Journal of Agriculture and Food Sciences
Volume 19, Number 2, October 2021, pp 30 - 42

EFFECT OF CLIMATE SMART AGRICULTURAL PRACTICES ON FARMING HOUSEHOLDS′ FOOD SECURITY STATUS IN IKA NORTH EAST LOCAL GOVERNMENT AREA, DELTA STATE, NIGERIA

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ABSTRACT
This study investigates the effect of Climate Smart Agricultural Practices on farming households` food security status in Ika North East Local Government Area, Delta State, Nigeria. The study utilized primary data. The data was collected using structured questionnaire. A three-staged sampling technique was used to select 140 respondents for the study. The data collected was analyzed using descriptive statistics, FGT model and logit regression model. The result of the study shows that majority of the farmers were aware of the CSA practices, and the following practices were the most utilized practices among the respondents; Agro-forestry, Crop rotation, Mixed cropping, Improved crop varieties, Intercropping, Compost making, Improved fallowing, Organic manure, Mulching and Cover crops. The headcount ratio showed a poverty head count ratio of 0.29, food insecurity shortfall 0.28, and food insecurity severity of 0.13. The regression result indicated age ($p \leq 0.05$), gender ($p \leq 0.01$), household size ($p \leq 0.01$), and years of farming experience were the major determinants of food security in the study area. The study concluded that though climate smart agricultural practices have positive coefficient but however not significant have the potential to enhance food security. The study also recommended that policy be put in place help confront the constraints being faced by the farmers from adopting CSAs in the study area.

Keywords: Climate Smart, Practices, Food security, Nigeria

https://dx.doi.org/10.4314/jafs.v19i2.4

INTRODUCTION
Climate change is recognized as one of the greatest threats to agricultural productivity in several regions of the world (Niang *et al*., 2014). Many developing countries are sensitive to climate change because they are located in the tropics, with temperatures that already compromise agricultural production (Kurukulasuriya, and Mendelsohn, 2006); Mendelsohn *et al*. 2006), and also they have limited access to the human and physical capital that might help mitigate its effects (Di Falco, 2014). Climate change is evolving as the most vital environmental challenging problem confronting the modern society. Climate is an important factor for agricultural productivity and any variation in these factors is bound to result in a larger impact on crop yield (Ashalatha *et al.,* 2012).

According to Muller *et al.,* (2011) most African countries are projected to be severely compromised by the effect of climate change. This is because most part of the region rely so much on rain-fed Agriculture which is affected by climate change (Cooper *et al*., 2008). Harvell *et al*., (2002) have shown that climate change would impact on agriculture along with high population growth with great implication on consumption pattern of people in the region. The world population is projected to be about 8 and 10 billion in 2020 and 2050 respectively (Serdeczny *et al.,* 2016). With such a population trend, agriculture will require a significant transformation to ensure adequate food supply for the growing population and meet the challenges of climate change (Kaczan *et al*., 2013). Integrating the effects of climate change into agricultural development planning is therefore a major challenge as climate change would likely leave many more people vulnerably to poverty.

Nigeria is highly vulnerable to the whims of climate change because of its long (800km) coastline which is prone to sea level rise and the risk of flood. Also it is at the risk of fierce storm and drought as a result of its closeness to desert lands up North (Apata, Samuel and Adeola (2009). Ayinde *et al.,* (2010) in a study showed that change in climate has significant effects on agricultural productivity in Nigeria. Another study on the impact of climate change on grain yields in Nigeria reveals that climate change through extreme temperature, frequent flooding, drought and increased salinity of water used for irrigation has become a recurrent subject of debate globally, (Ajetomobi *et al.,* 2010). However, the evidence of sudden increase in air temperature in Nigeria was observed as from the early 1970s until 2005. This abrupt increase could be linked to the effect of climate change and its associated global warming previously reported in Nigeria by Ikhile (2007) and supported by the global trend (IPCC, 2007).

The concept of Climate Smart Agriculture (CSA) offers a suite of approaches for transforming and reorienting agriculture systems to support food security in the face of climate change, by focusing on the potential synergies and trade-offs between agricultural productivity and food security, adaptive capacity, and mitigation benefits (Campbell et al.,2014). Incremental change may be inadequate to bring about the societal changes needed to mitigate and adapt to climate change and enhance food security (Biermann et al., 2012), particularly in the long term as the impacts of climate change become increasingly obvious (Rickards and Howden, 2012; Cooper et al., 2013). In addition, there is the need to move beyond small incremental changes, there is also a need to move from working small numbers of farmers to achieving outcomes among large portions of farming population, in efficient and effective ways.

Agriculture in Nigeria must undergo a major transformation in the coming decades in order to meet the intertwined challenges of achieving food security, reducing poverty and responding to climate change without depletion of the natural resource base. Climate smart agriculture include proven practical techniques like; mulching, intercropping, conservation of agriculture, crop rotation, integrated cop-livestock management, agro-forestry, improved grazing, and improved water management. Although there has been a rapid uptake of CSA by national organizations and the international community, implementation of the approach is still in its infancy and equally challenging partly due to lack of tools, capacity and experience in developing countries. CSA is still evolving and faces a number of challenges related to awareness, adoption, practice, conceptual understanding, policy, environment, social and economic issues. Observation shows that there is still limited in-depth understanding of the public on climate smart agricultural and especially among the rural people or communities (FAO, 2013). According to FAO (2010), CSA practices are seen as the means to achieve resilience at the same time reducing environmental degradation. There is paucity of literature on the possible effects of CSA practices farming households′ food security status, it is against this backdrop that this study seeks to examine the effect of the adoption of CSA practices on farming households′ food security in Ika North East local Government Area, Delta State, Nigeria. This study aimed to fill the identified gap in knowledge.

The adoption of CSA practices has the potential to significantly help increase farmers' resilience to climate change. Development experts and farmers would need this research as an agent of change and development to have better understanding adequate for proper actions. Furthermore, the results of the study will be used to provide reference for better understanding of the importance of practicing CSA by farmers. This will further help to inform policy makers and program designers on climate change response of agricultural systems in Delta State as well as Nigeria in general knowing fully well that early action in climate smart agriculture is essential to build up capacity, experience and guide future choices. The main objective of the study is to examine the effect of the adoption of climate smart agricultural practices on farming households` food security in Ika North East Local Government Area, Delta State, Nigeria. The specific objectives are to:

i. describe the socio-economic characteristic of farming households in the study area;
ii. identify the level of awareness and utilization of climate smart agricultural practices in the study area;
iii. examine the food security situation in the study area;
iv. examine the effects of the adoption of climate smart agricultural practices on farming households food security status in study area; and,
v. identify the constraints to climate smart agricultural practices adoption in the study area.

MATERIALS AND METHODS

The Study Area

The study was conducted in Delta State, Nigeria. The state was created on the 27^{Th} August, 1991and lies between Longitudes $5^{o}00$ and $6^{o}301$` North. It has a total land area of 17,440 square kilometers, about one-third of this is swampy and water logged (Delta State Diary,2003) and the area ranks 23^{rd} out of 36 states. According to National Population Commission (2006), Delta State has a population of 2,074,306 males and 2,024,085 females. Delta State consists of 25 Local Government Areas (LGA). The state is divided into three Agricultural Zones by Delta Development Program (DADP), these zones are Delta North, Central and Delta South agricultural zones with Agbor, Effuru and Warri as the headquarters, respectively. Delta State is one of the highest producers of crude petroleum products in the country with anticipated exploration, exploitation and regular gas flare. However, as with most part of the country, agriculture is the dominant aspect of the rural economy of the state. A lot of farming activities are carried out in the study area and these includes perennial crops and annual crops farming, livestock and fish farming.

Sampling Procedure

The population for this study comprises of farming households in Agricultural Zone in Ika North-East Local Government Area, Delta

State. A three -stage sampling method was used for the study. In the first stage, a purposive selection of Ika North East Local Government Area due to the pre-dominance of farming activities carried out in the communities. In the second stage, a random selection of four farming communities in the area. In the third stage, 35 farming households was randomly selected to give a total of 140 respondents for the study.

Method of Data Collection

Primary data was used for the study. The data was collected from the respondents with the use of structured questionnaire administered to farming households. The questionnaire was structured to help achieve the study objectives.

Analytical Techniques

The study data was analyzed using descriptive statistics, FGT model, logit regression mode and mean score from likert-type rating scale.

Objective one and two of the study was achieved using descriptive statistics, and Objective three was achieved using the Foster Greer Thorbecke (FGT) model. Objective four of the study was achieved using a Logit regression mode, while objective five using mean score from the Likert-type rating scale.

Food Security Status

The household food security was measured using household calorie acquisition adjusted for Adult Equivalent (A.E). From the estimates, households whose calorie consumption are greater than or equal to 2260 Kcal/AE will be categorized as food secure while those less were categorized as insecure (FAO, 2012).

FGT model is given as:

$$FGT = \frac{1}{N}\sum_{i=1}^{q}\left[\frac{z-yi}{z}\right]^{\alpha}$$

Where

y_i = calorie intake of each food insecure households

q= number of food insecure households

N= total number of size

z = minimum of requirements per day per adult equivalent (2100 kcal/AE)

α = weight attached to food insecurity (0,1 and 2 for poverty headcount, poverty gap and poverty severity respectively).

Logit regression model

The effect of adoption of CSA practice on farming household food security of the respondents was achieved using a logit regression model.

The generalized logit regression model is given as:

$$logit\,(P) = \log\left(\frac{p}{1-p}\right) = In\frac{p}{1-p}$$

$$logit\,(P(x)) = \log\left(\frac{p(x)}{1-p(x)}\right) = a_0+b_1x_1+b_2x_2+b_3x_3+\ldots b_nx_n+u$$

Where Y is binary dependent variable valued as 1 when household is food secure and 0 when is food insecure. Independent variables include the following:

X_1= gender of respondent (1=male, 0= female)
X_2= access to extension (1=access, 0= otherwise)
X_3= credit access (1=access, 0=otherwise)
X_4= educational status of respondent (non-formal, primary, secondary, tertiary)
X_5 = labour (naira)
X_6 = age of the respondent (years)
X_7 = farming experience of respondent (years)
X_8 = land ownership (1= owned, 0= not owned)

X_9 = off-farm income (naira)
X_{10} = Climate Smart Agriculture practices (number of CSA practices)

Results and Discussion

Socio- Economic Characteristics of Respondents

The socio-economic characteristics of the respondents examined were: age, sex, marital status, household size, educational level and farming experience, primary occupation, annual income, co-operative society and extension services.
Table 1 shows the mean age is 40 years implying that there were more economically active people who engage in agricultural activities in the study area. The result shows 60.71% of the respondents were males while 39.29% were females. This shows that majority of the rural farmers were males and this may be attributed to intensive labor requirement of farming activities and their easy access to farmland. Table 1 shows that the majority (64.29%) of the respondents were married. This implies that greater proportion of farmers in the area were married.

The result further indicates the household size of most of the respondents range from 4-6 members (55.71%), while the average household size was 4 persons. A large household increases a household's labor endowment. Also, the result shows that 28.57% of the respondents had no formal education, 15.71% had primary education and 20.00% had secondary education. The result of the study revealed that most of the respondents had some form of formal education. The result has implication for technology adoption. According to Henri-Ukoha, *et al.*, (2011) the level of education of a person not only increases his farm productivity but also enhances his ability to understand and evaluate new technologies. The educational level of a farmer typically correlates positively with the adoption of technological innovations because of the assumed link between education and knowledge accumulation and the farmer's capacity in decision making (Gebrehiwot and Van Der Veen 2013).

The result shows majority (66.43%) of farmers affirm to have not had contact with extension agent in the last 12 months, while the remaining 33.57% have contact extension agent. Regular contact with extension agents motivates and exposes the farmers to innovations and gives them information on how to use the technologies (Orisakwe and Agomuo, 2011).

Table 1 shows that majority (47.14%) of the respondent earned below ₦200,000 annually. The mean annual income was ₦256,123.60. This is in line with the report of Oluwatayo (2013) that respondents` income distribution was of low income group who might not be in position to readily afford or access new agricultural technology. Majority (57.55%) of farmers do not belong to cooperative society while the remaining 42.49% belonged. Cooperative societies play a very important role in the enlightenment of their members. Farmers who belong to such groups are easily enlightened and exposed to new farming technologies that will help boost agricultural production. Result shows that (32.14%) of the respondents were workers who receives salary, 27.86% were farmers, 16.43% engaged in other types of work such as catering, tailoring, driving e.t.c. 15.00% of the respondents were into trading (engaged in buying and selling of good).

Table 2 indicates that most respondents with 99.29% were aware of climate smart agriculture. According to Vera et al. (2017) and Teklewold et al., (2013), farmers enjoy more benefits when they adopt multiple strategies, as some of the strategies can be complementary to one another and enable the farmers to exploit relevant synergies. As a result, the adoption of multiple CSA practices helps in building a sustainable agricultural system that is very resilient to shocks which are related to climate change and other factors posing challenges to agricultural production. The result reveal that mixed cropping and mixed farming ranked both ranked 1st. Improved crop varieties ranked 3rd. Cover crop, mulching, intercropping, organic manure, compost making, crop rotation and agro-forestry ranked 4th, 5th, 6th, 7th, 8th, 9th, and 10th respectively.

The result of the study on the food security situation in the study area as presented on Table 3 indicated that majority (71%) of the farming households were food secure while only 29% were food insecure. Furthermore, based on the recommended daily calories intake of 2260 Kcal, the headcount ratio shows 0.29, with short fall index and severity of 0.28 (28%) and 0.13 (13%) respectively. The result revealed the head count ratio of 29%, the result also further revealed that the food insecure households fell short of the recommended calorie intake by 28% and core food insecurity of 13% respectively.

From the result in Table 4 it is noteworthy that the model was correctly estimated with chi^2 value of 98.50 overall, the model was significant at 1%. Four (4) out of the eight (8) explanatory variable included in the model significantly influence food security status of the households. These variables are; age, sex, household size and extension visit. The coefficient of age (β=-0.11) is negative but significant at $p < 0.05$ level of probability. This implies that a decrease in age of the respondents will lead to the likelihood of the household been food secure. This is in conformity with the a priori expectation. This result also agrees with the findings of Kayunze et al., (2017) who reported age to be negatively related with food security, and reported that households with older age are less food secure. Sex had a significant negative effect on food security. The coefficient (β=-3.11) of the variable was significant at $p < 0.01$ level of probability. This implies that the probability of food security decreases with increase in female headed household heads. That is, households heads that are male are more likely to be food secure than household with female. This result was not in conformity with that of Arslan *et al.,* (2014) who observed that female headed were more food insecure. Household size had a significant negative effect on food security. The coefficient (-0.97) of this variable was significant at $p < 0.01$ level. This implies that the probability of household food security increases with decrease in the household size of the respondents. That is, large household size is more likely to be food insecure than small household size. This result is in conformity with that of Idrisa *et al.,* (2008) who observed that the larger the household size, the more the household expenses, especially in a situation where majority of the household income is generated by only household heads. The coefficient (0.14) of farming years was positive and significant at $p < 0.05$ level. This means that the higher the farm experience, the more the likelihood of the rural households to be food secure. This is in conformity with Kayunze *et al* (2017) who observed that farming years has the potential to increase households' food security.

Constraints to Climate Smart Agricultural Practices by Crop Farmers

The mean score from the constraints confronting the ability of the farmers to adopt Climate Smart Agricultural practices in the study area is shown in Table 5.

The result shows that high cost of input (mean score = 2.83) was a very serious problem. Lack of access to agricultural credit (mean score = 2.79) was a very serious problem. Also, the result shows that high cost of production (mean score =2.69) was also a very serious constraint. Inadequate financial resources (mean score = 2.47) was rated as very serious constraint by respondents in the area. This implies that majority of the respondent do not have adequate financial resources to adapt CSA practices. This corroborates the report by Oyekale (2009), that small-scale farmers, having low resource base, are more vulnerable and less able to cope with the consequences of climate change.

Conclusion

The study assessed the effect of Climate Smart Agricultural practices on farming households` food security status in Ika North-East Local Government Area of Delta State. The major finding shows that climate smart agricultural practices has positive coefficient though not statistically significant. The result shows that CSA has a potential to enhance food security but probably needs to be combine in a manner to make it more effective.

Based on the findings of the study, the study recommends that farmers should be encouraged to combine CSAs as much as possible to reduce the negative effect of climate change and to have a higher effect on food Security status. The study also recommended that policy be put in place help confront the constraints being faced by the farmers from adopting CSAs in the study area.

REFERENCES

Adeoti, A.I. (2006). Farmers` Efficiency Under Irrigated and Rainfed Production System in the Derived Savanna Zone in Nigeria`. *Journal of Food and Agricultural Environment*, 4 (3 &4): 90-94.

Ajetomobi, J. O., Abiodun, A and Hassan, R. (2010). *Economic Impact of Climate Change on Irrigated Rice Agriculture in Nigeria*. Contributed Paper Presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, S. Africa, Sept.,19-23.

Apata T.G., Samuel, K.D. and A.O. Adeola (2009). *Analysis of Climate Change Perception and Adaptation among Arable Food Crop Farmers in South Western Nigeria*. Contributed Paper Prepared for Presentation at the International Association of Agricultural Economists' 2009 Conference, Beijing, China, pp. 1-5.

Arslan, A., McCarthy, N., Leslie L., Asfaw, S., Andrea, C and Misael, K. (2015). Climate Smart Agriculture? Assessing the Adaptation Implications in Zambia, *Journal of Agricultural Economics*, 1-29. doi: 10.1111/1477-9552.12107.

Ashalatha, K.V., Munisamy, G. and Bhat, A.R.S (2012). Impact of Climate Change on Rainfed Agriculture in India: A Case Study of Dwarwad. *International Journal of Environmental Science And Development*, 3(4):368-371.

Ayinde O.E (2010). Empirical Analysis of Agricultural Production and Climate Change: A Case Study of Nigeria. *Journal of Sustainable Development in Africa,* 12(6): 345-253.

Biermann, F and 32 Others, (2012). Navigating the Anthropocene: Improving Earth System Governance. Science 335, 1306-1307.

Campbell, B., Thornton, P.K., Zougmoré, R., Van Asten, P and Lipper, L (2014). Sustainable Intensification: What is its Role in Climate Smart Agriculture? Current Opinion in Environmental *Sustainability* 8, 39-43.

Cooper, P.J.M., Cappiello, S., Vermeulen, S.J., Campbell, B.M., Zougmoré, R and Kinyangi, J. (2013). *Large-scale Implementation of Adaptation and Mitigation Actions in Agriculture*. CCAFS Working Paper No. 50. Copenhagen, Denmark.

Delta State Diary (2003). Delta State Printing Press; pp.1

Di Falco, S. (2014). Adaptation to Climate Change in Sub-Saharan Agriculture: Assessing the Evidence and Rethinking the Drivers. *European Review of Agricultural Economics*, 41(3): 405-430.

FAO (2010). Climate Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation. Rome, FAO.

FAO (2012). Economics of Plant Genetic Resource Management for Adaptation to Climate Change. A Review of Selected Literature, by S. Asfaw & L. Lipper. (Available at http://www.fao.org /docrep/015/an649e/an649e00.pdf).

FAO (2013). Food Security Indicators. Food and Agriculture Organization of the United Nations. Rome, Italy.

Gebrehiwot, T. and Van Der Veen, A. (2013). Farm-level Adaptation to Climate Change: The Case of Farmer's in the Ethiopian Highlands. *Environmental Management* 52(1): 29-44.

Harvell, C.D., Mitchell, C.E., Ward, J.R., Altizer, S., Dobson, A.P., Ostfeld, R.S and Samuel, M.D (2002). Climate Warming and Disease Risks for Terrestrial and Marine Biota. *Science,* 296, 2158–2162.

Henri-Ukoha, A., Orebiyi, J.S., Eze, C.C., Akubude, F.C. and Ibitoye, S.J (2011). Demand for Institutional Credit from

NACRDB by Small Scale Farmers in Imo State, Nigeria. *International Journal of Agricultural Search, Sciences and Technology*, 1(2):83-87.

Idrisa, Y.l., Gwary. M.M and Shehu, H (2008). Analysis of Food Security Status among Farming Households in Jere Local Government of Borno State, Nigeria. *Agro-Science Journal of Tropical Agriculture, Food, Environment and Extension.* 7(3): 199 -205.

Ikhile, C. I (2007). Impacts of Climate Variability and Change on the Hydrology and Water Resources of the Benin-Owena River Basin. *Ph.D. Thesis Submitted to the Department of Geography and Regional Planning, University of Benin, Benin City, Nigeria*, pp 234-236.

Inter-Governmental Panel on Climate Change (IPCC) (2007). Fourth Assessment Report: Climate Change 2007 (AR4). Geneva: IPCC.

Kaczan, D., Arslan, A., Lipper, L (2013). Climate-Smart Agriculture, A Review of Current Practice of Agro-forestry and Conservation Agriculture in Malawi and Zambia; ESA Working Paper No. 13-07; Food and Agriculture Organization of the United Nations (FAO): Rome, Italy.

Kurukulasuriya, P and Mendelsohn, R (2006). *A Ricardian Analysis of the Impact of Climate Change on African Cropland*. CEEPA Discussion Paper No. 8. Centre for Environmental Economics and Policy in Africa, University of Pretoria.

Mendelsohn, R., Dinar, A and Williams, L (2006). The Distributional Impact of Climate Change on Rich and Poor Countries.' *Environment and Development Economics*, 11(2): 159-178.

Müller, C., Cramer, W., Hare, W.L., Lotze-Campen, H. Climate Change Risks for African Agriculture (2011). Proceeding of the National Academy of Science of the United States of America, 108(11), 4313–4315.

Niang, I., Ruppel, O.C., Abdrabo, M.A., Essel, C., Lennard, C., Padgham, J., Urquhart, P and Descheemaeker, K (2014). African Climate Change: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment; Cambridge University Press: Cambridge, UK; New York, NY, USA, pp. 1199–1265.

Oluwatayo, I.B (2013), Resource Use Efficiency of Maize Farming Households in Rural Nigeria. Evidence from Ekiti State., *World Journal of Agricultural Sciences*, 4(1), 91-99.

Oyekale, A.S (2009). Climatic Variability and its Impact on Agricultural Income and Households' Welfare in Southern and Northern Nigeria. *Electronic Journal of Environmental, Agricultural and Food Chemistry,* 8(1), 13-34.

Rickards, L and Howden, S.M (2012). Transformational Adaptation: Agriculture and Climate Change. *Crop and Pasture Science* 63(3), 240-250.

Serdeczny, O., Adams, S., Baarsch, F., Coumou, D., Robinson, A., Hare, W., Schaeffer, M., Perrette, M. and Reinhardt, J (2016). Climate Change Impacts in Sub-Saharan Africa: From Physical Changes to their Social Repercussions. *Regional Environmental Change.* 17, 1585–1600.

Teklewold, H., Kassie, M., Shiferaw, B and Köhlin, G (2013). Cropping System Diversification, Conservation Tillage and Modern Seed Adoption in Ethiopia: Impacts on Household Income, Agrochemical Use and Demand for Labor. *Ecological. Economics.* 93, 85–93.

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APPENDIX

Table 1: Socio-Economic Characteristics of the Respondents

Socio-economic characteristics	Frequency	Percentage	Mean/mode
Age			
20-29	7	5.0	
30-39	35	25.0	
40-49	35	25.0	
50-59	34	24.29	40 years
≥ 60	27	20.71	
Total	140	100	
Sex			
Male	85	60.71	
Female	55	39.29	
Total			
Marital status			
Single	22	15.71	
Married	90	64.29	
Widow(ed)	18	12.86	
Divorced	10	7.14	
Total			
Household size			
1-3	49	35.00	
4-6	78	55.71	4 persons
7 above	13	9.28	
Total			
Educational level			
Non-formal education	40	28.57	
Primary education	22	15.71	
Secondary education	28	20.00	
ND/NCE	27	19.28	
HND/First degree	23	16.43	
Total			
Extension service			
Yes	47	33.57	
No	93	66.43	
Total			
Annual income			
≤ 200000	63	47.14	
201000-300000	15	10.71	
301000- 400000	15	10.71	
401000-500000	17	12.14	
≥500000	27	19.29	
Total			

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Cooperative society		
Yes	59	42.49
No	80	57.55
Total		
Primary occupation		
Farming	39	27.86
Salaried	45	32.14
Trading	21	15.00
Craft & Artisans	12	8.57
Others	23	16.43
Total	140	100

Field survey, 2020.

Table 2: Climate Smart Agricultural Practices Utilized by the Farmers

CSA Practices	Frequency	Percentage	Rank
Awareness about CSA Practices			
Aware of CSA	139	99.29	
Not aware	1	0.71	
CSA Practices utilized			
Agro-forestry	38	27.34	10
Crop rotation	74	52.86	9
Mixed cropping	140	100	1
Improved crop varieties	138	98.57	3
Intercropping	128	87.86	6
Compost making	81	58.27	8
Improved fallowing	26	18.57	12
Organic manure	115	82.14	7
Mulching	133	95.00	5
Cover crops	135	96.43	4
Mixed farming	140	100	1

Source: Field survey, 2020.

***Multiple responses were recorded**

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Table 3: Indices of Farming Households Food Security

	Households		
	Food-secure	**Food insecure**	**All**
Percentage household	99 (71%)	41 (29%)	100
Daily per capita Calorie consumed	4079.90	1634.04	3604.09
Food security index (z)	1.96	0.72	1.60
Head count ratio (H)	0.71	0.29	
Shortfall index (P_1)		0.28	
Severity (P_2)		0.13	

Source: field survey. 2020.

Table 4: Effect Adoption of CSA on Farming Household Food Security in the Study Area

Food security	**Coefficient**	**Std. error**	**P > /z/**
Age	-.1057934	.0440518	0.016
Gender	-3.114827	.7360879	0.000
Household size	-.9722147	.2734742	0.000
Educational level	.1110799	.248611	0.655
Farming years	.1435878	.0615197	0.020
Extension visit	-.349462	.5379032	0.516
Last farming income	8.854e- 07	1.62e-06	0.597
No. of CSA practice	.0954333	.1778518	0.592
Constants	12.63805	3.75834	0.001
LR chi ^{2} = 98.50			
Prob > chi ^{2} = 0.000			
Pseudo R ^{2} = 0.5818			
Log livelihood = -35.406343			

Number of observation = 140 * = sig 5%, ***= sig 1%

Table 5: Constraints to the adoption of Climate Smart Agricultural practices

Constraints	Not serious	Serious	Very serious	Mean score
Lack of awareness of CSA practice	102	33	5	1.31
Poor extension service	51	74	15	1.74
Low dissemination of information on CSA options	54	71	15	1.72
Limited availability of equipment	80	45	15	1.54
Illiteracy of farmers	70	66	4	1.53
Limited availability of inputs	76	47	17	1.58
inadequate financial resource	7	60	73	2.47*
Poor technical capacity of farmers	67	50	23	1.69
Lack of access to agricultural credit	2	25	113	2.79*
High cost of improve crop variety	8	20	112	2.74*
Non-availability of farm labor	129	8	3	1.1
Lack of inadequate government policy	75	54	11	1.54
High cost of production	6	33	101	2.69*
Pest and disease	90	34	16	1.47
Shortage of labor	123	13	4	1.15
High cost of input	0	24	116	2.83*
Lack of improved storage facilities	91	27	22	1.51

Source: Field survey, 2020