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## CONSTRAINTS TO ADOPTION OF CLIMATE- SMART AGRICULTURAL PRACTICES BY YAM FARMERS IN EKITI STATE NIGERIA

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### ABSTRACT

The study examined the constraints to adoption of CSAPs by yam farmers in Ekiti State, Nigeria. A multistage-sampling procedure was used in selecting 150 yam-farmers and data were collected with the aid of questionnaire and interview-schedule. Both descriptive and inferential statistical tools were used. The result shows that available used CSAPs are crop rotation (84.7%), mulching (73.3%), early harvesting of yam (70.0%), planting of improved yam set (65.3%), planting cover crops and shade trees (59.3%) and early staking of the yam (58.7%). The majority (86.0%) were aware of CSAPs. The main source of information on CSAPs is extension workers (30.0%), Social Media (22.0%) as well as family members and Radio program (17.0%) among others. The adopted CSAPs are cultivating short-duration yam varieties, mulching, cover cropping, and crop rotation with adaptation index value (KAI) more than the grand index value (0.66 to 0.95). The Chi-square analysis between constraints to adoption and awareness of CSAPs shows a negative relationship with insufficient contact with extension on smart practices ( $\chi^2=-123.701$ ), high cost of implementation of climate smart practices on yam ( $\chi^2=-112.321$ ), lack of clear understanding of the smart practices on yam production ( $\chi^2=-57.649$ ) respectively among others at 1% significant level. Major constraints to adoption are inadequate extension services (0.34), inadequate training on CSAPs (0.29), Inadequate information on CSAPs or Inadequate credit and funding to adopt CSAPs (0.28) among others. It was recommended that all constraints to adoption of CSAPs be contained and mitigated while more awareness campaign on CSAPs be promoted to improved food security.

**Keywords:** Climate-Smart, Agricultural-Practices, Constraints, Yam-farmers, Ekiti

### INTRODUCTION

Agriculture is extremely susceptible to climate change effects since it is one of the key human activities dependent on weather patterns significantly. Agriculture contributes and suffered from unwelcome consequences of climate-change (Action Aid Nigeria, 2009) over time. Many of the current farming practices are harmful to the environment constituting the main cause of anthropogenic greenhouse gas (GHG) emissions. This poses extra encounter to agriculture, rotational planting and inappropriate animal wastes in nature (Önder et al., 2011). The influence of agricultural practices on the ecosystem is dependent on the varieties of practices used among farming folks around the world (Faleye and Afolami, 2020). Agriculture has the tendency to adjust to changing climatic condition to decrease emission among farming folks in Africa. Hence, sustainable approach to the practice of agriculture is pivotal among the farming communities (Garrity et al., 2010; Beddington et al., 2011). There has been development and promotion of several initiatives aimed at promoting sustainable agriculture over the last decades (Beddington et al., 2012) and emphasizes has been on agricultural practices that put

food security as a goal while also ensuring adaptation and mitigation against climate change.

Climate Smart Agricultural Practices (CSAPs) are the on-farm practices conceived by farmers out of their innovativeness or indigenous technical-knowledge (ITK) to lessen the negativities posed by climatic-variabilities on plants or animals to increase production and or productivity (Yiran and Stringer, 2017). These CSAPs include a list of organic agricultural-practices such as cover cropping, minimum to zero tillage, crop rotation, mulching, composting, solar powered greenhouses among others that assist in reducing the consequences of changing climate by giving a futuristic ecological health to soil, air, water and landscape for a sustainable-development in agriculture (Olorunfemi et al., 2020). Smart-Agricultural Climatic Practices consist of the use of ingenuities which upsurges resilience and stability in agriculture thus helping farmers adapt to changing climatic risks (Oladele, 2015; Olorunfemi et al., 2020). The significance of CSAPs in order to maintain farm productivity, needs thorough understanding by clientele to improve mitigation of the environmental impacts of changing climate for steady and or increased crop yield.

Many barriers to implementing these adaptation practices needs to be overcome by farmers, these includes but not limited to inadequate information on climate change characteristics, lack of financial resources, lack of local involvement in policy decision making and other climate information (Antwi-Agyei et al., 2015a; Yiran and Stringer, 2017). In addition to that, complexity and non-compatibility of some CSAPs to the policy, environment and economy of the clientele can also pose as obstacle to the narrow spread in Nigeria.

Yam is the leading staple food to the inhabitants of Ekiti state, valued for its significant cultural role and taste as a major delicacy processed to pounded yam in ceremonial occasions. Ekiti state is a major contact area in yam marketing in southwest Nigeria (Awoniyi and Omonona, 2006). Yam cultivation is a main source of food security and livelihood to the dwellers. Yam is exceedingly valued among the people but its cultivation is declining steadily, may be as a result of high incidence of post-harvest losses as a result of changing climate and field diseases, pest attack and yet the crop enjoys ready market demand in the state. However, as yam production is changing, the Ekiti man is changing in reaction to pressures from socio-economic and environmental pressures (Oluwasusi and Tijani, 2013). The unstable conditions of farming can thus, affect the overall productivity of farmers, make them abandon farming for some time, produce at capacities below their best or have little gains for their efforts. Climate variation already poses significant impacts on the agricultural sector and there has been little commitment to make adaptation a national priority in the country. The draw back in adaptation is attributed to low and poor scientific development as most development innovations are not built on indigenous knowledge of farmers, to provide for sustainability of new practices. The associated impacts of climate variation are predominantly negative, with the most severe impacts being experienced in vulnerable communities that accommodate the bulk of Nigerian farmers, practicing farming at subsistence levels with very weak capacity to adapt. Yam production and yield patterns are of economic importance to the livelihood of an average Ekiti farmer, as they have link with income generation and economic sustainability in rural communities in the state. However, understanding the climate smart agricultural practices deployed by these yam farmers is paramount in handling variation in weather condition across the state (Oluwasusi and Tijani, 2013). This study therefore contributes to filling this knowledge gap in the literature by assessing Climate Smart Agricultural Practices (CSAPs) used among yam farmers in Ekiti State, Nigeria for food security. The Specific objectives are to;

- examine respondents' awareness of Climate Smart Agricultural Practices;
- identify respondents' sources of information on Climate Smart Agricultural Practices;
- identify the climate smart agricultural practices by the respondents;
- determine the Adoption of CSAPs among respondents and;
- identify constraints to adoption of Climate Smart Agricultural Practices (CSAPs)

## **METHODOLOGY:**

### **Study Area:**

The Ekiti State lies entirely within the tropics. It is situated within longitudes 40°51' and 50°451' East of the Greenwich meridian and latitudes 70°151' and 80°51' north of the Equator. It lies south of Kogi and Kwara State, Eastward of the State of Osun and surrounded by Ondo State Eastward and in the south. It has a total land mass of 5887.890sq-km. Ekiti State has 16 Local Government Councils (1991 Census). The population of the State was 1,647,822 while the estimated population upon its creation on October 1st 1996 was estimated at 1,750,000 with the capital located at Ado-Ekiti. The 2006 population census by the National Population Commission put the population of Ekiti State at 2,384,212 people. The State enjoys a tropical climate with two distinct seasons. There exists the tropical Forest in the south, while the guinea savanna prevails in the northern peripheries. The main occupation of the people of Ekiti is agriculture, and it serves as the major source of livelihood for majority in the inhabitants therein. Agriculture offers employment and income for over 75% of the population in Ekiti State, Nigeria. Some of agricultural produce in Ekiti State are: Oil Palm, Kolanut, Cash crops such as Cocoa, Plantain, Cashew, Bananas, Timber and Citrus; Arable /Food Crops such as Cassava, Rice, Yam, Cowpea and Maize (Ekiti State Government, 2022).

### **Sampling Procedure and Sample Size**

A 4-stage sampling procedure was employed in selecting respondents for the study. The first-stage was a purposive selection of all the 3 ADP-Zones of the state due to the fact that yam farmers abound in all the ADP zones. At the second-stage a random selection of two local government areas from each of the three zones was done to obtain a total of 6 LGAs. At the third-stage a random selection of three communities each from the selected local

government areas was made, to make a total of 18 communities, while at the fourth-stage a random selection of nine yam farmers from each the selected communities were done to make a sample size of 162 respondents for the study. Data were composed using both questionnaire and interview schedules. Data were analyzed using descriptive statistics such as percentages, means score, frequency counts, figures and Tabulations. At the end of survey, a total of 162 questionnaire was administered and only 150 was recovered given a questionnaire rate of return of 92.6% hence analysis was carried out based on these numbers.

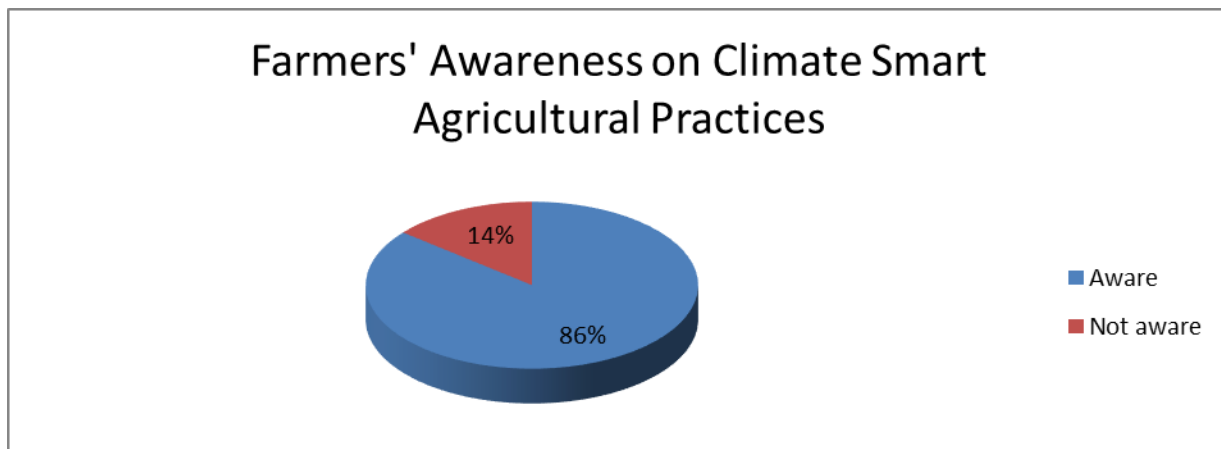
## RESULTS AND DISCUSSION

### Awareness of Climate Smart Agricultural Practices among Respondents

The awareness of climate smart agricultural practices (CSAPs) among yam farmers is depicted in figure 1. As

shown, majority (86.0%) of the respondents (yam farmers) were aware of the climate smart agricultural practices in coping with climate change and variations on their farming activities while small proportion (14.0%) claimed none awareness of the climate smart agricultural practices required. This is in line with the work of Opeyemi, et al (2021) who agreed that majority of the farming households were aware of climate smart agricultural practices in Delta State, Nigeria. Climate change is global issue throughout the world and there is need for more awareness and better understanding of the best agricultural practices in mitigating the results of the change. This is only possible if the clientele in agriculture are aware of the effects of the climate change in order to device some smart practices in containing and handling the conditions. This is in line with the work of Fawole and Aderinoye-Abdulwahab (2021) on climate smart agricultural practices to improving productivity in Nigeria.

### Distribution of the Yam Farmers based on Awareness of CSAPs



Source: Field Survey, 2024

**Figure 1: Awareness of Yam Farmers on Climate Smart Agricultural Practices (CSAPs)**

### Sources of Information of the Respondents on Climate Smart Agricultural Practices

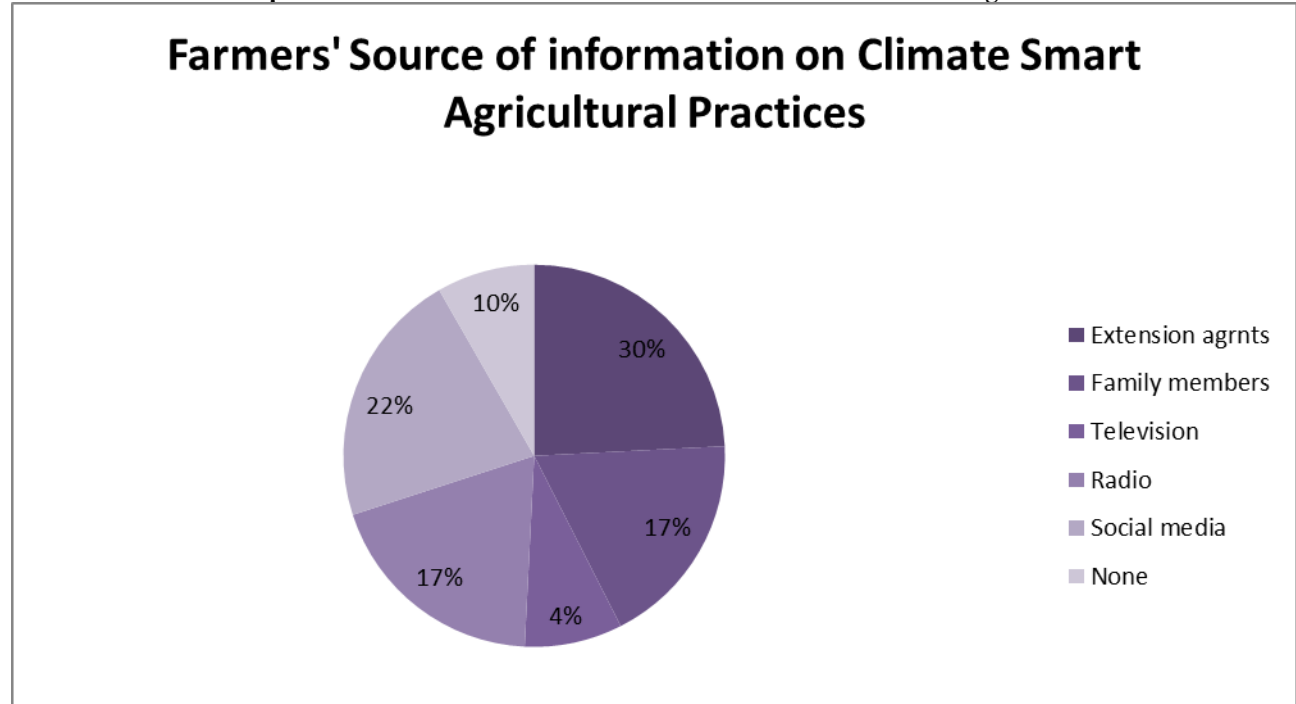
According to Figure 2 showing the distribution of the yam farmers based on sources of information on climate smart agricultural practices. It shows that the main source of information of the respondents on climate smart agricultural practices is extension workers (30.0%). This implies that the extension

component of the Agricultural Development Programme (ADP) of the state that is saddled with the responsibility of disseminating useful practices, innovation and improved technologies from the research to the farmers who are the end users is very proactive. This is in consonance with the work of Eta, et al (2022) who agreed that extensions agents are proactive in the dissemination of climate smart agricultural information to farmers in their study

area. This was followed by Social Media (22.0%). It implies that most of the respondents in the study area uses social media in getting information on agricultural best practices on climate change activities. Next to this are family members and Radio program (17.0%). That mean there is information flow from the informal channel of individual contacts within the study area. Also, radio is the cheapest means by which farmers receive information on agricultural best practices. This is in line with the

work of Aidoo and Freeman (2016) who posited that there is information flow in informal communication networks among farmers. Television was the least in getting agricultural information on climate smart practices to farmers probably because of its affordability, infrastructural problems like electricity, better signals amongst others. This is in line with Olorunfemi et al (2020) on climate change information among farmers.

**Distribution of the Respondents based on Sources of Information on Climate Smart Agricultural Practices**



Source: Field Survey, 2024

**Figure 2: Farmers’ Sources of Information on Climate Smart Agricultural Practices (CSAPs)**

**Available Climate Smart Agricultural Practices by the Respondents**

The respondents’ available climate agricultural practices in the study area is shown in Table 1. The result shows that the respondents have some climate smart agricultural practices used in coping and containing the changing climatic condition on yam production. These practices are crop rotation

(84.7%), mulching (73.3%), early harvesting of yam (70.0%), planting of improved yam set (65.3%), planting cover crops and shade trees (59.3%) and early staking of the yam to provide avenue for increased photosynthesis (58.7%). This is in congruent with the study by Oluwasusi and Tijani (2013) in their study on yam farmers in Ekiti State, Nigeria.

**Table 1: Distribution of the respondents based on available climate smart agricultural practices on yam production (n=150)**

Variables	Frequency	Percentage
Crop Rotation	127	84.7
Mulching	110	73.3
Early Harvesting of Crops	105	70.0
Planting of Improved Varieties of Yam Set	98	65.3
Planting cover crops and shade trees	89	59.3
Early staking of seedling	88	58.7

Source: Field Survey, 2024

### Respondents Adoption on Climate Smart Agricultural Practices

The adoption of the respondents is shown in Table 2. The knowledge adoption index is very important as this will give us the clear picture of the proportion of the respondents who adopted the available climate smart agricultural practices. Hence, the Knowledge-Adoption Index (KAI) is used in the study to understand the knowledge and adoption level of respondents under different Climate Smart Agricultural Practices (CSAPs). Lebesques's Dominant Convergence Theorem was used to find the sequence converges point (otherwise called mean value  $\bar{x}$ ). The KAI for each CSAPs practice (variables under consideration) was calculated based on the knowledge and adoption of the practice among respondents. The calculation was done from the below relationship. The grand total of the average value of the CSAPs represents the KAI value for decision making on the adopted CSAPs on climate smart agricultural practices in yam production.

$$KAI = \frac{fk+2 fa}{2N}$$

Where:

KAI=Knowledge-Adoption Index

fk= Number of respondents who only know but not adopt the smart agricultural practices

fa = Number of respondents who have adopted the climate smart agricultural practices

**Table 2: Distribution of the Respondents based on Adoption of Climate Smart Agricultural Practices**

Variables	Adopted	Not Adopted	Don't Know	KAI ( $\bar{x}$ )
Minimum to zero tillage	38	75	7	0.62
Crop rotation	109	11	0	0.95
Cover cropping	113	7	0	0.93
Mulching	70	41	9	0.75
Solar-powered greenhouses	0	81	39	0.33
Composting	21	72	27	0.47
Short-duration yam varieties	62	35	23	0.66
Integrated farming	45	55	20	0.60
Drought tolerant crops	35	84	26	0.55
Organic farming	10	84	26	0.43
<b>Mean score</b>				<b>0.63</b>

Source: Field Survey, 2024

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N= Total number of respondents under consideration in the study

### Adoption of Climate Smart Agricultural Practices

It can be deduced from the Table 2 that the grand total of all the knowledge adoption index ( $\bar{x}$ ) which is the adoption index to be used for judgement is 0.63. Therefore, values above the index value implies adopted smart agricultural practices while values below represent not adopted climate smart practices. The lowest to KAI value (0.33 to 0.63) were found in solar-powered greenhouses, organic farming, composting, drought tolerant crops, integrated farming; and minimum to zero tillage. These practices were not adopted by the respondents while the adopted practices were cultivating short-duration yam varieties, mulching, cover cropping, and crop rotation with KAI value more than the grand index value (0.66 to 0.95). Those none adopted climate smart agricultural practices may probably be because the respondents were not aware of those practices. Hence, they don't have knowledge of them and without knowledge there can be no adoption. Those practices adopted might be due to their awareness of those climate smart agricultural practices probably from the zonal extension agent in charge of the area. This is in congruent with the work of Fawole and Aderinoye-Abdulwahab (2021) on climate change on agricultural practices.

**The Relationship between the Respondents’ Constraints to Adoption of Climate Smart Agricultural Practices in Yam Farming their Awareness of Climate Smart Practices on Yam Production**

Chi-Square test of the association between constraints to adoption of climate smart practices and their awareness of climate smart practices among yam farmers is shown in Table 3. It shows that insufficiency contact with extension on smart practices ( $\chi^2=-123.701$ ,  $p<0.01$ ), High cost of implementation of climate smart practices on yam ( $\chi^2=112.321$ ,  $p<0.01$ ), Lack of clear understanding of the smart practices on yam production ( $\chi^2=57.649$ ,  $p<0.01$ ), Access to different varieties of yam that are climate friendly ( $\chi^2=-41.244$ ,  $p<0.01$ ), Socio-economic factors among yam farmers ( $\chi^2=109.743$ ,  $p<0.01$ ), Lack of technical know-how on CSAPs

( $\chi^2=-56.735$ ,  $p<0.01$ ), Inadequate information on CSAPs ( $\chi^2=-39.480$ ,  $p<0.01$ ), Lack of institutional support on CSAPs ( $\chi^2=54.911$ ,  $p<0.01$ ), Inadequate training on CSAPs ( $\chi^2=-136.491$ ,  $p<0.01$ ), and Cultural and religious beliefs of the study area ( $\chi^2=112.509$ ,  $p<0.01$ ) were constraints with significant association with awareness on climate smart practices among yam farmers in the study area. This implies that higher those positive significant factors of constraints the higher the constraints to adoption of climate smart practices. This finding is mirror to that by Akerele, Babayanju, & Oyebanjo (2020). Also the negative factors have inverse relationship which implies that the higher they are by 100% the lower the constraints to adoption by 50% and vice versa. Only Inadequate credit and funding to adopt CSAPs ( $\chi^2=11.178$ ,  $p<0.05$ ) was significant at 5%.

**Table 3: Chi-Square test of the constraints to adoption of climate smart agricultural practices and the awareness of climate smart practices**

Variables	Chi-Square	P-value
No/insufficiency contact with extension on smart practices	-123.701*	0.000
High cost of implementation of climate smart practices on yam	112.321*	0.000
Lack of clear understanding of the smart practices on yam production	57.649*	0.000
Access to different varieties of yam that are climate friendly	-41.244*	0.000
Socio-economic factors among yam farmers	109.743*	0.000
Inadequate credit and funding to adopt CSAPs	11.178**	0.004
Lack of technical know-how on CSAPs	-56.735*	0.000
Inadequate information on CSAPs	-39.480*	0.000
Lack of institutional support on CSAPs	54.911*	0.000
Inadequate training on CSAPs	-136.491*	0.000
Cultural and religious beliefs of the study area	-112.509*	0.000

\* Correlation is significant at the 0.01 level.

\*\* Correlation is significant at the 0.05 level

**Constraints of the Yam Farmers to Adoption of Climate Smart Agricultural Practices**

The respondents’ constraints to adoption of climate smart agricultural practices is shown in Table 4. It can be seen that the most severe constraints of the respondent on climate change in the study area is inadequate extension services (0.34±0.48). This implies that extension services with its responsibility of disseminating agricultural information to farmers is not living to expectation in the study area. This was followed by Inadequate training on climate smart agricultural practices (0.29±0.46) probably because farmers felt there is need for on the job training on

climate smart practices. There are also limitations in the areas of credit and funding, technical know-how on CSAPs, information shortage and lack of institutional supports on CSAPs (0.28±0.45). Socio-economic constraints which related to farmers’ personal variations is not left out as constraint (0.24±0.43) as well as high cost of implementation of CSAPs (0.23±0.42). This agrees with the submission of Olorunfemi et al (2020) who posited that the most severe constraints of farmers on information dissemination on smart practices is extension contact. This is in tandem with the submission of Ajieh and Okoh (2012) on the constraints to the implementation

of climate change adaptation measures by farmers in

Delta State, Nigeria.

**Table 4: Distribution of the Respondents based on Constraints to Adoption of Climate Smart Agricultural Practices**

Constraints	Mean ( $\bar{x}$ )	SD	Rank
Socio-economic constraints	0.24	0.43	4 <sup>th</sup>
Inadequate credit and funding to adopt CSAPs	0.28	0.45	3 <sup>rd</sup>
Lack of technical know-how on CSAPs	0.28	0.45	3 <sup>rd</sup>
Inadequate information on CSAPs	0.28	0.45	3 <sup>rd</sup>
Lack of institutional support on CSAPs	0.28	0.45	3 <sup>rd</sup>
High cost of implementation of CSAPs	0.23	0.42	5 <sup>th</sup>
Inadequate training on CSAPs	0.29	0.46	2 <sup>nd</sup>
Inadequate extension services	0.34	0.48	1 <sup>st</sup>

Source: Field Survey, 2024

### CONCLUSION AND RECOMMENDATIONS:

The following conclusions were made.

- The adopted climate smart practices are; cultivation of short duration crops, mulching, planting of cover crops and practicing crop rotation ( $\bar{x}$ =0.66-0.95).
- Majority of the respondents were aware (86.0%) of climate smart practices.
- Major constraints are inadequate extension services (0.34) and training on climate smart practices (0.29) amongst others.
- It was recommended that:

Other sources of awareness with wider spread should be used for information dissemination on climate smart practices to the respondents

- Extension services should be strengthened and made proactive to be able to live to expectation of spreading information smart agricultural practices.
- Periodic capacity building and advisory services should be done to assist the clientele to be abreast of current information on climate smart practices.

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