
**KNOWLEDGE AND PRACTICE OF NIGERIAN METROLOGICAL AGENCY'S
SEASONAL CLIMATE INFORMATION ON MAIZE PRODUCTION AMONG
FARMERS IN ONDO AND PLATEAU STATES, NIGERIA**

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Abstract

The study assesses the Knowledge and Practice of the Nigerian Meteorological Agency's (NiMet's) seasonal climate information on maize production among farmers in Ondo and Plateau States, Nigeria. The study's objectives are to ascertain if climate information by NIMET increases maize production among farmers in Ondo and Plateau States and the types of seasonal climate information released by NiMet on maize farming. The other objective is to determine the challenges of climate information uptake by maize farmers. The study uses the diffusion of innovation theory. It adopts the mixed methods research approach and employs the questionnaire and key informant interview as instruments for data collection. A total of 120 respondents participated in the study. The respondents were selected using purposive, snowballing, and availability sampling techniques. Findings show, among others,

that seasonal climate information by NiMeT does not increase maize production among the farmers. The study thus recommends that the government should initiate programmes that will encourage farmers to break up from their held-on/traditional beliefs regarding how maize is cultivated.

Keywords: Climate Information, Diffusion of Innovation Theory, Maize Production and NiMet

Introduction

In order to achieve impactful climate information, the United Nations Development Programme (UNDP) and its partners are constantly working around the globe to deepen climate information uptake and early warning systems. This is an effort to support farmers in changing the manner in which they cultivate, manage, gather, and market their produce. Collection and dissemination of climate data such as temperature, precipitation, wind, and humidity, among other variables, is known as “climate information”. Climate data can help farmers in communities that are prone to floods, droughts, extreme weather events, rising temperatures, and other climate consequences (UNDP, 2020). The precise date to plant depending on soil moisture content, whether to submit an application, whether to expect harvest (in the event of a forecast of rainfall), irrigation management, and other operational decisions are all made using climate information (Food and Agricultural Organisation, 2019). Farmers today must have access to and utilize viable climate services in order to manage climate risks and utilize climate resources effectively. This will allow them to maximise problems brought on by unfavourable weather. In order to manage climate uncertainty at the local level, new strategies and techniques are needed. One such strategy is to increase household food security by giving smallholder farming communities climate information that is specifically tailored to their needs (FAO, 2019).

In spite of temperature variations, the frequency and severity of extreme weather, which have a considerable impact on crop yields in the United States, excessive rainfall combined with poorly drained soils considerably reduces maize production in cooler regions (Rothman, 2021). However, in the United States (US), crop production has significantly increased due to adequate Utilization of climate information (Rothman, 2021). In Korea, the 2016 and 2017 climate conditions had a negative impact on crops like rice, apples, and vegetables. Crop production did, however, grow in 2018, 2019, 2020, and 2021 due to a vigorous drive to use climatic information (National Academy of Agricultural Science, NAAS, 2021). Similarly, 90% of the farmers in South Africa who participated in a study by Thinda (2021) on the

distribution of climate change adaptation tactics employed by farmers identified a lack of climate knowledge as a major barrier to the adoption of climate change adaptation. In the same vein, 74% and 77% of the farmers indicated a lack of capital and knowledge of agricultural production, respectively, as important constraints to the adoption of adaptation strategies.

In Nigeria, the considerable fluctuation in rainfall and temperature distribution in the regions has posed a significant limitation for the agriculture sector, primarily rain-fed (Audu, 2012). Rainfall in Nigeria affects maize output in many ways and to different degrees across the country (Ntat, 2018). In their study, Ammani, Ja'afar, Aliyu, and Arab (2012) discovered that drought stress causes an estimated 80% of the maize crop to experience periodic production decreases. Ater and Aye (2012) asserted that farmers who employ climate information have not completely reaped their benefits. This could be due to a number of reasons, such as cognitive difficulties in receiving or understanding climatic information and the capacity and willingness of decision-makers/ farmers to modify actions (McIntosh Pook, Risbey, Lisson & Rebbeck, 2007; Pulwarty, Olanrewaju & Zorba, 2009).

In order to mitigate this, the Federal Government of Nigeria, in June 2003, set up the Nigerian Meteorological Agency (NiMet). The Agency's basic functions include advising the government on aspects of meteorology, computing and interpretation of data to aid good policy making, assistance in the field of aviation through en route and destination of weather forecasts and trends, and terminal aerodrome. Others include updating the citizens on weather forecasts and predictions, disaster and environment management, and providing weather and climate services to farmers, herders, and fishermen to promote sustainable agricultural development, increase productivity and contribute to food security in Nigeria (NiMet, 2021). However, one critical question that needs to be answered is: To what extent has NiMet's climate information affected maize production in the country? Thus, the crux of this study is to assess the Nigerian Meteorological Agency's seasonal climate information on maize production in Ondo and Plateau State, Nigeria.

Objectives of the Study

- i. To ascertain if climate information by NIMET increases maize production among farmers in Ondo and Plateau States.
- ii. To find out if the maize farmers are aware of seasonal climate information released by NiMet related to maize farming.
- iii. To ascertain the types of seasonal climate information released by NiMet on maize farming.
- iv. To examine the challenges of climate information uptake by the maize farmers.

Conceptual Clarifications

Climate Information

According to the World Meteorological Organisation (2020), climate information is the communication of messages to the public about the various weather conditions. National Centres for Environmental Information (2022) describes climate information as the supply of current environmental information about temperature, precipitation, storms, snow, wind, drought, wildfire and other weather patterns and providing historical incidents to the people. The West Africa Biodiversity and Climate Change (2021) states that climate information is passing information to the public about the state of the atmosphere at a given time and place regarding temperature, air pressure, wind, humidity, cloudiness, and precipitation.

According to Lugen (2017), climate information is the communication of information concerning different variables such as temperature, humidity, precipitation, winds, radiation, and other meteorological conditions to assist decision-making by individuals such as farmers. For this study, Lugen's (2017) definition has been adopted.

Review of Empirical Studies

This segment of the study focuses on global and local review of studies on climate information. To begin with, Measham et al. (2011) researched: "Adapting to Climate Change through Local Municipal Planning: Barriers and Challenges". The study pointed out that the

inadequacy of information is a major barrier to climate change adaptation, planning, and implementation. The study suggested that the farmers must feed frequently with climate-related information that tends to affect their crop production. Srinivasan et al. (2011) studied the topic "Climate Information Requirements for Community-Level Risk Management and Adaptation". The study made use of a survey, focus group, and in-depth interview methods for data collection. It found that from the point of implementation, field progress is rather slow despite the seeming concern by experts and policymakers to connect service providers and users in an end-to-end climate information generation and application system. Other studies like that of Changnon (2014) on the topic: "Improving Outreach in Atmospheric Sciences: Assessment of Users of Climate Products," acknowledged the difficulty illiterate users face in understanding climate information. The study revealed that the intensive use of extension services in educating the farmers on the need to use the information they receive from experts regarding climate-related issues is highly important. Patt and Gwata (2002) in the Effective Seasonal Climate Forecast Applications study: Examining Constraints for Subsistence Farmers in Zimbabwe. Findings revealed that subsistence farmers often preferred traditional farming methods based on their personal experiences with less or no recourse to available climate information.

Antwi-Agyei, et al (2014) conducted a study on "Livelihood Adaptations to Climate Variability: Insights from Farming Households in Ghana". The study found that, a considerable percentage of its population (about 45%,) who are engaged in small- holder farming in the rural areas are mostly illiterate. The study recommended aggression education and sensitization so that the farming population will know the importance of imbibing climate information services sent to them. The study concluded that farmers make little use of climate information in decision making because the current channels of communicating climate information are unsuitable for the illiterate population. Skolniko (1999) corroborates the above in his study on the topic: "The Role of Science in Policy: The Climate Change Debate in the United States." Aside from farmers' illiteracy, the adherence to climate information may be influenced by other competing factors like held belief in traditional farming methods by

farmers and too much political influence in disseminating climate information, among others. Where farmers consider these competing factors to be more important than the available climate information, there is a high inertial response and vice versa. Devereux's study in (2009) also supports the above authors finding. Devereux researched the topic, "Why does Famine Persist in Africa?" The study established that an example in history is drought in the Ethiopian highlands in the year 2000, before donor countries gave early warning signals in 1999. However, this information could not help mitigate the food crises because the farmers were hopeful that the aid given by donor countries could be used as leverage to stabilise the effect of the drought (Devereux, 2009).

Olunanjo and Alade (2018) conducted a study on "Effect of climate variability on the yield of crops in Ondo State, Nigeria". The study used both quantitative and qualitative approaches, and the period was between 1996-2014. The results showed that the rainfall range for the nineteen years was 1013.08 mm, the temperature range was 5.14°C and the relative humidity range was 11.55%. Variations in rainfall, temperature and relative humidity were found to have effects on cassava, yam, pepper and tomatoes yield by 20.7, 18.6, 26.8 and 15.5%, respectively. It was recommended among other things that the extension agents should work with the Nigeria meteorological agency to advice farmers in the State in order to use a cropping calendar in accordance with the weather forecast since temperature, rainfall and relative humidity had little effect on cassava, yam, pepper and tomatoes yield in Ondo State. A repetition of this kind of study today would determine whether their findings are valid or not. As such, the present study focuses on climate information and agricultural development in Nigeria, with maize production as a specimen as imperative. Sufiyan, et al. (2020) carried out research on "Effect of Climatic Variables on Agricultural Productivity and Distribution in Plateau State Nigeria". The study focused on millet, groundnut, and guinea corn (sorghum). The study found that rainfall has the highest correlation with 0.987 while the impact of temperature based on the Pearson rank correlation has 0.853. It recommended the application of the coefficient determination, which will provide individual crop yield based on its relationship with the independent variable.

Oyinbo, Rekwot and Duniya (2014) conducted a study on “Rainfall Pattern and Agricultural Production in Nigeria: Implication for Food Security”. The study employed time series data on rainfall and agricultural production index in Nigeria from 1970 to 2008. The data were obtained from various publications of the Central Bank of Nigeria and the Nigerian Meteorological Agency. Findings indicated a unidirectional causality from rainfall pattern to agricultural production at 5% probability level and this implies that rainfall pattern was significant in influencing agricultural production over the period under study. The study concluded that changes in rainfall resulting from climatic variables are a key determinant of agricultural production and, invariably, food security attainment. It was recommended that adaptation measures to changing rainfall such as investment in irrigation drought tolerant crop varieties, among others should be encouraged amongst farmers especially small scale farmers who are responsible for the bulk of agricultural production in Nigeria. The period of the reviewed study is a gap that needs to be filled, as such, the current study will give room for validation and revalidation of their study. Tunde (2021) researched on “Perception of Climate Variability on Agriculture and Food Security by Men and Women Farmers in Idanre L.G.A, Ondo State, Nigeria.” The descriptive statistical techniques employed were employed. The findings showed that climatic variables affect both men and women farmers’ productivity. 60% are male while 40% are female. 47% of the respondents perceived climatic variability as delayed in rainfall, 22% perceived it as high temperature, 6% says it is flood, 3% sees it as unusual rainfall while 22% perceived it as undefined season. It also found that both gender do not have the same adaptive capacity, women (100%) are more vulnerable to the impact of climate variability despite the fact that they play an active role in adapting to its impact to secure food in the study area. The analysis further revealed that 62%, 50%, 66%, 90%, 34% and 32% of the variance in cocoa, cocoyam, sweet potatoes, maize, yam and cassava can respectively be explained by the climatic variables examined. The study equally found that rainfall is highly correlated with cocoa (0.534), cassava (0.481) and maize (0.822). Maximum temperature is highly correlated with cocoyam (0.660) and sweet potatoes (0.412). Minimum temperature is highly correlated with all the crops while relative humidity is negatively

correlated with all the crops. These affect the farmers' crop yield in the study area. The study recommended that both genders grow crops more resilient to weather changes and practice afforestation.

Tejidini and Oyekale (2015) conducted a study factors explaining farm households' access to climate change information in Ilorin west local government area of Kwara State, Nigeria. Using the survey design, and multi-stage sampling procedure, the outcome of the study revealed that 97.92% of the farmers already noticed climate change with 79.17% experienced flooding, 61.46% experienced some losses on their farms as a result of flooding. Also, 87.5% indicated that seasonal temperature had increased over time, while 83.3% claimed that seasonal precipitation had decreased and 91.7% hinted that seasonal timing of rain was early, as well as factors that influenced access to climate information were livestock/crop farming, use of hired labour, awareness of climate change, water scarcity, change in level of inputs, lack of climate information adaptation. The research concluded that climate change and lack of usage of climate information remain a problem to farmers in Ilorin. It was recommended that efforts to enhance farm households' adaptation to climate variability should be strengthened with commitments to integrate adaptation mechanisms into the extension service delivery systems.

Ater and Aye (2012) did a study on topic, *Economic Impact of Climate Information on Nigerian Maize Sector*. Data were collected on temperature, precipitation, soil, maize revenue, socioeconomic characteristics and adaptation strategies to varying climate factors being disseminated to the maize farmers using the survey method. The findings of the study revealed that net maize revenue per hectare is sensitive to adaptation of climate information. The study also found that inadequate information from climate-related information agencies and insufficient Utilization of the little information that maize farmers receive from these agencies are causing dwindling maize outputs in the country. Ammani, Ja'afaru, Aliyu and Arab (2012) conducted research on: *Utilization of Climate Information and Maize Production: Empirical Evidence from Kaduna State, Nigeria*. Survey research method was adopted. The study found that an estimated 80% of the maize crop suffers periodic yield

reduction due to drought stress, which the researchers found to be lack of climate information and adaptation problem from the maize farmers. Inadequate information and utilization of climate information by maize farmers regarding drought at flowering and grain filling period was also found to cause losses of 40-90%. The study also found that there was increase in maize production and fertilizer usage among the farmers due to the messages they get from extension agents.

Ezeaku, Okechukwu, and Abaa's (2014) study centred on climate change effects on maize (*zea mays*) production in Nigeria and strategies for mitigation. The result showed that the predicted maize yield at current level decreased with increase in temperature in all the agro-ecological zones. The reduction in yield was more pronounced in the humid forest and semi-arid agro-ecological zones with 18% and 13% yield reduction, respectively while the least was observed in the derived and southern guinea savannas with 7% yield reduction. Doubling the current level of showed increases in yields at low temperature change of between, but the yield was consistently reduced in all the zones with higher temperature changes of between 3-4oC. The study, however, found that the best strategies to mitigate the effects of climate change on maize production is increased climate information by agencies concerned and adaptation of the information communicated by maize farmers.

Theoretical Framework

The study was anchored on the Diffusion of Innovation Theory. The Diffusion of Innovation theory was propounded by B. Ryan and N. Gross in 1943, cited in Bwakan (2020) and 13 years after, Everett Rogers cited in Bwakan (2020) further injects more ideas into the theory. The focal point of the theory is the dissemination of new innovations, ideas, products or positive agricultural development programs and policies. The model identifies several factors that influence how quickly an idea or behaviour can be adopted. The adoption of the new idea or behaviour depends on the characteristic of the innovation and the communication channels (in this case, the climate information communication channels).

The theory identifies five factors that influence how quickly an idea or behaviour can be adopted. The factors include:

1. Relative Advantage: The degree to which an innovation is seen as better than the idea, programme, or product it replaces.
2. Compatibility: How consistent the innovation is with the values, experiences, and needs of the potential adopters.
3. Complexity: How difficult the innovation is to understand and/or use.
4. Trialability: The extent to which the innovation can be tested or experimented with before a commitment to adopt is made.
5. Observability: The extent to which the innovation provides tangible results.

The theory is thus found suitable for this study because sensitisation campaign for better agricultural output in Nigeria is carried out through climate information agencies aimed at farmers in the country. In other words, the new innovation and other climate related information that will affect crop production in the country either positively or negatively are communicated.

Methodology

Qualitative and quantitative research strategies were used to collect data for the study. The purpose of adopting the mixed research approaches includes:

- i. To complement the lapses of one approach by the other. For instance, the qualitative research gives avenue to probe deeper areas where the quantitative could not address.
- ii. Qualitative research approach equally allows participants ample liberty to describe their feelings in their own words and possibly in their local dialect, but with few number of participants, the quantitative approach reaches out to a large number of populations and confines them to already structured options to choose from.
- iii. Findings from qualitative and quantitative data sources can be compared after collecting both types of data. Meaning, the results can be analyzed through side-by-side discussions.

- iv. Another reason for adopting the mixed approaches is because the result of one approach can be used to help develop bridge the gap of the other. That is qualitative and quantitative research strategies can validate each other and create a solid foundation for drawing conclusions on evaluations.

Furthermore, survey and key informant interviews were employed. The survey was considered important due to the arguments put forward by scholars such as Barbie (2001, p. 259) who emphasizes the value and importance of survey when he notes that “survey is probably the best research method available to the social scientist interested in collecting original data for the purpose of describing a population too large to be observed directly. Also, the key informant interview assumed importance in the study because it enabled the interviewees to provide answer based on their knowledge of the subject of investigation, as well as it paved way for the researcher to probe further and get the responses that were not captured in the survey.

Under the quantitative method, open and closed-ended questionnaire technique was adopted. Due to the nature of the most of the respondents (farmers), the researchers employed the use of research assistants who interpreted the questions in Yoruba and Hausa languages. Interview guide was adopted for the qualitative data collection. The study population consists of maize farmers in Mangu, Plateau State and Ifedore Local Government Areas of Ondo State. The choice of these states (Plateau and Ondo States) was based on reports by Nigeria’s Federal Ministry of Agriculture and Rural Development (2020) that generally, there was less rainfall in 2020 than 2019 in Southwest and North Central, Nigeria. Also, the researchers chose these States to represent South and Northern regions of the country. Further, the researchers selected these Local Government Areas purposively because they are among the major maize producing local government areas in the two states (PwC Report, 2019). In addition, five communities were selected each in the studied local government areas through snowballing sampling. The communities selected in these local government areas for Ondo State were Igbara-Oke, Ibule, Ilara-Mokin, Ijare and Ipinsa in Ifedore LGA; while Panyam, Pushit, Kerang, Mangu-Halle and Daika in Mangu LGA. The use of snowball sampling was because

it was difficult to assemble the respondents in one place, as well as it was suitable for knowing the next dominant maize farming communities in the LGAs studied.

There was no available data as to the total number of maize farmers in the selected communities. So, the researchers selected 10 farmers in each community through availability sampling method. In all, the total population for the quantitative aspect of study is 100.

Furthermore, two interviews were conducted in each selected community through purposive sampling, making a total of 20 interviews. Purposive sampling was relevant because the researchers wanted in-depth information from opinion leaders and farmers who are more knowledgeable and familiar with farming and information about seasonal farming information they receive from NiMeT. The overall total population is 120. On method of data presentation and analysis, descriptive statistics through the use of, tables, frequencies and percentages were used for quantitative data. Also, mean deviation of five-point Likert scale and the criteria mean of 5 points is 3.00 was used. Narrative format of qualitative data presentation was adopted. Narrative format was adopted for qualitative data presentation.

Data Presentation and Analysis

Table 1: Awareness of Seasonal Climate Information Released by NiMet Related to Maize Farming

Option	Frequency	Percentage
I am aware	22	23.6
I am not aware	71	76.3
Total	93	100

Source: Field Work, 2023

From the above, it is inferred that most of the respondents have no knowledge of climate information usually given by NiMet on maize farming activities. To compliment the quantitative data in the Table above, one of the respondents from Igbara-Oke, Ifedore, Ondo state had this to say: “for now I am not aware of any climate information related to maize production”. While another one from Mangu-Halle disagreed, “there are a lot of projects on

climate information, a lot of interventions. I am aware of a project while I was in Abeokuta, which was all about developing early warning system to mitigate the impact of climate on the farmers but the project did not see the light of the day. It was not effectively implemented. One more respondent from Daika in Mangu averred that:

I can say I am aware, I can say I am not aware. I am aware in the sense that definitely in the country as a whole there are measures but most of these measures that are being taken are domiciled in some parts of the country. In case of Ondo State, there is no tangible or concrete measure being taken by government, especially the federal government in regards to maize production.

A respondent from Igbara-Oke, Ifedore, Ondo State concurred that, “there are many seminars and training programmes in different areas not only on maize to farmers that I am aware of, to get them equipped and informed about climate information, especially towards knowledge of climatic change”.

Another key informant from Panyam, Mangu, Plateau State agreed that:

Efforts have been made by government to make sure that climate information which is relevant for production of maize reaches the farmers, who are the final destination of that information. NiMet is mandated to produce and provide such information before the cropping season every year, which include information on maize production.

Meanwhile, a respondent from Ipinsa, Ifedore, Ondo State stated, “I have not gotten any information in terms of climate information as regards maize production, I think I am just hearing it for the first time”.

Table 2: Types of Seasonal Climate Information Released by NiMet on Maize Farming

Option	Frequency	Percentage
Information on the time to plant maize	16	17.2
Information on the type of maize to plant	19	20.4

Information on the soil type suitable for a particular maize variety	13	13.9
Information on how to harvest and store different maize varieties	11	11.8
All of the above	34	
Total	93	100

Source: Field Work, 2023

Data from the Table above revealed that the respondents have come across different climate information regarding maize production by NiMet. An interviewee corroborated that “There have been climate information on how to produce maize. This information come in terms of when to plant, the type of soil and the way to harvest and store maize. But the information is not adequate, especially to us in the rural areas”.

Table 3: Challenge of Climate Information Practice by Maize Farmers

Options	SA	A	UD	D	SD	Mean Rating	Decision
Cultural practices as the farmers do not believe in the climate information released by NiMet	78	4	11	0	0	4.7	Accepted
Communication gap	83	8	0	2	0	4.8	Accepted
Refusal to adhere to climate information instructions given by NiMet	46	19	6	9	13	3.8	Accepted
Inadequate number of agricultural extension workers	89	4	0	0	0	4.9	Accepted
The maize farmers do not know how to convert the climate information into	43	30	7	5	8	4.0	Accepted

usable format**Source: Field Work, 2023**

It could be inferred from the data in the above Table that climate information concerning maize production in Nigeria is faced with some challenges such as cultural practices, maize farmers do not know how to make use of the information released, among others. One of the interviewees from Mangu-Halle, Mangu LGA, Plateau State corroborated that “The level of understanding communication languages has been a major challenge. Most of our farmers leave in the village and sometimes getting the information passed on to them in their local dialect is a big problem”.

Another one from Igbara-Oke, Ifedore LGA, Ondo State affirmed that “One of the communication gaps is language barrier. A respondent from Ibule, Ifedore LGA, Ondo State that:

As at today, it is the peasant farmers that constitute the largest population of agricultural producers. Majority of them are not well-educated, and some of our extension service providers do not have the requisite knowledge of new technologies, which constitute a challenge of communicating these information to farmers. This knowledge transfer is largely missing and it constitutes a huge communication gap between the information carrier and the end users.

Another respondent from Daika in Mangu LGA stated, "The farmers are afraid of adopting new technology; others will simply refuse to adhere to instructions, like appropriate application of fertilizer and so on”.

Discussion of Findings

The study found that most of the respondents, as revealed in Table 1 above, are unaware of climate information related to maize production being released by the Nigerian Meteorological Agency. Qualitative data also supports that the information has not been effectively communicated to the maize farmers. This is consistent with the assertion made by one of the respondents during interview that there has been inadequate dissemination of

climate information to farmers in the rural areas. Also, in agreement with the ineffectiveness of the climate information, Ode (2017) declared that government of Nigeria has not shown much interest in communicating climate-related information to farmers in the country.

The research further found that though NiMet information has been inadequate, the farmers are aware of climate information from NiMet such as information on the time to plant maize, the period to harvest, the type of soil suitable for maize production and how to store maize (Table 2). Finding also revealed that maize farmers' climate information uptake is constrained by illiteracy, cultural practices, and language barriers, among others. This is supported by Tall et al's (2014) study that found that the integration of local people in formulation of policies and integration of information with local indigenous knowledge foster trust, local relevance and use. Walthall et al (2012) is equally in tandem with this finding, as their study identified attitudes of farmers as one of the major factors affecting adaptation to information received concerning climate variation on agriculture.

Conclusion/Recommendations

The thrust of the study has been on assessing Nigerian Meteorological Agency's seasonal climate information on maize production in Ondo and Plateau States, Nigeria. From the analysis, the study concluded that NiMet has been given seasonal climate information on the time to plant maize, the period to harvest, the type of soil suitable for maize production and how to store maize. The study equally concluded that there is communication gap between climate information provider and the end users due to held on believe on traditional method that have been with the society for decades. These communication gaps include: Language barrier, high rate of illiteracy among the maize farmers, among others. It, therefore, becomes imperative to bridge this communication gap by setting up community media stations, involving the locals in designing climate-related message, as well as improving the capacity of the maize farmers through education. Government should initiate programmes that will encourage farmers to break up from their held on/traditional beliefs regarding how maize is cultivated.

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