PERCEPTIONS AND ADAPTATION STRATEGIES FOR CLIMATE CHANGE FROM SMALL RUMINANT FARMERS IN NORTH-WEST CAMEROON †

[PERCEPCIONES Y ESTRATEGIAS DE ADAPTACIÓN AL CAMBIO CLIMÁTICO DE LOS PEQUEÑOS AGRICULTORES DE RUMIANTES EN EL NOROESTE DE CAMERÚN]

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SUMMARY

Background. Climate change is affecting the livestock sector in Cameroon particularly in the small ruminant sector. It is therefore essential to have information on the perception and adaptation strategies of farmers in order to improve animal production. **Objective.** The objective of this study was to determine perceptions and adaptation strategies to climate change from small ruminant farmers in Northern Cameroon. **Methodology.** 113 farmers were interviewed using questionnaires. The study was conducted from January to March 2018 in the Mezam division, North-West Region of Cameroon. **Results.** This survey revealed that small ruminant husbandry is practiced mostly by men (88%) with an age between 40 to 60 years (44%), married (71%) and with primary school education (40%). More than half of the surveyed farmers worked in both animal husbandry and agriculture (63%) as main activities and had between 6 to 10 years of breeding experience (32%). Most of them were not trained (72%) and more than half (53%) desired to be trained in all aspects of husbandry. Livestock were mostly purchased (88%), 61% had goats and 35% had sheep. Most (72%) farmers perceived climate change in the past decade and the majority (43%) identified deforestation as the main cause. Farmers observed a rise in temperature (41%) and a drop in precipitation (36%) and 63% did not practice any adaptation strategies to climate change on their herd. The majority (46%) of farmers perceived that climate change could be tackled with reforestation. Despite these constrains, 67% of the surveyed farmers wished to continue this activity by increasing their herd sizes. **Implications.** Surveyed farmers have noted a rise in temperature and decrease in precipitation in the past decade, which are believed to be major indicators for climate change. The farmers strongly think that climate change can be tackled through reforestation and education on the impacts of climate change. **Conclusions.** Overall, it appears that most of the surveyed farmers of Mezam division North-West region have perceived that climate change is related to deforestation. However, they do not practice any adaptation option on their small ruminant herds.

Keywords: Cameroon; small ruminant husbandry; perception; adaptation strategies; climate change.

RESUMEN

Antecedentes. El cambio climático está afectando al sector ganadero en Camerún particularmente en el sector de los pequeños rumiantes, por lo que es fundamental tener información sobre la percepción y las estrategias de adaptación de los agricultores para mejorar la producción animal. **Objetivo.** El objetivo de este estudio fue determinar las percepciones y estrategias de adaptación al cambio climático de los pequeños agricultores de rumiantes en el norte de

† *Submitted September 3, 2020 – Accepted August 3, 2021.*
ISSN: 1870-0462.

Camerún. **Metodología.** Se entrevistó a un total de 113 agricultores mediante cuestionarios. El estudio se realizó de enero a marzo de 2018 en la división Mezam, región noroeste de Camerún. **Resultados.** Esta encuesta reveló que la cría de pequeños rumiantes es practicada principalmente por hombres (88%) con una edad entre 40 y 60 años (44%), casados (71%) y con educación primaria (40%). Más de la mitad de los agricultores encuestados trabajaban tanto en la ganadería como en la agricultura (63%) como actividades principales y tenían entre 6 y 10 años de experiencia en la cría (32%). La mayoría de ellos no estaban capacitados (72%) y más de la mitad (53%) deseaba recibir capacitación en todos los aspectos de la cría. Sus animales para la cría fueron en su mayoría comprados (88%), 61% tenían cabras y 35% tenían ovejas. La mayoría (72%) de los agricultores percibió que hubo cambios climáticos durante la última década y la mayoría (43%) identificó la deforestación como la principal causa. Los agricultores observaron un aumento en la temperatura (41%) y una caída en las precipitaciones (36%) y el 63% no practicó ninguna estrategia de adaptación al cambio climático en su hato. La mayoría (46%) de los agricultores percibió que el cambio climático podría abordarse con la reforestación. A pesar de estas limitaciones, el 67% de los agricultores encuestados deseaba continuar con esta actividad aumentando el tamaño de sus rebaños. **Implicaciones.** Los agricultores encuestados han notado un aumento de la temperatura y una disminución de las precipitaciones en la última década, que se cree que son los principales indicadores del cambio climático. Los agricultores creen firmemente que el cambio climático se puede abordar mediante la reforestación y la educación sobre los impactos del cambio climático. **Conclusiones.** En general, parece que la mayoría de los agricultores encuestados de la región noroeste de la división Mezam han percibido que el cambio climático está relacionado con la deforestación. Sin embargo, no practican ninguna opción de adaptación en sus pequeños rebaños de rumiantes.
Palabras clave: Camerún; cría de pequeños rumiantes; percepción; estrategias de adaptación; cambio climático.

INTRODUCTION

Animal production in Sub-Saharan Africa plays a fundamental role as source of animal protein for humans (Tendonkeng *et al*., 2013; Tendonkeng *et al*., 2018). According to a report from FAO, it was observed that in 2016 the number of chronically undernourished people in the world was estimated to have increased to 815 million, from 777 million in 2015 (FAO, 2017). This is especially critical in Sub-Saharan Africa, which has one of the world's fastest growing human population, with an increased rate of 2.6 percent per annum (FAO, 2017). The growth in livestock production has barely kept pace with the growth in demand for food of animal origin (Otte and Chilonda, 2002).

In Cameroon, agricultural production growth per year is estimated to be 2.2%, which is less than the annual demographic expansion of 2.9% (FAO, 2004). Specifically, data from different sources of animal proteins shows that 36 kg of meat is consumed per capita as opposed to 42 kg per capita recommended by FAO (FAO, 2008). Similarly, in Cameroon, the average animal protein consumption is 11 g/day/person, which is below FAO recommendations of 33g/day/person (FAO, 2017). In this regard, production of ruminants particularly of small ruminants have played a vital role for animal protein supply in Cameroon (Nanda, 2009).

Global climate change is primarily caused by greenhouse gas (GHG) emissions that result in warming of the atmosphere (IPCC, 2013). Unfortunately, climate change has affected livestock (including small ruminants) production both directly and indirectly (Brahmi *et al*., 2012; Munthali *et al*., 2016). Direct effects from air temperature, humidity, wind speed and other climate factors influence animal growth, milk production, wool production and reproduction (Brahmi *et al*., 2012; Munthali *et al*., 2016). Climate can also affect the quantity and quality of pastures, forages and grains, the severity and distribution of livestock diseases and parasites (Niggol and Mendelsohn, 2008). One possible solution is to adapt livestock production to climate change, as policy option to address climatic challenges that prevail in sheep and goats' production (Deressa *et al*., 2008).

Much of the research on farmer's perception and adaptation to climate change has been carried out in Sub Saharan African countries like Ethiopia (Deressa *et al*., 2008; Feleke *et al*., 2016), Ghana (Kemausuor *et al*., 2011), Kenya (Mariara, 2008), Nigeria (Apata, 2017), and Tanzania (Komba and Muchapondwa, 2015). However, farmer's perception to climate change has not yet been studied in Cameroon. Since climate change is affecting the livestock sector in all regions of Cameroon particularly in the small ruminant sector, understanding the perception and adaptation strategies of farmers in the different regions of the country will facilitate strategies to boost production to meet animal protein demand and promote the rural livelihood (Tendonkeng *et al*., 2018). This should also help governments when making decisions in the implementation of development programs. The objective of this study was to determine perceptions and adaptation strategies to climate change from small ruminant farmers in North-West West region of Cameroon specifically in the Mezam Division.

MATERIALS AND METHODS

The study area

This study was carried out in Mezam division, one of the seven divisions in the North-West region of Cameroon, with Bamenda as the administrative headquarter. Bamenda is located between latitudes 5°56" N and 5°58" North of the equator and longitude 10°09" and 10°11" East of the Greenwich Meridian. Bamenda lies at an altitude of 1430m above sea level with a surface area of 3125 ha (Acho-Chi, 1998). The town is located along the Cameroon Volcanic Line and exhibits two very distinct relief environments; that is, the High Lava plateau (Up Station) with an altitude of about 1400m and the Lower plateau (Down Town) with an average altitude of 1100m above sea level. Mezam division is surrounded by Wum at the North, by Boyo at the Northeast, by Ndop at the east, by Mbengwi and Batibo at the West and Southwest, respectively and by Babadjou of the West Region at the South.

Data collection and participants

A list of potential farmers and their contacts in each sub-division was obtained from their respective sub-divisional delegations. The farmers were contacted via calls through which appointments were made. In each sub-division visited, the Chief of animal production centres guided us during the first days to the farmers in their areas of jurisdiction. In most cases, only one farmer was contacted and he further orientated us to the next farmer. The social data of small ruminant husbandry and the farmers' perception to climate change were obtained through two sources: Primary and secondary data.

Primary data

Primary data were collected anonymously; they include no personally identifiable information such as name or mailing address and was performed using questionnaires, interviews, and direct observations. Data relative to this study were obtained from 113 farmers in all the sub-divisions of Mezam division, North-West region of Cameroon (Table 1). The main information relative to the climate change was focused on the perception of small ruminant farmers about climate change, their perceived impacts of climate change and various adaptation practices.

Secondary data

Secondary data were analysed from available literature including reports from the Ministry of Agriculture and Rural Development (MINADER) and the Ministry of Livestock (MINEPIA) delegations of Mezam and the various sub-divisions.

Table 1. Characteristics of farmers participating to survey.

Characteristics	Average (%) (N=113)
Age in years	
<20	1
20 to 40	16.41
41 to 60	44.11
>61	38.48
Marital Status	
Yes	99.08
No	0.92
Number of wives	
1	71.29
≥2	28.71
Number of dependents	
0 to 5	50.75
6 to 10	35.40
11 to 15	12.50
16 to 20	1.35
Religion	
Christianity	58.02
Islam	41.98
Educational level	
Illiterates	35.62
Primary	39.58
Secondary	18.23
Higher	6.57

Questionnaire development

The questionnaire had 16 questions and was divided into the following sections: (1) sociodemographic information (age, sex, education, marital status, number of children or dependents, religion, educational level, activities of respondent, experience in breeding and workforce); (2) farmers' perception about climate change; (3) adaptation practices to climate change. The question "Do you think the climate is changing?" was considered a dichotomous variable. If the answer was "yes," the participant was asked to continue to answer questions about the causes of climate change (deforestation, overgrazing, population growth, poor solid waste management, other); if the answer was "no," the participant was asked to answer the next question. The questions used for this study were adapted from similar surveys on Farmers' Perception of Climate Change (Kemausuor *et al*., 2011). Before we used the final questionnaire, we performed a pilot survey among 30 participants to evaluate the questions in terms of clarity, accuracy of response options, use of scientific terminology, and the overall flow of the survey. Full questionnaire can be found as supplementary material.

Table 2. Distribution of farmers according to the perceived possible causes of climate change.

Causes of climate change	Average (%) (N=113)
Deforestation	
Climate does not change	27.67
Highly Agree	43.37
Highly Disagree	11.08
Agree	4.13
No idea	13.75
Population growth	
Climate does not change	27.67
Highly Agree	7.69
Highly Disagree	46.08
Agree	4.18
No idea	13.75
Overgrazing	
Climate does not change	27.67
Highly Agree	9.86
Highly Disagree	46.51
Agree	32.21
No idea	13.75

Table 3. Distribution of farmers according to their perceptions on temperature variation as an indicator for.

Indicators of climate change	Average (%) (N=113)
Rise in temperature	
Climate does not change	27.67
Highly Agree	41.03
Highly Disagree	29.26
Agree	2.05
Decrease in temperature	
Climate does not change	27.67
Highly Disagree	72.33
No change in temperature	
Climate does not change	27.67
Highly Agree	71.38
Highly Disagree	0.95

Data analysis

Data collected was analysed using descriptive statistics and SPSS (*Statistical Package for Social Sciences*) software version 20.0. Statistical frequency was analyzed using the Chi-square test and statistical significance was set at $P \leq 0.05$.

RESULTS AND DISCUSSION

Farmers perception to climate change

According to their perception on climate change, the majority of farmers (72%) had observed a change in climate in the past decades (Figure 1).

Table 4. Distribution of farmers according to the respond to rainfall variation as an indicator of a changing climate per subdivision.

Indicators of climate change	Average (%) (N=113)
Increase rainfall	
Climate does not change	27.67
Highly Agree	19.18
Highly Disagree	52.84
Decline rainfall	
Climate does not change	27.67
Highly Agree	35.71
Highly Disagree	34.88
No change in rainfall	
Climate does not change	27.67
Highly Agree	10.64
Highly Disagree	61.69

Causes of climate change

The distribution of farmers according to the possible causes of climate change (Table 2) shows that on average 27.67% of farmers never perceived any change in climate. The Chi-square test for the association between the opinion in climate change and deforestation and population growth and overgrazing showed a very strong association ($\chi 2 = 98.149$; DF = 8; $p < 0.001$) between them. From all respondents, 11.08% think that deforestation does not influence climate change while 43.37% of respondents do. Concerning population growth, 46.08% of opinions considered it as the major cause of climate change while 11.9% were against it. Around 46.51% respondents declared that overgrazing may affect climate change while 42.07% declared the contrary. This result is not surprising because most farmers associate climate change to changes in rainfall patterns because of its direct effect on agricultural production and food security. This is supported by Maddison (2006) and Ivo *et al*. (2013) who reported that farmers' understanding of climate change is often linked to experiences on rainfall patterns. Similar observations were also made by Komba and Muchapondwa (2015) in Tanzania, Feleke *et al*. (2016) in Ethiopia, Munthali *et al*. (2016) in Malawi and Apata (2017) in Nigeria. On average, the majority of farmers of this zone highly disagreed that population growth can be a cause for climate change. On average, most of the farmers highly disagreed that overgrazing is a cause of climate change, followed by 32.21% who simply agreed, 13.75% who had no idea and 9.86% who highly agreed.

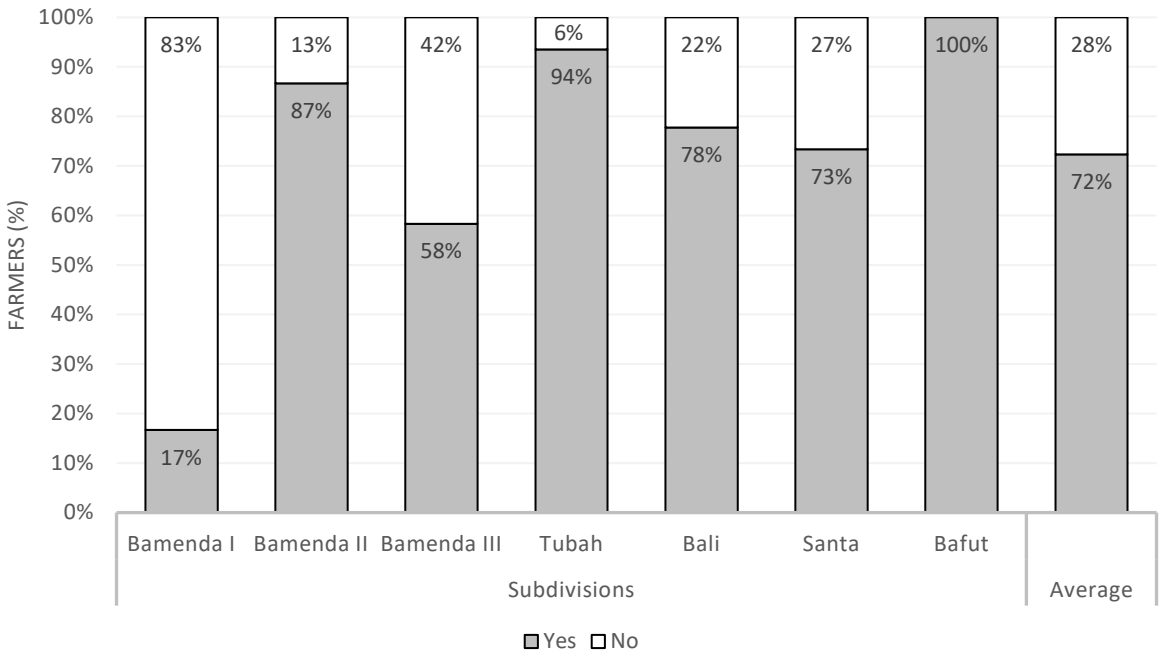

Figure 1. Distribution of farmers according to their perception to climate change per subdivision.

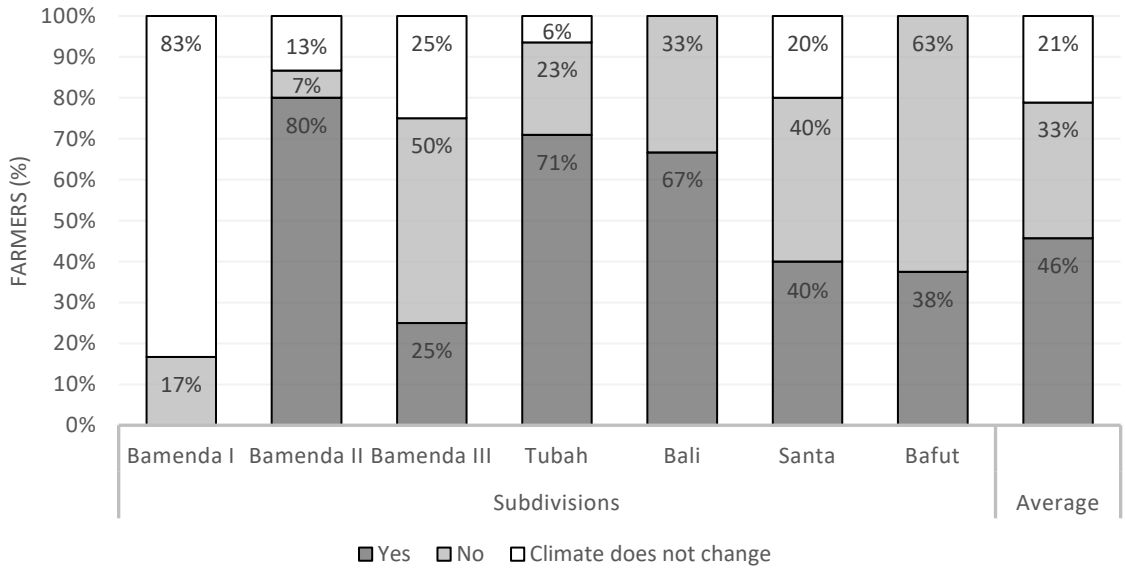

Figure 2. Distribution of farmers according to whether or not climate change can be solved or not per subdivision. Yes = climate change can be solved; no = climate change cannot be solved.

Indicators of climate change

The distribution of farmers based on their response to temperature variation as an indicator to climate change is presented in Table 4. As mentioned earlier, 27.61% did not perceive any change in climate in the past decades. Among those who perceived a change, most farmers highly agreed that temperature has increased over the past decade indicating that climate is changing. Thus, an average of 41.03% farmers (which is the majority) highly agreed that there has been a rise in temperature over the decades indicating that climate

is changing, with 29.26% who highly disagreed and 2.05% who agreed. The Chi-square test for the association between climate change and variation of temperature showed that there was a very strong association ($\chi2$ = 148.197; DF = 6; $p < 0.001$) between them. Around 41.03% of respondents highly agree that there is a rise of temperature while 29.26% highly disagree about it. According to Shankara *et al*. (2013), farmers' perceptions about changes in temperature often fall within observed meteorological data. Farmers' perception of changes in temperature is usually in line with meteorological data since the farmers are in a position to rightly judge changes in evapotranspiration and dehydration in human bodies over time. The same observations were made in Ethiopia by Deressa *et al*. (2008) and Feleke *et al*. (2016), and in Tanzania (Komba and Muchapondwa, 2015). This can also be explained by the fact that most of the farmers from Mezam division were of the age range between 41 to 60 years, so that there is a high possibility that they have observed these changes in the past decade.

The distribution of farmers according to the rainfall variation as an indicator of climate is shown in Table 4. Most of the farmers who highly agreed that there has been increases in rainfall over the decade and which served as an indicator of climate change were on average (52.84%) highly disagreed that increases have been observed and thus cannot be an indicator, while 19.18% of farmers thought increased rainfall had been observed. The Chi-square test for the association between climate change and rainfall variation show that there was a very strong association ($\chi2$ = 22.432; DF = 4; $p < 0.001$) between them. Around 19.18% of respondents highly agreed that there is an increase in rainfall, 35.71% of respondents declared that there is a decrease in rainfalls whereas 10.64% of respondents are of the opinion that there is no change in rainfalls. Most farmers declared to know specific days or weeks within a critical crop growth period when a crop demand for water is highest and if it does not rain in those critical times, farmers might perceive it as a decrease in rainfall amount (Ado *et al*. 2018). Smallholder farmers perceptions of changes in both temperature and rainfall revealed that perceptions are made based on local environment and are not linked to an understanding of climate change and variability in the national or global contexts (Munthali *et al*., 2016).

Adaptation Strategies to climate change

According to their practice of adaptation option on their herd, the majority of farmers (63%) in this zone did not practice any adaptation. The main reason for this was limited finance and most of the farmers had no idea about different adaptation options.

Housing and shading

The distribution of farmers according to the different adaption practices (Table 5) shows that on average of 62.45% farmers never practiced any adaptation at all. Among those who did adapt, the majority did not carry out this option (provision of housing). Thus, an average of 10.39% farmers provided houses to their animals as an option while the majority (27.16%) never did. The Chi-square test for the association between opinion on adaptation and provision/marketing showed that there is no association ($\chi2$ = 2.266; DF = 4; p = 0.686) between them. This may be because of incidental expenses related to building houses and preparation of shades. This was also reported by Feleke *et al*. (2016) with sheep and goat farmers from Ethiopia.

Table 5. Distribution of farmers according to different adaptation practice.

Adaptation practices	Average (%) (N=113)
Provision of housing	
No adaptation at all	62.45
Yes	10.39
No	27.16
Good feed and water provision	
No adaptation at all	62.45
Yes	16.33
No	21.22
Marketing during shock	
No adaptation at all	62.45
Yes	15.12
No	22.43

Feed and water supply

Climate change has a great impact on the quality and quantity of forage and on the availability of water, which at times dry up. An average of 16.33% did this as an adaptation option. On the other hand, the majority never did this with the most giving an average of 21.22%. This may be because there were no watering problems in this zone. Feleke *et al*. (2016) reported in Ethiopia that 89.6 % farmers practiced this as an adaptation strategy, which was second to marketing during shock.

Marketing during extreme weather events

Most farmers from this study who sold some of their animals as a way of adapting were an average; the majority (22.43%) never sold their animals as a way of adapting to climate change. This practice enabled

farmers to sell their sheep and goats during extreme weather events because animals were unable to resist long dry periods due to deficiency of feed and water. Thus, in general, the majority of the farmers never practiced the above and many other adaptation options because climatic conditions in Mezam division do not go to extremes as it is in semi-arid regions where the dry season is usually very long, hot and harsh with limited water and forage for animals (Table 5).

Table 6. Distribution of farmers according to various way to manage climate change.

Ways to manage climate change	Average (%) (N=113)
Reforestation	32.86
Reforestation and avoid burning	5.25
God's intervention	1.72
Education on impacts of changing climate	6.34
No idea	4.18
Don't think climate changes	49.66

Measures to fight climate change

The majority of farmers (46%) of Mezam division believed that climate change could be tackled. The distribution of farmers according to whether climate change can be solved or not is shown in Figure 2. The distribution of farmers according to the various ways to manage climate change (Table 7) shows that among farmers who had observed a change in climate, most felt that reforestation is the main measure to manage climate change and it effects. On average, the majority of farmers (32.86%) thought that reforestation is the main measure to manage climate change, followed by education on the impacts of climate change (6.34%), next by the combination of reforestation and avoid burning (5.25%), those with no idea about what could be done (4.18%), followed by those who thought God's intervention is the solution (1.72%). This shows the lack of information at the level of farmers on the adaptation measures such as the modification of production and management systems involves diversification of livestock animals and crops, integration of livestock systems with forestry and crop production, and changing the timing and locations of farm operations (IFAD, 2010). Also, diversification of livestock and crop varieties which can increase drought and heat wave tolerance, and may increase livestock production when animals are exposed to temperature and precipitation stresses. In addition, this diversity of crops and livestock animals is effective in fighting against climate change-related diseases and pest outbreaks (Batima *et al*., 2005; IFAD, 2010; Kurukulasuriya and Rosenthal, 2003).

CONCLUSIONS

Overall, it appears that most of the surveyed farmers of Mezam division North-West region have perceived that climate change is related to deforestation. These farmers have also noted a rise in temperature and decrease in precipitation in the past decade, which is believed to be major indicators for climate change. However, they do not practice any adaptation option on their small ruminant herds. The farmers strongly think that climate change can be tackled through reforestation and education focused on the impacts of climate change.

Acknowledgments
The authors thank the University of Dschang and the breeders of the Department of Mezam for their participation in this study.

Funding. This study was supported by the Ministry of Higher Education of Cameroon.

Conflicts of Interest statement. The authors declare no conflicts of interest.

Compliance of ethical standards. The Ethics Committee of the Faculty of Agronomy and Agricultural Sciences from the University of Dschang approved this project.

Data availability. Data are available with the first author upon reasonable request**.**

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Household Survey Questionnaire

INQUIRY FILE SHEET No. _____Date _.....___ / ____ / 2018
SUBDIVISION OF.....
Dear Respondent
In order to collect information on small ruminant farmer's perception and adaptation strategies to climate change, this questionnaire is sent to you for academic and scientific purposes. The information given to us is highly privileged and every information's which will be provided by you is kept confidential. Thanks in advance for your cooperation.
Name and Sur names: ..... Tel: .....
Village: ..... Quarter.....

I-SOCIAL CHARACTERISTICS

1.1. Age [.....] 1 = Less than 20 years 2 = 20-40 years 3 = 41-60 years 4 = 61 years and over
1.2. Sex [.....] 1 = M 2 = F
1.3. Marital status
1.3.1: Married [.....] 1 = Yes 2 = No, widow [...] 1 = yes 2 = No, widower [...] 1 = yes 2 = No
1.3.2: Number of women […] 1 = one, 2 = two, 3 = three, 4 = four, 5 = five, 6 = more than five]
1.4. Number of children or dependents: [.....] 1 = 0,2 = 1 to 5, 3 = 6 to 10
4 = 11 to 15, 5 = 16 to 20, 6 = 21 and more
1.5. Religion […
1 = Christianity 2 = Islam 3 = Animism 4 = No religion 5 = other...
1.6. Education level: [.....]
1 = did not attend school 2 = Primary 3 = Secondary 4 = Higher
1.7. Activities of the respondent:
1.7.1 What is your main agricultural activity? [...] 1. Livestock 2. Agriculture 3. Livestock and agriculture4. Other (specify)_____

1.7.2 Non-agricultural activities [.....] 1. Crafts 2. Trade 3. Employee 4. Other (specify) _____
1.8. Experience in breeding: [.....]
1 = 0-5 years 2 = 6-10 years 3 = 11-15 years old 4 = 16-20 years old 5 = 21 years and older
1.9. Have you had any training in breeding? [.....] 1 = Yes 2 = No
1.9.1: If so, how?
1 = Feeding 2 = Health 3 = Housing 4 = Reproduction 5 = All
1.9.2: Duration [.....] 1: 1-3 Days 2: 4-6 Days 3: 7-9 Days 4: 10-12 Days
5: 2 Weeks to 1 Month 6: More than 2 Months
1.9.3: If not, why not? [.....]
1: Lack of information 2: Lack of time 3: Other (specify)……
1.10. On what aspects would you like to be trained? [.....]
1: Housing 2: Feeding 3: Reproduction 4: Health 5: All 6: None
Why... .....
1.10. In your absence who cares for the animals? [.....]
1 = men 2 = women 3 = both
Age: [….]. 1 = under 20 years old 2 = 20-40 years old 3 = 40-60 years old 4 = 60 years and above
1.11. Workforce [……]
1: Family 2: Wage 3: Both (number of employees)

II PERCEPTION AND ADAPTATION STRATEGIES TO CLIMAT CHANGE

3.1 Farmers' perception about climate change

3.1.1- Do you think the climate is changing?

1.= Yes 0. = No

If "Yes", what do u ses climate change?

Cause of Climate change	1=highly Agree	2=Agree	3=Disagree	4=Highly Disagree
a) Deforestation				
b) Overgrazing				
c) Population growth				
d) Poor solid waste management				
l) Others.....				

3.1.2. What are the indicators (impacts) of a changing climate?

Evidence of climate change	1=Highly Agree	2=Agree	3=Disagree	4=Highly Disagree
1.a) Rise in Temperature				
b) decrease in Temperature				
c) No change in Temperature				
2.a) Increase in Precipitation				
b) Decline in precipitation				
c) No change in precipitation at all				

3.2. Adaptation practices to climate change

3.2.1- Do you practice any climate change adaptation option on your small ruminant herd?

1= Yes 0= No

If "Yes", answer the following questions.

3.2.2. What are the different adaptation practices employed on your small ruminant herd?

Adaptation practices	1=YES	0=NO	Year of starting the practice
1. Provision of housing			
2. Provision of shade for animals during day			
3. Good feed and water provision			
4. marketing during shock			
5. Others.....			

3.3. Do you think climate change can be tackled? 1 =Yes 0 =

3.3.1 If "Yes", what do you think needs to be done to address climate change?

.....

.....

.....

3.4. Are you satisfied with your breeding? Why? [...] 1: yes 2: no

Reason: .....

3.4.1. What are the constraints encountered during breeding? (Rank in order of importance) if yes, check (√) / rank.

Constraints	**Check**(√)	rank.
Lack of finacial means		
Lack of feed		
Lack of water		

Diseases		
Predators		
Commercialisation		
Lack of labour force		
Lack of ameliorated genetic material		
Reproduction		
Theft (stealing)		
Animal supply		
Housing and equipement		
Far/Absence of animal market		
Others (to be specified)		

3.3.6 What are your perspectives?[……]
1: Increase financial resources 2: Increase livestock 3: Maintain livestock
4: No longer raising 5: Other .....
3.3.7. Reasons.....