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Farmers' Perceptions and Knowledge on Climate Variability among farmers in North West Cameroon

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Farmers' Perceptions and Knowledge on Climate Variability among farmers in North West Cameroon

ABSTRACT

Climate variability as a global problem exerts negative impacts especially on the agricultural sector, which is the mainstay of many households in developing countries. Increasing temperatures and variations in rainfall have been reported in the Western highlands of Cameroon. While farming households in developing countries stand to bear the greatest brunt, not sufficient information exists on their perceptions and knowledge of climate variability and how these could influence the adaptation strategies that such households implement to mitigate the effects of climate variability. This research seeks to assess the impact of farmers' knowledge and their perceptions on climate variability in the North Western highlands of Cameroon.

Data was collected using a standardized questionnaire. 272 farmers from six randomly selected villages located in three randomly selected subdivisions in the North Western Highland Regions (Nkambe, Oku and Babessi) were sampled for the questionnaire administration. Two trained enumerators accompanied the principal researcher in the questionnaire administration.

Results revealed that over 97% of interviewed farmers, demonstrated contextual knowledge of climate variability, as they reported increased rainfall, prolonged dry seasons and changes in rainfall patterns. However, their perceptions as to the cause were diverse. While 20% had no idea, about 40% attribute climate variability as the outcome of unsustainable human activities. A mean of 20% each perceived climate variability as equally a result of industrial activities and the anger of the gods.

The research concludes with the need for further research on the impacts of climate variability as well as the strategies implemented by farmers to combat climate variability in order to combine them with knowledge and perceptions for building resilience amongst farmers in the north western highlands of Cameroon.

Keywords: *Climate variability, Farmers' Perceptions, Western Highlands, Cameroon*

1. Introduction

Climate variability is a global problem. In many developing Countries, climate variability is reported to exert negative impacts particularly on the agricultural sector (IPCC, 2014). This is important as agriculture is the mainstay for a larger proportion of the population in many developing countries. Over 80 % of farmers in developing countries are food insecure and depend on agriculture as their primary source of livelihoods (Valdés *et. al.* 2010).

The importance of agriculture in Cameroon in general and the western highlands in particular cannot be overemphasized. Close to 70% of the population in Cameroon for instance depends on agriculture for their livelihoods. In addition, this sector contributes 35% to the gross domestic product (Moloa and Lambi, 2006), for which rain-fed agriculture is important.

Unfortunately, this sector is highly vulnerable to climate related stresses such as temperature and precipitation (Moloa and Lambi, 2006). Reduced rainfall and increase temperatures reduce the availability of water needed by plants. Changing weather conditions such as low rainfall and increased temperature recorded in Cameroon have been identified as key drivers for starvation and poverty, as a result of their significantly negative impacts on agricultural production. In fact, an estimated five million people are thought to be food insecure in Cameroon as a result of climatic variability (Nzouankeu, 2012). According to Sigha and Mafang (2008) rainfall in Cameroon on which local agricultural practices depend is inconsistent, resulting in crop failure, post harvest losses and food insecurity. Climate variability therefore exposes farmers to the risk of poor harvest and potential risk of famine as well as extreme weather events with consequences that go beyond their adaptive abilities (IFAD, 2013) especially when they are not aware of what is the root of their problem. Exposure and vulnerability to climate variability leaves farmers with little choice than to adapt to the change in climatic situations (Tingem and Ravington, 2008, Ngigi, 2009, Riziki, 2009). This will be more effective if the farmers have demonstrate sound knowledge on climate variability issues so as to take more resilient decisions related to adaptation.

As of now, not enough seems to be known on the perceptions and knowledge on climate variability by farmers in this region. This paper aims at addressing this issue.

1.1. Problem Statement

Increasing temperatures and variations in rainfall have been reported in the Western highlands of Cameroon, especially in North Western Region of Cameroon. Reports from the Bafut airport meteorological station (2015) for instance, show variability in climate over the last 12 years. High fluctuations in average rainfall (ranging between 1200mm-32100mm) and temperatures (increasing from 26°C to 32°C) has been reported for certain parts of the North western part of Cameroon, which is a crucial part of the Western Highlands agroecological zone in Cameroon (Ministry of Agriculture Ndop, 2015), as well as in Nkambe and Oku (Yengoh *et. al.* 2010, Ministry of Agriculture Nkambe, 2014). The Western highland of Cameroon plays a great role to food security at national and international levels. This is particularly true for North Western Region of Cameroon, where agricultural is an important livelihood activity. Farmers' perceptions and knowledge on climate variability issues are necessary for better management of its negative impacts in the process of acquiring better livelihood options and developing resilience. While some work has been done in other parts of Cameroon (Madison, 2009, Gambo *et. al.* 2010), case studies in North Western part of the region is difficult to find. There is therefore need to conduct this research in order to reduce the knowledge gap.

1.2. Objective of the Paper

The main objective of this paper is to assess farmers' perceptions and knowledge of climate variability in North Western part of the Western highlands of Cameroon.

2. Literature Review

Empirical evidence exists to support the fact that farmers' perceptions of climate variability can be crucial in influencing their adaption strategies, their ability to reduce resulting food insecurity and their capacity to develop resilience (Bryam, 2009, Madison, 2009). Farmers' perceptions influence their ability to interpret climate variability, providing frameworks under which they attribute meaning to the environmental changes. This arguably has a direct impact on how much efforts they will be willing to endogenously provide or exogenously accept to mitigate the consequences of such changes.

Madison (2009) for instance, reported results from a study that assessed the ability of farmers in the ten African countries to perceive and react to climate change. Result from the studies showed that farmers indeed do perceived changes in climatic factors over time due to natives' lack of

frequent visit to village sacred places such as mermaid palace in rivers and traditional prayers. Based on such perceptions they were able to apply strategies to adapt to climate variability and reduce food insecurity, by adopting improved seeds varieties and appropriate irrigation practices. Moyo *et. al.* (2012) report that farmers in Zimbabwe perceived that climate is actually changing and is no longer as it was some years back. They however associated the change to the consequences of lack of respect for ancestral spirits and other traditional customs. Farmers found it difficult to effectively plan their agricultural activities as hithertofore, since it had become unsure when to expect rains and when to plant. Similar results have been reported by Ishaya and Abaje (2008) and Mertz *et. al.* (2009) in Nigeria. However, the Nigerian farmers attributed climate variability to diverse human activities such as cutting of trees and using bush fires as a means of clearing their farms. Effective soil management techniques (planting of cover crops, planting of fruit trees and prevention of bush fires) were being applied by the farmers to curb the effects of climate variability. In his work, Tunde (2011) revealed that 47% of his respondents perceived climatic variability as delay in rainfall, 22% perceived it as high temperatures, 6% says as floods, 3% as unusual rainfall while 22% perceived it as undefined seasons.

Research conducted by Sarah *et. al.* (2012) in Kenya showed that perceived changes in climatic factors (reduced rainfall both in quantity and quality, increased temperature, wind and pest diseases) resulted from the rise in Christianity and non-performance of rain mourning ceremonies. Moloa (2010) points out that 80% of farming households in the West region of Cameroon perceive changes in climate as a reality. Most of them believed that the main factors behind the variability in climate are disrespect of the gods and cultural shrines which have resulted to shifts in rainfall patterns, making it impossible for them to carry on with their agricultural activities at the proper time. In the Northern part of Cameroon about 52% of farmers perceived excessive deforestation, as a result of climate variability (*ibid*).

This paper increases empirical evidence on farmers' knowledge and perceptions by focusing on the North Western part of Cameroon, which is part of the western highlands. The western highland of Cameroon is one of the five agro-ecological zones in the country. It has two seasons: the rainy season that lasts from Mid-March to October, and the dry season from November to Mid-March. Annual rainfall varies from 1300mm-3000mm. Mean monthly temperatures range from about 15°C on the high lands to about 27°C in low-lying regions (Yengoh, 2012).

3. Materials and Methods

The research was carried out in the North western region, which is part of the western highland agro ecological zone in Cameroon. The region is the third most populated region in the country with an estimated population of more than 1.8 million. It has an urban growth rate of 7.95% and a rural growth rate of 1.16% (Ambagna *et al.* 2012). Over 80% of the natives depend on agriculture for their livelihood, including a strong livestock sector (Yengoh, 2012). The region has a poverty rate of 51% and is home to 13% of the total number of rural poor (Ambagna *et al.* 2012). It is based on the above reasons and others that this region was selected for this research.

3.1. Sampling Size and Techniques:

In an attempt to capture the diversity in the North West Region, the seven divisions were purposively grouped according to altitudes (high: above 2500mm, medium: 2000-2500mm and low: below 2000mm). This was because climatic elements (rainfall and temperature) do vary according to altitudes. One division each was then randomly selected from each of the altitude zones (Bui division in the high altitude, Donga Mantung division in the medium altitude and Ngoketunjia division in the low altitude respectively). One subdivision was randomly selected from each of the above mentioned divisions (Oku, Nkambe and Babessi respectively). In each subdivision, two villages were randomly selected (Bangola and Mambim in Oku; Binka and Binshua in Nkambe and Kesortin and Njenai in Babessi subdivisions respectively). Smallholder farmers were then systematically selected with the help of lists obtained from the agricultural delegations in the various subdivisions, and the agricultural officers in the respective villages. A smallholder farmer was considered to be one who cultivated an area of land under 5hectares. Primary data was collected from individual farmers, using a standardized questionnaire. The original questionnaires from Advanced Reading, Development and Demonstration Project (2008), FAO, (2007a) and Johannes John-Langba (2012) were adapted, modified and used in this research so as to enable for the capture of new variables of interest. A contact visit was first done in all the subdivisions and the sampled villages to inform the different stakeholders on the research procedures. The questionnaire was pretested in the different villages during such visits. The pretested questionnaires were analysed and the results observed for validity of the questionnaire. Based on the analysis, the final questionnaire was produced.

For the final data collection process, farmers were randomly selected by drawing from a lot. A total of 272 questionnaires were administered to a mean of 45 randomly selected farmers in each village. The process of data collection ran from June 19th to July 18th 2015.

Data collected was analysed using SPSS (Statistical Package for Social Sciences) version 17.0, at 95% confidence interval ($\alpha = 0.5$). Descriptive statistics was performed in order to understand the level of farmers' knowledge and perceptions to climate change.

4. Results and Discussions

This section presents the results of the research. It will present and discuss the socioeconomic characteristics of the sampled farmers in the north western region of Cameroon, before proceeding to the understanding of farmers' perceptions and knowledge on climate variability in the research region.

4.1. Socioeconomic characteristics of farmers in the North western highlands

Table 1: Distribution by gender

	Frequency	Percentage
Male	100	36.8%
Female	172	63.2%
Total	272	100%

Source: Field data analysis

The sample distribution by gender is presented on table 1 above. 63% of all farmers interviewed were females (172) while 37% of them (100) were males. This is probably due to the fact that women are mostly the ones engaged in subsistence agriculture in developing countries. In Oku village for instance, the men were found to concentrate on coffee production while in Babessi village, the men concentrated mostly on rice cultivation which is locally a cash crop.

Most of interviewed farmers (80%) are married and living with their spouse, indicating their high chances of getting family labour for use in their farms. However, small proportions were still single 12%, while the remaining 8% are either divorced or widowed. The main source of livelihoods in the research area, is farming (about 92%) while the remaining 8% are employed in non-farm enterprises, and only carry out farming activities as a secondary source of livelihood.

Also, more than 50% of the sample population have no formal education or have only completed primary school (Figure 1). However, 23% of the sample population have secondary and above education. More so, about 60% of the inhabitants were found to be literate based on whether they can read and write in the English language. This means that there are farmers who did not complete primary school, but who are capable of reading and writing in English.

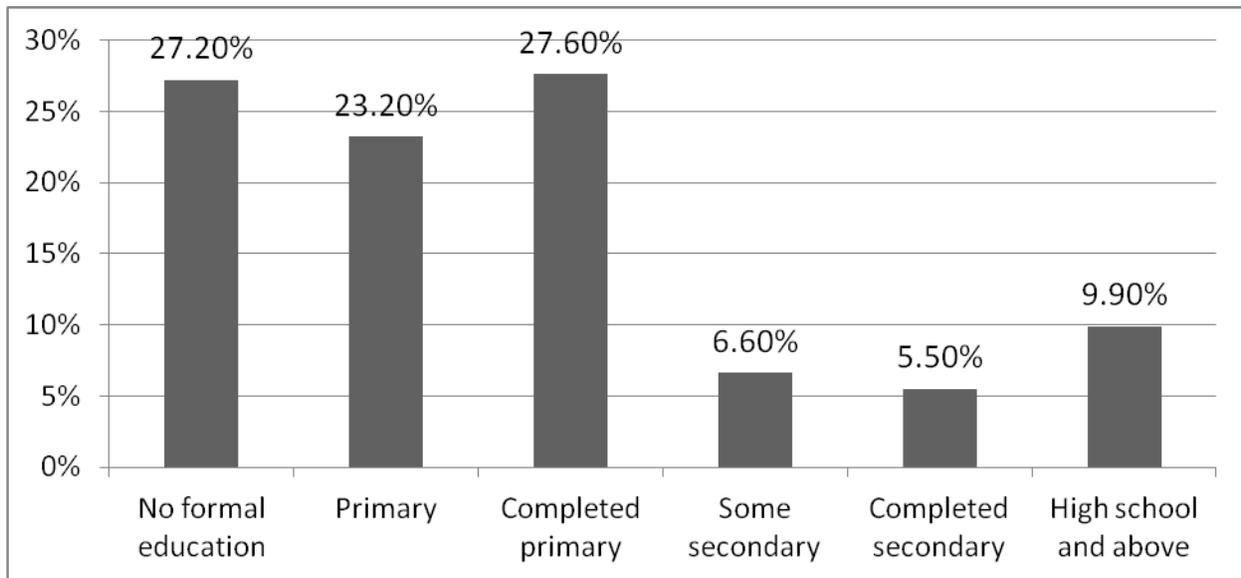


fig 1. Educational attainment of the sample population

Source: Field data analysis

As presented in table 2 below, the mean age of the respondents was about 45 years, 9 years short of the life expectancy ratio in Cameroon (World Bank Report, 2013).

The lower life expectancy ratio in the area for instance can be associated to the inadequate healthcare, inadequate environmental hygienic conditions and health personnel existing in these villages. This is in line with the findings of Rourke (2008) who found that rural areas often suffer from inadequate healthcare due to demographic, geographic and other socioeconomic factors. Further, the mean household size is 8, 2 persons higher than the average household size reported in the country (World Bank Report, 2013). The mean monthly income was found to be about FCFA 35,800 (US Dollar 42.23). This is higher than the minimum national salary in Cameroon (ibid).

Table 2. Mean age, household size and income

	Minimum	Maximum	Mean	Std. Deviation
Age of respondent	20	100	43.73	29.895
Household size	1	30	8.45	4.182
Estimated monthly income of respondent/FCFA	10000	500000	35582.40	55808.284

Source: Field data analysis

4.2. Farmers' Perception and knowledge of Climate Variability

Table 3. Number of year's respondent has been a farmer.

	Minimum	Maximum	Mean	Std. Deviation
How long the respondent has been a farmer	1	85	24.91	12.825

Source: Field data analysis

Table 3 presents the mean farming experience in the sample, which is almost a quarter of a century. This provides the farmers with sufficient experience to identify changes in climatic factors. This probably explains why 97.4% of the sampled farmers, acknowledged to have experienced climate variability (figure 2 below)

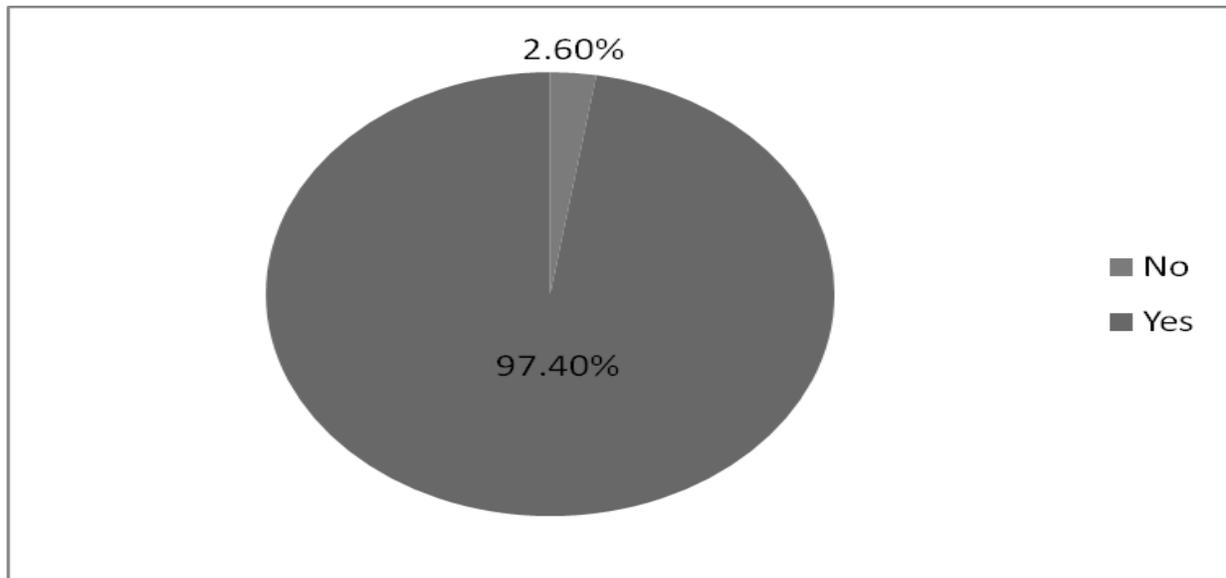


fig.2. If farmer has ever heard of climate variability.

Source: Field data analysis

To these farmers, climate variability in descending order mean changes in rainfall pattern (58%), increase in temperature (50%), changes in weather conditions (31%), poor harvest (30%) and

long dry seasons (14%). Details are presented in table 4 below. These results are similar with the case studies of Bose *et.al.* (2014) and Tunde (2011) in their work in Nigeria as well as Sarah *et.al.* (2012) in Kenya. Based on the above results, it can be concluded that farmers in the North Western part of the Western Highlands of Cameroon at least have some knowledge on climate variability issues.

Table 4: Meaning of climate variability by as reported by farmers.

Indicators of climate variability	Respondents		
	No	Yes	Total
Changes in weather conditions (Number and percentage)	189 69.5%	83 30.5%	272 100%
Increase in temperature (Number and percentage)	139 51.1%	133 48.9%	272 100%
Changes in rainfall patterns (Number and percentage)	114 41.9%	158 58.1%	272 100%
Long dry seasons (Number and percentage)	233 85.7%	39 14.3%	272 100%
Poor harvest (Number and percentage)	190 69.9%	82 30.1%	272 100%

Source: Field data analysis

To capture farmers' perceptions on climate variability, Farmers were questioned on the cause of climate variability. Figure 3 below presents the results. Around 20% of all the farmers had no idea of the cause of climate variability. A majority of them (close to 40%), reported that climate variability resulted from unsustainable human activities such as deforestation and bush burning practices. About 20% of them attributed changes in climatic factors to industrial activities, while slightly above 20% explained it is as a result of the "Anger of the Gods". Our results are similar to the findings in Moloa (2010) in the western region of Cameroon, where farmers believed that climate variability is a punishment of the gods as a result of disrespect of the latter and cultural shrines, and the perpetuation of vice community habits such as abortion and working on a

“Country Sunday”. Our results are generally similar to that of Madison 2009 in his work in ten African countries and Moyo *et.al.* (2012) in Zimbabwe.

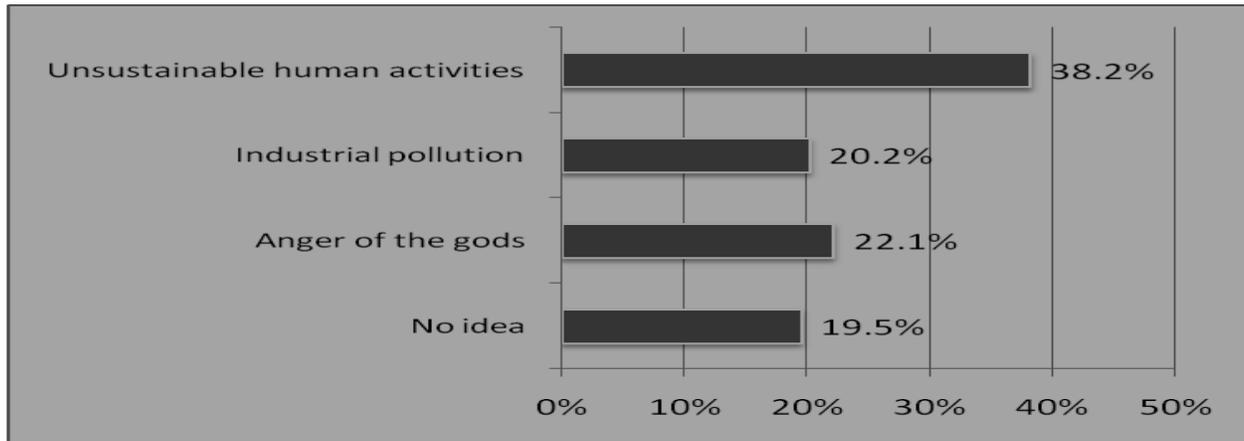


fig 3. Farmers' perceptions on the cause of climate variability

Source: Field data analysis

5. Conclusions and Recommendations

This paper intends understand farmers' knowledge and perceptions to climate variability in the Northwest Region of Cameroon in the country. Data was collected from individual farmers across all altitudes and analyzed. The following conclusions can be made.

Firstly, there is clear evidence that the farmers in the Northwest are knowledgeable and are experiencing climate variability. This is supported by the fact that 97% of the sampled farmers acknowledged having heard of the word climate variability, acknowledged in the form of decreasing rainfall and increasing temperatures. However, their perceptions as to the cause of climate variability were mixed. While most of the farmers (about 40%) hold that climate variability has emerged from unsustainable human activities like deforestation, bush fires, the rest attribute it to industrial pollution, the anger of the gods or simply do not have an idea as to the exact causes.

On the basis of these results, we make the following recommendations. Firstly, both formal and informal trainings on the general and possible causes of climate variability should be carried out in the research region, to build on the already existing knowledge. A particular focus should be placed on women who dominate the subsistence agriculture, characteristic of the research region. Secondly, it would be important to investigate to what extent socio-cultural aspects (e.g. the anger of the gods) could be accepted as causes of climate variability. Further research on the impacts of climate variability on livelihoods, adaptation strategies implemented by the farmers to

combat climate variability, and to what extent community based knowledge and processes could contribute to building resilient communities in the Western Highlands of Cameroon in particular, and in other agro-ecological zones in general could be helpful towards developing long term efforts in dealing with the effects of climate variability in the research region.

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