



FACTORS INFLUENCING THE ADOPTION OF CLIMATE SMART AGRICULTURAL PRACTICES IN SELECTED COUNTRIES OF AFRICA: A REVIEW

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ABSTRACT

The review assessed factors influencing the adoption of Climate Smart Agricultural (CSA) practices in Ethiopia, Ghana and Nigeria. The Socio-economic characteristics of the farmers revealed that majority (85.46%, 43.40% and 59.39%) were male in Ethiopia, Ghana and Nigeria respectively. The result also revealed that the mean age of the respondents were 48.6, 35.3 and 39.3 years in Ethiopia, Ghana and Nigeria respectively. The educational level of the farmers in Ghana revealed that almost half (49.7%) were formally educated. The review also showed that 42% of the farmers in Nigeria had higher education while 35.22% had basic education in Ethiopia. The mean household size of the farmers in the three Countries i.e. Ethiopia Ghana and Nigeria were 8, 7 and 8 years respectively. The review also showed that age, farming experience and farm size and access to credit were significant ($P < 0.01$) in influencing the adoption of climate smart agricultural practices in Ghana and Nigeria. Similarly, age, level of education and farm size were significant ($P < 0.05$) in influencing adoption of climate smart agricultural practices in Ethiopia, Ghana and Nigeria while sex, level of education and access to credit were significant ($P < 0.10$) in Ghana and Nigeria respectively. The Review concluded that age, level of education, farming experience, farm size and sex were the factors influencing the adoption of climate smart agricultural practices in the review area. The Review recommended that private sectors should be involved in establishing private extension services in other to educate the farmers on the effect of climate change and the importance of CSA practices.

Keywords: Adoption, Climate, Change, Smart, Agriculture.

INTRODUCTION

Agriculture employs about 75% of the rural population in the African sub-region (World Bank 2023). Extreme weather events arising from climate change pose a great threat to agricultural sector and agri-based livelihoods. Climate change is a worldwide event that poses one of the most serious risks mankind has ever faced, generating floods and droughts and hurting farmers' livelihoods by influencing ecosystems, water supplies, food security, settlements, and human health. (Kassa and Abdi 2022). Similarly, Adebisi-Adelani and Oyesola (2014) stated that Climate change is no longer a new phenomenon especially, among farmers. It has become a major challenge to agricultural development in Africa and the world at large. Agriculture, being one of the most weather-dependent of all human activities, is highly vulnerable to climate change. Climate change threatens agricultural production through rising temperatures, changes in rainfall patterns or the increase of drought.

There is a need to translate the perception of the farmers and the drivers of such perceptions into quick positive actions to manage the negative effects of climate change. One of such important action to respond to perceived climate events by farmers is climate-smart agriculture. Climate-smart agriculture entails the adoption/use of technologies/techniques/ practices/services to simultaneously increase crop yield, climate resilience and mitigation and food security. This is quite different from conventional agriculture which usually increases emissions and is less resilient to climate risks (Onyeneke *et al.*, 2021)

Climate-Smart Agriculture (CSA) aims to achieve three pillars:

- (i) Sustainably increase productivity and incomes of farmers;
- (ii) Enhance farmers' adaptive capacity and build resilience; and



(iii) Reduce the emission of Greenhouse gases (GHGs)

The objective of this review is to assess the factors influencing the adoption of climate-smart agricultural practices among smallholder farmers in Ethiopia, Ghana and Nigeria

Climate change is no longer a new phenomenon in Nigeria especially among farmers. It has become a major challenge to agricultural development in Africa and the world at large. Agriculture, being one of the most weather-dependent of all human activities, is highly vulnerable to climate change. Climate change threatens agriculture production through rising temperatures, changes in rainfall patterns or the increase of drought.

RESULTS AND DISCUSSION

Table 1 above showed that majority (85.46% and 59.39%) of the respondents in Ethiopia and Nigeria were male respectively, while 56.6% were female in Ghana. The implication of the above is that the male seems to dominate land ownership than the female. No doubt, Mashi *et al.* (2022) stated that Cultural practices that limit ownership of land resources to one gender category typically promote a lack of awareness of climate change impacts and the use of climate-smart technologies by the deprived gender category.



Table 1: Socio-economic Characteristics of the farmers

Variable	Ethiopia (n=213)		Ghana (n=350)		Nigeria(n=293)	
	Freq	%	Freq	%	Freq	%
Sex						
Male	182	85.46	152	43.4	174	59.39
Female	31	14.5	198	56.6	119	40.61
Age						
18-30	20	9.5	95	27.1	4	1.37
31-40	41	19.4	198	56.6	24	8.19
41-50	87	40.8	52	14.9	100	34.13
51-60	31	14.9	5	1.4	90	30.72
>60	34	15.4	-	-	75	25.59
Mean	48.6years		35.3years		39.3years	
Marital Status						
Married	162	76.06	-	-	-	-
Single	51	23.94	-	-	-	-
Educational Level						
No Formal	25	11.73	174	49.7	-	-
Primary	75	35.22	128	36.6	69	23.55
Secondary	61	28.64	37	10.6	100	34.13
Tertiary	52	24.1	11	3.1	124	42.32
Household Size						
1-5	36	16.90	82	23.43	55	18.77
6- 10	130	61.03	210	60.00	180	61.44
11-15	42	19.72	58	16.57	47	16.04
16-20	5	2.35	-	-	11	3.75
Mean	8		7		6	
Farm Size (ha)						
< 1	30	14.08	241	68.9	9	3.07
1-4	141	66.20	104	29.7	210	71.67
5-8	27	12.68	5	1.4	51	17.41
≥ 9	15	7.04	-	-	9	3.07
					5	1.71
					9	3.07
Mean	2.5ha	1.2		3.8	3.8	
Farming Experience (Years)						
1-15	32	15.02	80	22.9	80	27.30
16-30	121	56.81	121	34.6	131	44.72
31-45	46	21.60	117	33.4	50	17.06
>46	14	6.56	32	9.1	21	7.17
					10	3.41
					1	0.34
Mean	24 years		25years		21years	

Source: Atta-Aidoo *et al.* (2022); Kalu and Mbanasor (2023)

Figure 1 shows the frequency of the various CSA practices adapted by the respondents. The lower degree of CSA adoption is negatively correlated with the respondents' farmland's distance from their homestead, which is statistically significant. As a result, farmers who cultivate distant from their homesteads are probable to use CSA practices less frequently. This might be due to the difficulties they would have in practicing good and effective management due to the stress presented by distance as compared to their peers who live nearer to their farms (Kassa and Abdi, 2022). From the figure, it

was observed that Tree planting as Climate Smart Agriculture (CSA) had highest (206) frequency response, followed by use of Nitrogen Fertilizer (198), and use of irrigation (189) respectively, while crop diversity followed (136). Other CSA practices that followed were use of organic manure (120), crop rotation (112), intercropping (109), minimal tillage (98), use of terraces (92), mulching (79) and livestock breed improvement and diversification (23) respectively. This implies that the farmers in Ethiopia practiced one or more CSA practice. This finding agreed with that of Wahab *et al.* (2020) who reported that farmers in North-Western Nigeria adopted one or more CSA practices.

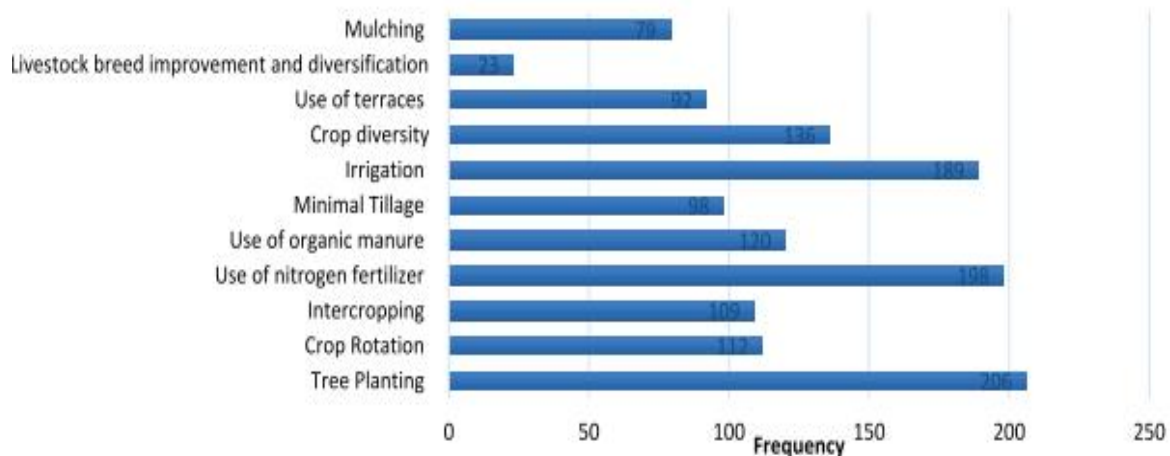


Figure 1: Climate Smart Agricultural Practices in Ethiopia

Figure 2 showed the farmers' awareness of climate smart agricultural practices in Nigeria and Ethiopia between the Urban and rural farmers. 25% of rural respondents in Nigerians claim any awareness of climate change compared to the 39% of urban respondents. On the other hand, both rural and urban dwellers in Ethiopia fair better than Nigerians, while 58% of urban respondents and 46% of those in rural areas indicate some level of awareness of climate change (Alhassan and Haruna 2023). This is in agreement with Ndung'u *et al.*, (2023) who reported that farmers in Kenya are aware of Climate Smart Agricultural practices (CSA) and adopted one or more CSA practices.

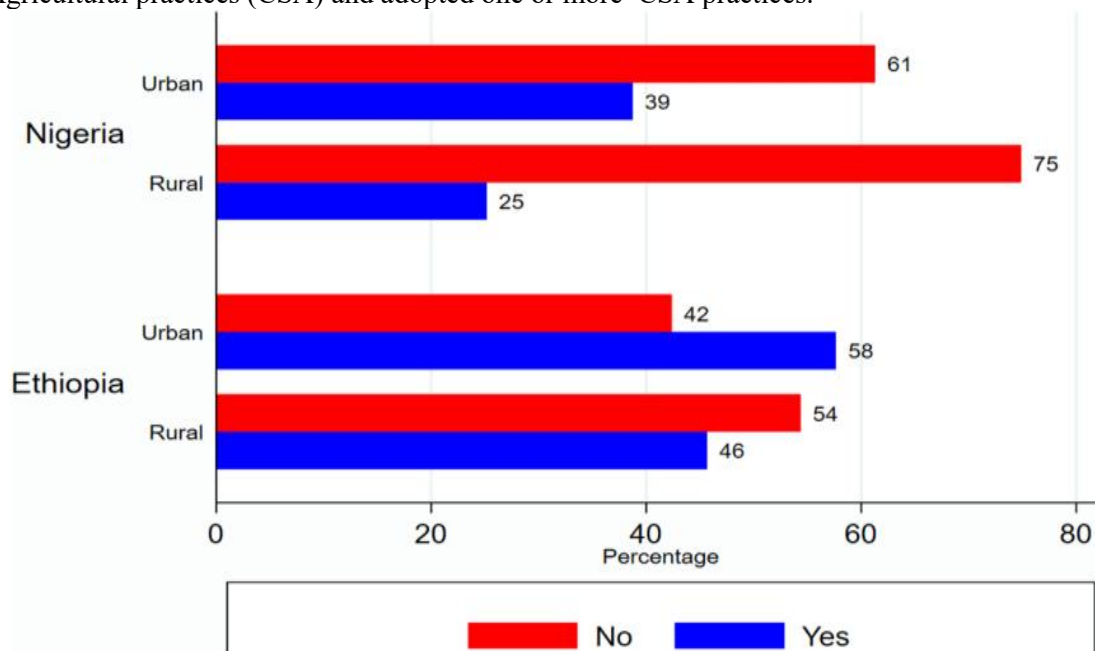


Figure 2: Farmers' Awareness of Climate Smart Agricultural Practices in Nigeria and Ethiopia

Figure 3 above showed that less than half (48%) of farmers in Ethiopia experienced changes in climate as against the 16% in rural Nigeria. On the other hand, while about 75% of rural farmers engage in one adaptation measure or the other in Ethiopia, 91% of rural farmers in Nigeria practice adaptation measures (Alhassan and Haruna 2023). This implies that the two countries knows the importance of Climate Smart Agricultural Practices and have adapted to at least one or more smart agricultural practice (s)

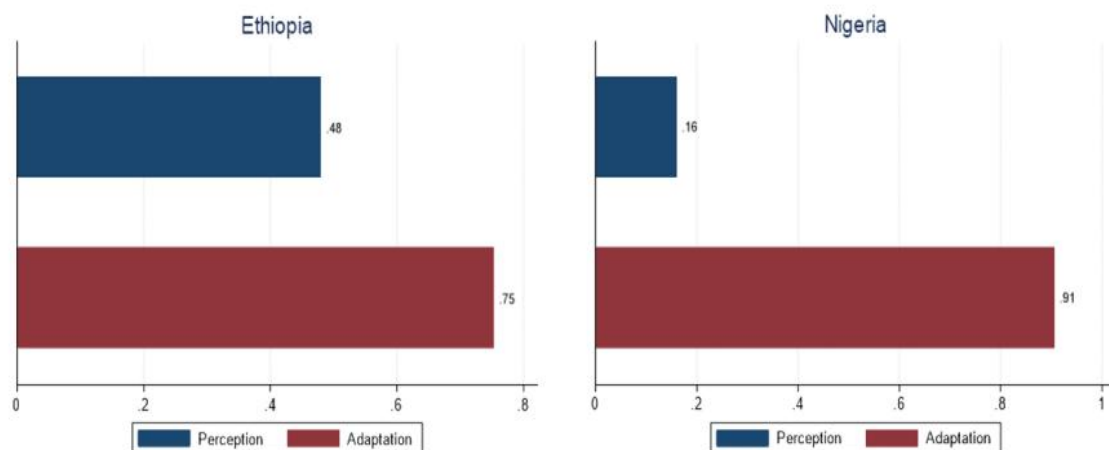


Figure 3: Farmers' perception and Adaptation of Climate Smart Agricultural Practices in Ethiopia and Nigeria

Table 2 showed that the most adapted CSA practices in the three countries were early maturing varieties with 20.99%, 14.14% and 26.23% in Ethiopia, Ghana and Nigeria respectively, implying that in the midst of climate change challenges, farmers need to go for early maturing varieties of crops. The implication of this review is that farmers in the selected countries (Ethiopia, Ghana and Nigeria) are aware of climate change and were both ready to adapt to climate smart agricultural practices.

Table 2: Climate Smart Agricultural (CSAs) Practices

Variable	Ethiopia(n=213)		Ghana (n=350)		Nigeria (n=293)	
	Freq	%	Freq	%	Freq	%
Drought tolerant Variety	30	12.34	37	10.05	34	11.15
Cover cropping	22	9.05	40	10.87	17	5.57
Inter-cropping with Legumes	36	14.81	65	17.66	50	16.39
Early maturing varieties	51	20.99	52	14.14	80	26.23
Irrigation Mgt	14	5.76	34	9.24	37	12.14
No burning crop residue	27	11.11	37	10.05	7	2.29
Crop rotation	35	14.42	65	17.66	23	7.54
Using Improved seeds	28	11.52	38	10.33	57	18.69
Total	*243	100	*368	100	*305	100

Source: Kassa and Abdi (2023); Atta-Aidoet *al.*,2022; Kalu and Mbanasor, 2023)

Note: *Multiple responses

Table 3 above revealed that the factors influencing the adoption climate smart agricultural practices in Ethiopia were educational level, Household Size and Farm Size, which were significant at ($P < 0.05$). The implication of this is that farmers with large household and farm size are likely to adopt new technologies than those with smaller sizes. This findings agrees with that of Goni *et al.*, (2024) who reported that educational level, farm size and household size had positive influence on adoption

of climate smart agricultural practices in Plateau State, Nigeria. In Ghana, Age, and Farming Experience were significant at ($P < 0.01$), and Farm Size, significant at ($P < 0.01$), while farm size and sex were significant at ($P < 0.05$) and ($P < 0.10$) respectively. In Nigeria, Age, Level of Education, Access to Credit and Farm size were significant at ($P < 0.5$) and ($P < 10$) respectively. The implication of this is that people who are educated or learned can make best decision to accept new technologies than those who are not. This is similar to the report of Taiwo *et al.*, (2025) who reported that educational level, farm size and age had influence the adoption of climate smart agricultural practices in Koumpentum, Senegal.

Table 3: Factors Influencing the Adoption of Climate Smart Agricultural Practices

Variable	Ethiopia Coefficient	SE	p>t	Ghana Coefficient	SE	p>t	Nigeria Coefficient	SE	p>t
Age	-.00579 ^{NS}	0.01942	.765	0.085697***	0.0222	0.0000	.0064**	.0023	0.005
Sex	.0221 ^{NS}	0.0881	.802	0.017260*	0.4056	0.0660	-.0154 ^{NS}	.0402	0.701
Farming Experience	.0765 ^{NS}	0.0791	.333	0.087116***	0.0200	0.0000	-.0003 ^{NS}	.0029	0.912
Level of Education	2093**	0.0870	.016	-0.051048 ^{NS}	0.0387	0.1870	.0113*	.0068	0.096
Household Size	0.0277**	0.0641	.045	-0.27906 ^{NS}	0.0658	0.6720	.0009 ^{NS}	.0075	0.908
Access to credit				-0.150782 ^{NS}	0.2405	0.5310	-.0873*	.0437	0.047
Farm Size	.2068**	0.2776	.002	-0.02006**	0.0449	0.0050	.0047*	.0027	0.085
Contact with EA	.1658 ^{NS}	0.2783	.551	-0.018090 ^{NS}	0.2964	0.9510	.0163 ^{NS}	.0429	0.704

Note: ***,** and* indicated Statistical significance at 1%, 5% and 10% respectively

Source: Kassa and Abdi (2022); Atta-Aidoo *et al.*, (2022) Kalu and Mbanasor (2023); Chavula *et al.* (2023); Alhassan and Haruna (2023).

CONCLUSION AND RECOMMENDATIONS

The Review concluded that the factors influencing the adoption of Climate Smart Agricultural Practices of farmers in the three Countries (Ethiopia, Ghana and Nigeria) were age, farming experience, farm size, level of education, household size and access to credit.

Based on the review, the following recommendations were made:

- Farmers need to sustain the various smart agricultural practices so as to curb the challenges of climate change in Ethiopia, Ghana and Nigeria.
- Private sector should be involved in establishing private extension services in other to educate the farmers on the effect of climate change and the importance of CSA practices.

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