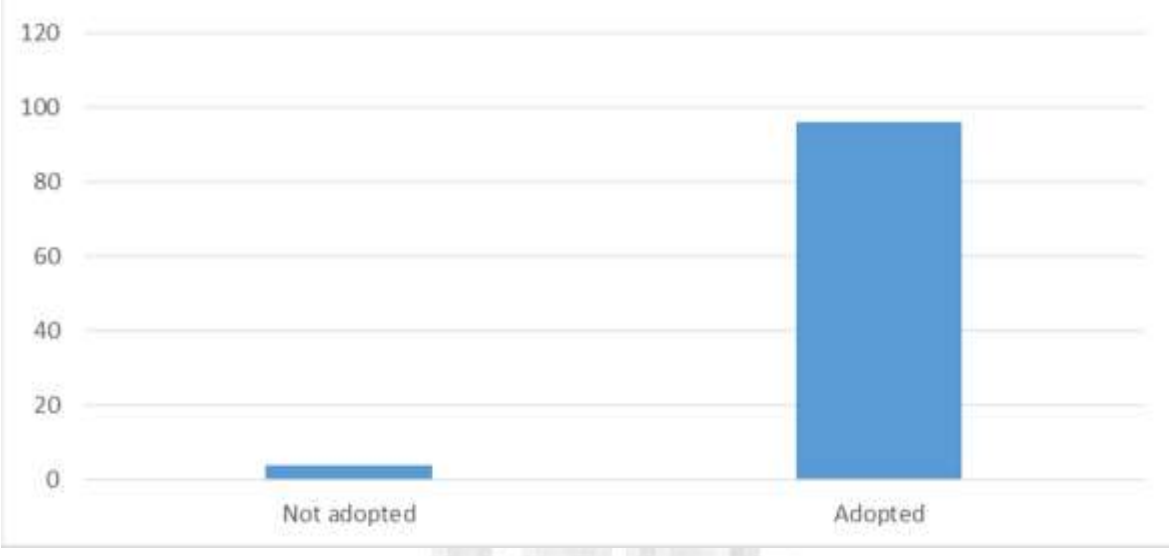

Figure 2: Adoption Index of climate smart Agricultural Strategies (Not adopted ≤ 0.33, Adopted ≥ 0.55)

Table 2 reveals the constraints to climate smart agricultural strategies in the study area, the result revealed and ranked these constraints according to the level of severity. The Scarcity of water during dry season, lack of improved storage facilities, inadequate data and information on CSA,

high cost of rice production inputs and inadequacy in dissemination of CSA information were constraints reported with the highest weighted mean to be 4.79, 4.72, 4.65, 4.58, and 4.56 and were ranked as 1st, 2nd, 3rd, 4th and 5th respectively. This implied that availability of water, storage facilities, access to climate data and cost of rice production significantly affects the farmers up scaling of CSA strategies in the study area. Ayinde, *et al.,* (2013) researched on the evaluation of the effects of climate change on rice production in Niger State, Nigeria. The result revealed that Rainfall is one of the climatic factors affecting rice production. Salisu (2022) also reported high cost of input, lack of access to agricultural funds, high cost of production was also a very serious constraint. Inadequate financial resources were rated as very serious constraint by respondents in the area

Table 2: Constraints to Climate Smart Agricultural Strategies in the study Area

Constraints of CSA Strategies	VSC	SC	ND	NSC	NVSC	Weighted Sum and Weighted Mean	Rank
Scarcity of water during the dry season	81(81.0)	18(18.0)	NR	1(1.0)	NR	479.0 ± 4.79	1st
Lack of improved storage facilities	NR	1(1.0)	NR	25(25.0)	74(74.0)	472.0 ± 4.72	2nd
Inadequate data and information	NR	3(3.0)	2(2.0)	22(22.0)	73(73.0)	465.0 ± 4.65	3rd
High cost of rice production	NR	2(2.0)	NR	36(36.0)	62(62.0)	458.0 ± 4.58	4th
inadequacy in dissemination of CSA information	NR	3(3.0)	NR	35(35.0)	62(62.0)	456.0 ±4.56	5th
Lack of awareness of CSA practice	7(7.0)	2(2.0)	2(2.0)	36(36.0)	59(59.0)	450.0 ± 4.50	6th
Unfavorable government policy	NR	3(3.0)	2(2.0)	50(50.0)	35(45.0)	437.0 ±4.37	7th
CSA Strategy Illiteracy amongst farmers	NR	3(3.0)	NR	55(55.0)	42(42.0)	436.0 ± 4.36	8th
Inadequate extension service	NR	1(1.0)	1(1.0)	63(63.0)	35(35.0)	432.0 ± 4.32	9th
Inadequate investment in CSA	7(7.0)	65(65.0)	6(6.0)	15(15.0)	7(7.0)	250.0 ± 2.50	10th

Source: Field Survey 2024. NR denote No response
Note: Very severe constraint (VSC), 4= severe constraint (SC), 3= Not sure (ND), 2= Not severe constraint (NSC), 1=Not very severe constraint (NVSC)

CONCLUSION

The study concluded that male farmers are more involved in rice farming and majority of respondents are found to be in active age and were married thereby ensuring more labour supply. Basic education helps in the overall improvement in farming activities likewise the years in rice

farming experience. More so, CSA strategies awareness level were high among the respondents. Scarcity of water during dry season, lack of improve storage facilities, inadequate data and CSA information, high cost of input for rice production and inadequacy in dissemination of CSA information were the most constraints affecting rice production in the study area.

RECOMMENDATIONS

The study therefore recommended that women and youth farmers should participate more in rice production, rice farmers should acquire the know-how on each CSA strategies adopted for optimal utilization. Furthermore, Government and stakeholders should intensify in promptness and efficient CSA strategies information dissemination to the farmers in timeliness. Lastly Government should provide inputs adequately at low cost and at the appropriate time to farmers to ensure high outputs.

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