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Examining Climate Change Adaptation Measures And Limitations In Cocoa Producing Communities In Peje West Chiefdom, Kailahun District Eastern Sierra Leone.

Joseph Christain Adamu Mboma

Department of Social Studies (Geography & Environmental Studies Unit) Eastern Polytechnic, Kenema.

ABSTRACT

Cocoa production in Eastern Sierra Leone has and continue to experience a declining trend in cocoa producing communities over the recent past. It has been due to a number of factors in which climate change has been the leading factor. Cocoa farm communities came to accept the realities of climate change quite recently with a decline in production. This study therefore seek to examine adaptation measures used by cocoa farmers and limitations encountered in the selected communities. Interview guide and questionnaires were used to collect to collect data from the field. Data was also collected from Ministry of Agriculture station at the chiefdom headquarter town of Bunumbu and Kailahun Town, Environmental Protection agency (EPA) and tow (2) Cooperative Society (Muboa-Nga and Molehma Cooperative Societies in Bunumbu Town). Sixty-five (65) respondents (cocoa farmers) responded to the questionnaire in five (5) large cocoa farm communities. All the respondents claimed that they were aware of climate change impact on their cocoa plantation and therefore were using various adaptation measures though with a number of limitations. Climate change adaptation measures used by the respondents in the study communities ranges from planting hybrids cocoa seeds to application of climate change training information received from Ministry of Agriculture, Environmental Protection agency (EPA) and Cooperative Societies. Climate change adaptation limitations envisaged by respondents also ranges from limited or no access to climate change information in the study communities to unreliable weather forecast made by meteorological department in the capital Freetown. It was concluded that the respondents were using indigenous adaptive measures to combat adverse effects of climate change on their cocoa farms but were limited in some areas which led to low production. It was recommended that Ministry of Agriculture, EPA and Cooperative Societies improve on respondents' indigenous climate change adaptive measures by providing effective climate change training for them and at least establishing one meteorological sub-station for them in the district for regular and reliable weather forecast.

New words: Cooperative Societies, EPA, Adaptive measures, Indigenous Meteorological Prediction, Mercedes hybrid cocoa.

1.1 INTRODUCTION

Cocoa was first developed in many ancient South American cultures, with the Aztecs and Mayans being the most well-known of these indigenous populations. Theobroma cacao is a native to humid tropical regions of northern part of South America but some reports like that of Miranda (1962) postulated that it has its origin from Central America. Up to date there is still controversy about the origin and domestication of cacao in the world. Since the cocoa has appeared in different cultures worldwide for hundreds of years. According to Barley, B.G.D (2005), 'Ceylon Red', 'Nicaraguan Criolo', 'Forastero' cacao were brought over to Sierra Leone as plant stock whilst one thousand (1000) seeds of unknown DNA were also introduced in the country. The only country that does not produce cacao along the coast of West Africa is Benin where the Savana reaches down to the sea coupled with seasonal dryness of the climate which is unfavorable for its production. The other countries along the Guinea coast is favorable for the production of Cacao because it was once covered by forest (ECOWAS, 2007). Unfortunately, most of the forest areas has been harnessed to agriculture of various types including cacao farming. The produce Monitoring Board of Sierra Leone (PMB) traced the introduction of cacao to Sierra Leone much earlier than to other parts of West Africa by the Portuguese in the 15th and 16th centuries. It was estimated that in 1890, two hundred and two (202ha) or five hundred acres (500acres) was planted in Sierra Leone and three hundred and four Kilogram (304kg) of cacao beans were exported in that same year. PMB also outlined another way in which cacao was introduced in Sierra Leone; from the Gold Coast (presently day Ghana) in 1905 and was introduced at the Agricultural Experimental Station at Njala in 1912. Unfortunately seedlings raised from the 1912 introduction died because of drought. Climate change in IPCC usage refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer (IPCC, 2014). This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), where climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods. In this context, the IPCC definition is applied. Cocoa growing is focused primarily on the Kenema and Kailahun districts of the Eastern Province. Major area of cacao production is within the Kailahun District. According to the estimate of Ministry of Trade and Industry there are only 42,000 hectares of land to some degree, in the production of cacao compare to around 800,000 in Ghana which produces around 18% or more of the world's cacao supply (McCoy, Lee., 2015). This shows that since the introduction of cocoa tree in Sierra Leone, it has been mainly grown by smallholder farmers. Comparatively, in Latin America cocoa plantations are large (estates) and also in Ghana and Cote d'Ivoire in West Africa as outlined in the works of Clarence-Smith and Ruf (1996). Presently about two (2) Million smallholder farmers in West Africa depend on cocoa for their livelihoods. (http://www.cargill.com/connections/more-stories/help-for-westafrica-cocoa-farmers/index.jsp).

In Kailahun district small holder cocoa farmers depend on its production for their livelihoods. Cocoa production in Kailahun district has been faced with contending challenges ranging from old age cacao trees to relatively long dry seasons. This situation is not akin to cocoa producing regions of Sierra Leone alone as Wood and Lass (2001) postulated that most parts of West Africa cocoa belt experience a relatively long dry season as compared to other major global cocoa producing regions. Smallholder cocoa farmers are also plague with problems of not realizing attractive income from cocoa production due to low level of farm gate cocoa prices which limits them in affording durable but costly instruments, complete absence of technical assistance to cocoa farmers in most countries and more frustrating problem of climate change (Laderach et al., 2013). Climate change has been a shock to most cocoa famers in the cocoa producing district of Kailahun as they were unaware of its consequences on their production. The antecedents of drought, rainfall instability and extreme high temperature in some cocoa growing agro-ecological zones in the world have undermined cocoa productivity with prolonged impacts (Wood and Lass, 1987 and Jacobi et al 2015). Cocoa farmers in West African Cocoa producing belt lacks adequate climate change adaptation strategies and are often limited in areas of expanding their farms. Hutchins et al., (2015) postulated that cocoa farmers' lack of adaptation capability and institutional risk sharing mechanisms, is influenced by persistent sensitivity to unprecedented changes in some weather parameters. Cacao production in Kailahun District is still confined to crude methods with limited knowledge in climate smart cacao production. In the words of Kroeger et al. (2017), the initiative for promoting climate smart cocoa production is a move taking into consideration with strategic emphasis on the protection of forestland, increase cocoa productivity and above all improvement in cocoa farmers' livelihoods. Strengthening cocoa farmers' climate change adaptation methods and minimizing the limitations they are faced would not only increase their earning power but will promote environmental sustainability in cacao producing communities in the district.

1.2 CONCEPT OF CLIMATE CHANGE ADAPTATION

Adaptation according to IPCC (2001) is adjustment in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects or impacts. Their definition is borders around changes in processes, practices or structures to moderate potential threats or damages associated with climate change. Climate change adaptation is the process of adjusting to current or expected climate change and its effects (Gruneis et al., 2016). Adaptation aims to moderate or avoid exploit opportunities for natural systems; but without mitigation, adaptation alone cannot avert the risk of severe, widespread and irreversible impacts (IPCC AR5 SYR, 2014). Adaptation actions can be either incremental where actions are the central aim to maintain the essence and integrity of a system or transformational where actions that change the fundamental attributes of a system in response to climate change and its impact is enforced (IPCC, 2014). Various climate change adaptation can be distinguished including anticipatory and reactive adaptation, private and public adaptation and autonomous and planned adaptation (IPCC TAR, 2001). It should be borne in mind that adaptations has externalities. The work of Neil et

al., (2005) opines that adaptations at one scale can create externalities at other by reducing the adaptive capacity of other actors. This often shows in situations where broad assessments of cost and benefits of adaptation are examined at smaller scales. It is possible to see that the adaptation may benefits some actors while negative effect is envisaged by others. This study targets cocoa farm communities with private adaptation measures in Peje West Chiefdom, Kailahun District, Eastern Sierra Leone.

1.3 AIM & OBJECTIVES

Generally, this research aim at examining climate change adaptation measures and limitations in cocoa producing communities in Peje West chiefdom, Kailahun district Eastern Sierra Leone. Specifically, the objectives include examining various adaptation measures presently adopted and the limitations envisaged.

2.1 METHODS AND MATERIALS

MAIN CHARACTERISTICS OF THE STUDY AREA

Peje West Chiefdom is found in Kailahun District Eastern Sierra Leone. Kailahun District lies between latitude 8° 16' 48.792" N and longitude 10° 34' 18.512" W. The climate in the wet season is warm, oppressive and overcast while the dry season is hot, muggy and partly cloudy. The hot season last for 2.6 months with an average daily high temperature above 89°F and the hottest day is March 21st with an average high of 92°F and low 72°F. The cool season last 2.8 months with an average temperature below 83°F and the cool day is January 1st with an average low of 64°F and high of 87°F. Kailahun experiences extreme seasonal variation in monthly rainfall. The rainy period of the year last for ten (10) months with a sliding thirty-day rainfall of at least 0.5 inch and at most 17.7 inches. Rainless period last for two months. Kailahun experiences extreme seasonal variation in the perceived humidity as the muggier period last for ten (10) months. Similarly, the average hourly wind speed experienced significant seasonal variation of the course of the year. The windier part of the year last for 2.9 months with average speed of more than 5.5 miles per hour while the calmer time of the year last for 9.1 months. The soil is largely loamy with some pockets of sandstones and clay. Loamy soil is rich in organic matter and highly permeable and therefore supports cacao cultivation. Cacao needs such soil as is rich in nutrient, retains water and has good drainage.

2.1.2 METHODOLOGY

This study is a case study research design as it investigates an in-depth study of a particular research problem rather than a mere statistical survey or comprehensive comparative inquiry. It is often used to narrow down a very broad field of research into one or a few easily researchable examples. The main focus is to describe a situation in detail, identify key issues of the situation and analyze the situation using relevant theoretical concepts. Case study research design has advantage in that it provides detailed qualitative information and better still provides insight for further studies. However, the main drawback of a case study research design is that it is subject

to selection bias. The study was conducted among major stakeholders dealing with agriculture and climate change issues in Peje West chiefdom and by extension Kailahun district and cocoa farmers. They included Ministry of Agriculture and Food Security Staff, Environmental Protection Agency (EPA) and cocoa farmers in the chiefdom. Two sampling procedures was used to sample the respondents and study communities. The first was purposive sampling which was used to select study communities in the chiefdom due to the fact that it had all the variables needed for the completion of this study. Another sampling procedure used was random sampling to select respondents. From the random sampling, fifty-five (55) respondents were selected from the five sections thus; twenty (20) from Galama section (Kpejemboama community), fifteen (15) from Bunumbu Foiya section (Bunumbu 1), ten (10) from Kpindima section (Jekibu community), six (6) six from Kimaya section (Bunumbu 2), and Kpayawa section four (4) from (Kpejewa community). More respondents were collected from Galama section (Kpejemboama community) because it has large cocoa plantations comparatively to others. Five cocoa buying agents stationed permanently in the study communities were randomly selected (one from each section) and three (3) Ministry of Agriculture Staff and two EPA staff which totals ten (10). In total sixty-five respondents were selected in all. The selected respondents are permanent residents of the selected communities and had cacao farms/plantations. For data collection, two methods were used which includes desktop literature review and questioning comprising field work which employed questionnaires and discussions with stakeholders to obtain primary data from the respondents. Descriptive statistics was used to analyze the result in the form of frequency tables and percentages.

3.1 RESULT AND DISCUSSION

When asked whether respondents were aware of climate change impact in their communities, all of them indicated that they were aware. By implication, it shows that all respondents in the selected cocoa growing communities are aware of the impact on their cocoa farming activities. The impact is felt from the time of planting to the time of drying the beans. In all the five selected communities in Peje West chiefdom, respondents are of the view that climate change is God's plan to change nature and that it is bound to happen without man's control/intervention.

3.1.2 CLIMATE CHANGE ADAPTATION MEASURES USED BY RESPONDENTS ON THEIR COCOA PLANTATIONS IN PEJE WEST CHIEFDOM, KAILAHUN.

ADAPTATION MEASURES	STRONGLY DISAGREE	DISAGREE	NUETRAL	AGREE	STRONGLY AGREE
Planting hybrid cocoa seeds	-	-	2(3%)	8(15%)	45(82%)
Tree shade management	-	1(2%)	2(4%)	5(9%)	47(85%)
Applying climate change information	25(45%)	20(36%)	2(4%)	5(9%)	3(5%)

from local radio					
Change in planting and harvesting time	2(4%)	1(2%)	-	10(18%)	42(76%)
Removing black pods from the tree	25(45%)	15(27%)	2(4%)	5(9%)	8(15%)
Applying climate change training information from EPA, Cooperatives, Non-Governmental Organizations and Meteorological Station	15(27%)	12(22%)	-	10(18%)	18(33%)

SOURCE: Field Survey Data, 2021.

Table one: climate change adaptation measures used by cocoa farmers in Peje West Chiefdom, Kailahun district. The study communities had large cocoa plantation because the soils and climate conditions are favorable as they benefits from long wet season of nine to ten (9-10)months with average annual rainfall of approximately 100iches (Population and Housing Census, 2015) . Data gathered from the study communities indicated that they were all aware of climate change impact on cocoa production from the time of nursery to the period of drying and therefore were using various adaptation measures to cope though with outstanding limitations. The adverse impact of climate change on their production was attributed to God as being the sole controller of nature and hence had limited control. From data collected, 82% strongly agreed that they were engaged in planting hybrid cocoa seeds as one major adaptive measure and 15% agreed using the same measure but indicated that it was difficult to access due to financial constraints as it is sold at high prices though a few was supplied by only one Cooperative Society (Molehma Cocoa Farmers' Cooperative). There was large expanse of the new hybrid of Mercedes cocoa nursery site established by the Cooperative which was to be supplied to their customers. It was discovered that Amazon cocoa was supplied by both Ministry of Agriculture and Cooperatives in the study communities but the new hybrid of Mercedes was introduced in the communities by Molehma Cooperative Society. Discussions with Ministry of Agriculture Staff stationed in Bunumbu, Chairmen of the two Cooperative Societies (Molehma and Mubao-Nga Cocoa Cooperative Societies, and five (4) respondents with large cocoa farms disclosed that they were not aware of any climate change resistant cocoa hybrid and therefore were cultivating the available seedlings in the study communities. This is in support of the work of Zhang and Motilal (2016) who stated that there has not been any cocoa varieties in West Africa that is drought tolerant or any one that has been created by research in the West African region where genetic diversity of cocoa is relatively small. 3% took neutral position on the issue because they had neither used it as a measure nor have they access it. For the mere fact that majority agreed planting hybrid cocoa seeds as adaptive measure to climate change, it should be borne in mind that it has been effective regardless its accessibility and cost and it is worth to go by because they

are in majority. This new hybrid cocoa is planted more in two (2) sections Bunumbu Foya section (Covering from Bunumbu 2 environs up to Kigbai along Segbwema-Kono main route) and Golama section (stretching from Madina, Kpejembaoma, and Batiama environs). When asked as to whether they consider tree shade management as climate change adaptive measure on their farms, 85% of the respondents strongly agreed that they are presently using tree shade management on the cocoa farms and 9% also agreed using it as an adaptive measure to climate change on their cocoa farms. However, 4% took neutral position and 2% disagreed to the fact that tree shades was used on their farms as adaptive measure. The use of tree shade management as climate change adaptive measure on cocoa farms in the selected study communities was the right step because production of cocoa under full solar radiation is unsustainable as its affects the long- term productivity of the cocoa trees and hence decrease the fertility of the soil within a few years to come by. The advice by NAPA (2007) was in consonance with tree shade management by cocoa farmers in the study communities as they noted that the characteristics of the seasons in Sierra Leone have changed particularly the Harmattan period (dry season) in recent times as it is reported warmer than in the past. It was discovered that bulk of the tree shades species managed by cocoa farmers were economic trees such as those that provided fruits, food and timber (Terminalia ivorensis locally called Baji tree) for the farmer. This is in line with the work of (Beer, et.al., 1988), as they opine that shade reduces the stress on cocoa trees by improving climatic conditions and nutritional imbalances in the soil. Trees used as shades on cocoa farms as adaptive measures should be those that provide other benefits for the farmer such as food, fruits, timber and fuel wood because they serve farmer in other ways. This was also mentioned during discussion by Ministry of Agriculture worker and Cooperative Society Staff stationed at Bunumbu as a sustainable climate change adaptive measure undertaken by cocoa farmers in the chiefdom. During discussion, 45% of the respondents strongly disagreed that climate change information (on adaptive measures) broadcast on local radio station was applied on their cocoa farms as adaptive measures and 36% of them also disagree. Their disagreement was as result of the fact that they do not have radio neither do they listen broadcast message of climate change programmes from their neigbours. However, 9% of the respondents agreed and 5% strongly agreed that climate change information broadcast on local radio station was applied on their cocoa farms and it was fruitful. 4% of the respondents took neutral posture because they don't trust the information. The most dispiriting aspect of it is that adaptive capacity of small holder cocoa farmers in the study community is very low. Climate change information broadcast on local station in Kailahun (Radio Kenewa) hardly gets to indigenous cocoa farmers for example in hilly communities like Kpejembaoma, Batiama and Gandorhun and therefore they have resolved in making countless strides to adopt local innovations/technologies to cope. This has implication for poverty alleviation among rural cocoa farmers. When asked whether they have been removing black pods from cacao tree as an adaptive measure of climate change, 45% of the respondents strongly disagree and 27% disagree that they removed black pods on cacao tree as an adaptive measure but rather as a normal practice to give way to new pods. Majority indicated that they were not removing the pods as an adaptive measure because of ignorance as excessive

rain to them had nothing to do with fugus infection. However, 15% of the respondents strongly agree that removing black pods on cocoa tree was climate change adaptive measures used, 9% also agreed and 4% maintained neutral posture on the grounds that they were not doing it all. Black pod is caused by a fungus (Phytophthora) that spreads rapidly on the pods under conditions of excessive rain and humidity, insufficient sunshine and temperature below 20^{o}C (70^{o} F). This happens because of climate change and farmers have used removal method as local adaptive measure on their cocoa farms. The work of Dakwa (1977) is in line with the adaptive climate change adaptive method used by farmers in the study communities as it suggested that relative humidity is associated with the development of black pod disease across cocoa growing belt of West Africa. In actual fact, increasing black pod infestation is highly pioneered by high rainfall (humidity) on their cocoa farms. 33% of the respondents strongly agree that applying climate change training from EPA, Cooperatives, NGOs and Meteorological Station was used as adaptive measures while 27% strongly disagree. A good number of respondents claimed applying training knowledge and meteorological updates on climate because they were educated and had gained financial benefits while a considerable number of them strongly disagree because they did not comprehend the knowledge provided not alone to apply them due to lack of formal education. However, 18% of the respondents agree to have applied the training knowledge received while 12% disagree. There is a contest of agreement and disagreement because bulk of them disclosed during discussion that the training from Cooperative Societies, EPA, and Ministry of Agriculture were applicable but never trusted information from the Meteorological Department. This was because the daily update and predictions provided were not applicable in their communities and therefore depended on local/indigenous meteorological station. This was exemplified in the following indigenous meteorological predictions which have been observed over years and believed to be workable; dividing cloud with blue coloured sky in between signifies hot dry season and the appearance of cattle egret (Yoonegbei/Nikawoma Jinei in their local language-Mende) predicts that dry season is approaching. In the same vein, croaking of frogs and appearance of mushrooms and millipedes signifies the beginning of raining season. This was captured by Morlai, T.A et.al. (2001) who postulated that every traditional farm community in Sierra Leone operates the indigenous meteorological station and predicts the climate of their communities. There are little or no formalized documentations with regards to indigenous innovations and technology to adapt to climate change impact in Sierra Leone and therefore its usefulness is not appreciated.

3.1.3 LIMITATIONS TO CLIMATE CHANGE ADAPTIVE MEASURES USED BY COCOA FARMERS IN PEJE WEST CHIEFDOM, KAILAHUN DISTRICT.

LIMITATIONS	STRONGLY DISAGREE	DISAGREE	NUETRAL	AGREE	STRONGLY AGREE
Limited or no access to climate change information	-	2(4%)	-	20(36%)	33(60%)

Poverty	-	-	2(4%)	16(29%)	37(67%)
Unreliable weather forecast	-	2(4%)	-	13(23%)	40(73%)
Small number of cocoa farmers benefits from climate change training	-	2(4%)	3(5%)	8(15%)	42(76%)

SOURCE: Field Survey Data, 2021.

Table two: Respondents' limitations to climate change adaptive measures used on cocoa farms.

This area identifies and shows clearly respondent's limitations to climate change adaptation on their cocoa farms in the study communities. Data collected from the study communities indicated that 60% of the respondents strongly agreed and 36% also agreed that limited access to climate change information was one of the major limitations to climate change adaptive measures used on their cocoa farms. Bulk of the respondents claimed that they lack access to readily available climate change data in their communities because they However, 4% of the respondents indicated that they disagree. This was because they were the few educated and had gone through several trainings without disseminating the message to their colleagues. In the same vein, 67% of the respondents strongly agreed and 29% of them agreed that poverty was a limitation to climate change adaptive measures used on their cocoa farms while 4% of them took a neutral posture on the grounds that they were employed gainfully in government establishments like teaching, community health services and trade in local commodities other than cocoa farming. If thirty-seven and seventeen respondents totaling fifty-three agreed that poverty was imminent among them and therefore serves as a limitation to effective and appropriate climate change adaptive measures used by them, then it is worth to go by because they were in majority. During discussion, it was emphasized by Ministry of Agriculture, Cooperative Society and Dealers in cocoa (those who buy from the farmers) that the cost of hiring labour groups to work on the cocoa farms by cocoa farm owners for proper farm maintenance is a problem. Sometimes they involve themselves in huge loans and at the time of harvest they are worried as little or nothing will be left with them after they have repaid their debt. What compounds the problem much more is the age of bulk of cocoa farm owners who have large plantations as they were poor and were unable to pay for maintenance and hence are mostly indebted. Out of the fifty-five (55) respondents surveyed in the selected study communities in Peje West chiefdom, 73% strongly agreed and 23% agreed that unreliable weather forecast information received from Meteorological Station a major limiting factor while 4% of them disagreed. Bulk of the respondents consider weather information issued by the country's meteorological station as unreliable because it often fail them. During discussions EPA staff, cooperative Societies and cocoa farmers (respondents) revealed that there was no weather station in Kailahun District and many a time rainfall, sun's intensity and other climatic elements forecasted to be adverse for farmers in the district does not occur. This has implication on the dependence and validity of

weather information provided by the state Meteorological station to cocoa farmers in the study communities. This has link with the work of Yeboah (2017) who opines that there is lack of real access to reliable and usable weather data across Africa. Weather information is often unavailable and even if it exist, is inaccessible, of poor quality, unknown to those who need it most and above all unreliable. Cocoa farmers in the study communities often receive inefficient weather information on drought forecast, rainfall distribution and best outbreak and most often it turns out to be unreliable. This serves as a major limitation to climate change adaptive measures by used respondents which has led to low agricultural production and food insecurity. Cocoa farmers depends on indigenous meteorological predictions over the years and it has been effective while reservations has been raised about the reliability of weather information provided by the nation's meteorological department in the study communities. To support their reservations, Berkes, Colding &Folke, (2000) indicated that rural folks or farmers have fear knowledge about climate variability as part of their traditional ecological knowledge, acquired and transferred through generations. In the same vein, 76% of the respondents strongly agreed and 15% agreed that small number of cocoa farmers (respondents) trained in climate change issues is serving as a limiting factor to their adaptive measures used. This was supported during discussions by Ministry of Agriculture, EPA and Cooperative Society staff on the grounds that the number of field extension officers and EPA staff are too few to cover the large number of cocoa farmers in the study communities and that the Cooperative Societies in Peje West chiefdom (study community) are not well informed with issue and therefore also depends on the Ministry and EPA. However, 5% of the respondents took a neutral posture because they have not heard of such training neither have they been informed by their colleagues who have gone through the training and therefore is a limiting factor for them altogether. 4% of them disagreed on the grounds that they have benefitted from the training and are utilizing it.

4.1 CONCLUSION

In line with other studies, this study concluded that all the respondents are aware of various impact of climate change on the cocoa farms but have over the years used indigenous adaptive measures to withstand the adverse effects of climate change. The indigenous adaptive measures used had limitations which had impact on their production system.

4.1.2 RECOMMENDATIONS

From findings, the following recommendations are suggested: Government and partners to encourage local cocoa farmers by making sure that their adaptive measures be improved on to enhance effective result. This can be done through trainings and application of practical knowledge on demonstration cocoa farms by Ministry of Agriculture, EPA and Cooperative Society Staff. At least one meteorological station be established in the district which will be constantly updating cocoa farmers on reliable weather information.

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