Non-Timber Forest Products and Climate Change Adaptation / Forest Dependent Communities in Bamboko Forest Reserve, South West Region of Cameroon

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Abstract

Background: Forests are tremendously endowed to combat climate change by protecting people and livelihoods, and creating a base for more sustainable economic and social development. But this natural mechanism is often hampered by anthropogenic activities. It is therefore imperative to take measures that are environmentally sustainable not only for mitigation but also for its adaptation. This study was carried out to assess the role of Non-timber forest products (NTFPs) was conducted among forest-dependent communities around the Bamkoko Forest Reserve in the South West Region of Cameroon as a strategy to cope with the impacts of climate change. Data were collected through household questionnaires, participatory rural appraisal techniques, transect walks, and direct field observations.

Results: A total of 18 plant species were identified to be harvested by residents around Bamkoko Forest Reserve as Non-Timber Forest Products. The majority of the respondents (88%) perceived that there has been a change in climate patterns due to increased temperatures and unpredictable rainfalls. Eru was found to be the most affected livelihood activity (55%) by climate change around Bamboko Forest Reserve. Communities living around Bamboko Forest Reserve were found to use more than one strategy to cope with the adverse effects of climate change.

Conclusions: The study concluded that non-timber forest products still play a safety net role to assist communities in an adverse situation such as crop failure under the current change in the climate. The need to emphasize sustainable harvesting, improve processing, and access to non-timber forest products markets is crucial.

Background

The importance of forests to the well-being of a large number of poor people especially in tropical developing countries is indisputable and well recorded (Ruiz Pérez and Arnold 1996; Arnold and Ruiz-Perez 1998; Byron and Arnold 1999; Tieguhong and Ndoye 2004; Sunderlin et al. 2005; Powell et al. 2011;). Besides, tropical forests are a natural resource pool indispensable to the national development plans and poverty reduction strategies around the world. Forests contain a wealth of timber and non-timber products which have thus been exploited for food, fuelwood, watershed, pharmaceutical royalties, honey, snail, and other marketable and non-marketable products. NTFPs contribute to the livelihoods of about 2 billion of the world's poorest people in urban and rural settlements and are among the most valuable plant resources for present and future food security. Forests are home to the people who are entirely or partly dependent on them for their livelihood (FAO, 2001; Basu, 2009). According to the report by World Bank (2008) the majority of communities living adjacent to the forest reserves; about 60 million around the globe are estimated to be almost wholly dependent on forests. Climate change is currently one of the greatest environmental challenges facing humankind (Totten et al., 2003). Africa was predicted to suffer the most from the impacts of climate change according to the 2001 Intergovernmental Panel on Climate Change (IPCC). It is argued that climate change presents additional challenges to a country such as Cameroon, owing to its agro-ecological diversity (Brown et al. 2010). Indeed, studies have identified

different aspects of climate change vulnerability specific to individual agro-ecosystems in Cameroon (Brown et al. 2010, Yengoh et al. 2010a). While changes that warrant adaptation may occur in all agroecosystems in the country, these changes are not likely to be of the same intensity in the entire country (IPCC 2007). Many developing countries (Smith and Scherr 2003; World Bank 2004);(Nkem et al.2010).Over1.6 billion people living in extreme poverty. Forest preservation and conservation provides an essential mitigation measure towards addressing climate variability and change (Kremen et al. 2000; Thompson et al.2009). There is a limited understanding of the magnitude of the changes in local climatic scenarios in the landscape. Observations were related to uncertainty, irregularity, and periodic changes. In a study in southern Cameroon, villagers describe this situation as a "climate accident"(Chia et al.,2013).However, the inherent variations of climate from season to season and from year to year make variability a fundamental part of climate change (Hulme et al., 1999; Berz, 1999). Research has underscored the vulnerability to climate variability and change of sectors, such as food, energy, and water (Sonwa et al.,2012), and the livelihood strategies of forest-dependent communities (Bele et al.,2013a,2013b; Nkem et al.,2012; Chia et al.,2013) in other forest areas in the region. In this paper the use Non-Timber Forest Products (NTFPs) is preferred as an adaptation option to climate change. Non-Timber Products are defined as biological materials other than timber which are extracted from the forest for human use. There are suggestions, however, of three major pathways of climate change impacts on indigenous people and their livelihoods through an increase in environmental risks, reduction in livelihood opportunities, and consequent stressing of existing social and policy institutions (Agrawal 2007). Forest livelihood strategies are influenced by forest type, which determines the availability and distribution of various livelihood assets described in the Department for International Development (1999) sustainable livelihood framework. This may be related to the differential sensitivity of forest types to climate impacts, as well as to the nature of the use of the asset by the community. These climate risks have been selected from the well documented scientific analysis of climate change on tropical forests, particularly Congo Basin forests (CBFP 2005; IPCC 2007; Locatelli et al. 2008; Somorin 2010).NTFPs encompass all tangible animals and plant forest products other than industrial wood, coming from natural forests, managed secondary forests, and enriched forests. NTFPs contribute to the livelihoods of about 2 billion of the world's poorest people in urban and rural settlements and are among the most valuable plant resources for present and future food security. There is a limited understanding of the magnitude of the changes in local climatic scenarios in the landscape. Observations were related to uncertainty, irregularity, and periodic changes. NTFPs if properly managed can provide good sources of animal protein and income to the immediate communities as well as promote tourism. Adaptation through reducing vulnerability is therefore one of the approaches considered likely to reduce the impacts of long-term climate changes. Importantly, it has been argued by Nkem et al. (2010) that sustainable utilization of NTFPs could be among the effective climate change adaptation strategies in Africa. Several climate change-related policies and programs have focused on NTFPs. According to the UN (2009), NTFPs are one of the co-benefits of REDD+ (Reduced Emissions from Deforestation and Forest Degradation plus). Through its implementation, communities will gain more benefits of ecosystem services, especially through the creation of sustainable NTFPs based enterprises. The Fifth Assessment Report of the IPCC Smith et al., (2014a) describes how older people are usually at greater risk from storms, floods, heatwaves, and other

extreme events partly because they tend to be less mobile than younger adults, more likely live alone in some cultures and thus find more difficult to avoid hazardous situations. During such times of stress, the most important coping strategy for households involves gathering of NTFPs such as wild mushrooms, firewood, wild fruits, thatch grasses, medicinal plants, bush meat, building poles to mention a few. This reliance on forest resources is often greater considering that forests also support local industries that produce wood products (Nkem et al., 2010). It is widely recognized that climate change has caused substantial impacts on forested ecosystems (Kirilenko and Sedjo, 2007). The majority of the forest dependent people have reduced opportunity to cope effectively with the adversities of climate change due to low capabilities, poverty, weak institutional mechanisms (Shackleton and Shackleton, 2004) and lack of access to resources (Brooks 2003; Brooks et al., 2005). According to Regmi et al., (2010) climate change adaptation consists of initiatives and measures to reduce the vulnerability of natural and human systems to actual or expected climate change effects.

Study Objectives

The objectives of this study were to:

1. Identify different types of NTFPs in the study area and amount sold per household per year in BFR.
2. To examine the local perception of climate change vulnerability and impacts on NTFPs availability and livelihoods of forest-dependent communities around BFR, perceptions on changes in rainfall patterns and temperatures around BFR.
3. To examine the coping/adaptation strategies at the community level in the changing climate.

Materials And Methods

3.1 Study area description

The Bamkoko Forest Reserve is located between latitude 4° 19' 53" and 4°50' 35" North and longitude 9° 10' 45" and 9° 25' 35" East of the prime meridian. This study covers part of the Mbonge Sub Division in Meme Division and part of the Muyuka Sub Division in the Fako Division both in the South West Region of Cameroon. Most of the reserve is found in the Mbonge Subdivision where most of the activities are carried out. This study covered the following sampled villages; Munyenge, Lilale, Lykoko, Bova, and Kotto. Several criteria were used in choosing the sampled villages which among others included: villages located not more than three kilometers from the forest reserve, Villages whose inhabitants are actively involved in the collection and harvesting of non-timber forest products, Villages having a good number of active hunters, At least one village from all the four corners of the reserve. The choice took into consideration the four corners of the reserve. Site "A" was made up of Munyenge, Lilale, Lykoko, site "B" the principal village sampled was Bova, site "C" was the concern with Efolofo village while site "D" had as sampled village Kotto. The layout of the Bamboko Forest Reserve is illustrated in figure 1 below: A sample size of 20% of the population was selected following Mugenda and Mugenda (2003), who states that a sample of 10.0% to 20% of the total population for a large or small population is adequate and

large enough to provide sufficient information concerning the population under study (Table 1). In each of the selected strata, all households head or their representative were interviewed.

Source: World Resource Institute, 2018

Table 1: Sample Frame			
Strata	Population (HH)	Proportion (%)	Sample Size
Munyenge	760	20%	152
Lilale	800	20%	160
Lykoko	750	20%	150
Bova,	943	20%	188
Kotto	500	20%	100
Total	3753	100%	750

2.1.2 Methodology

1. Data collection

Datasets were collected using household questionnaires, participatory rural appraisal techniques, transect walks, and direct field observations .A reconnaissance survey was carried out before actual data collection to provide a general picture of the research area, including identifying and meeting various stakeholders around the BFR. Reconnaissance surveys enabled the authors to obtain basic information on population size, ethnicity, and socio-economic activities of the study area. Ecoguards and village officers were the main resource persons of the baseline information related to the study area.

1. Participatory Rural Appraisal (PRA) techniques

PRA is an exploratory method that aims at having a dialogue with stakeholders and getting information from them through participatory communication and analytical method (Duangsa, 1996). The participatory tools and techniques for assessing climate change impacts and exploring adaptation options by Regmi et al., (2010) were modified and adapted for use during the exercise. The tools used in the study were resource mapping to map local climatic hazards; free listing of NTFPs; matrix scoring; climatic hazard trend analysis to gain insight into past hazards; climatic hazard ranking to compare and contrast the impact of major climatic hazards on the social group; vulnerability assessment; coping and adaptation strategies to assess the effectiveness of the current coping strategies

1. Transect walk

Transect walks were conducted to verify the identification of NTFPs in the BFR. In each village, two transects of 3km each from the edge of the forest towards the center were carried out. The distance from one transect to the next was 2 km. The first plot was established randomly followed by systematic sampling where the distance from one plot to another was 500m. The square sample plots of 25 m² x 25 m² were adopted because they are easy to layout with a total of two plots per transect. The square plot design is also recommended in the guideline for the baseline study of Community Forests in Cameroon (ICRAF, 2017), Sustainable Financing of Community Forest Enterprises in Cameroon (DRYAD) project. A total of 4 sample plots were established and existing NTFPs assessed and recorded (Figure 1). People with long experience in the utilization of particular NTFPs were asked to identify plant species and provide information on the use and quantity which can be harvested from each plant. The identification of plant species was in vernacular names and later was translated into botanical names. Secondary data involved the collection of information from different sources like reviewing relevant documents like publications, journals, reports, and books.

1. Data analysis

Data were analyzed descriptively using an excel spreadsheet. Statistical were carried out where necessary to test for the level of significance among variables.

Results And Discussions

3.1 Frequencies of NTFPs captured per transect

The frequency assessment by NTFPs showed that there is no single dominant NTFPs in the forest reserve with the maximum single frequency of 60. Considering the diversity of NTFPs recorded, there a low rate of dominance by a single NTFPs, it is possible to conclude that the BFR is reach in NTFPs .

Figure 1: Frequencies of NTFPs captured per Transect

3.2 Major NTFPs in and around BFR (Table 2)

NTFPs Scientific name	Local name
<i>Garcinia cola</i>	Bitter kola
<i>Irvingia Gabonensis</i>	Bush mango
<i>Piper nigrum</i>	Black Pepper
<i>miswak</i>	Chewing stick
<i>Gnetum africanum.</i>	Eru
<i>Cola nitida</i>	Kola nuts
<i>Cola lepidota</i>	Monkey kola
<i>Ricinodendron</i>	Njansang
<i>Prunus Africana</i>	Pygeum
<i>Calamus rotang</i>	Rattan cane
<i>Gastropoda</i>	Snail
<i>Acacia Seyal delile</i>	Fuelwood
<i>Aframomum melegueta</i>	Alligator Pepper
<i>Santalum lanceolatum</i>	Bush Plum
<i>Marantaceae</i>	Ngongo
<i>Cyperus bulbosus</i>	Bush Onion
<i>Anacardium occidentale</i>	Cashew nuts

Source: Fieldwork, 2018

Forest resources in the form of NTFPs serve as safety nets, sustaining the livelihoods of some forest communities in BFR. They play a vital role in income generation and household food security (Nkem et al., 2010). The results of this study indicate that the collection and sale of NTFPs is a major livelihood activity and a source of income for households especially in Munyenge, Lilale, Lykoko, Bova, and Kotto and the access to NTFPs is open to the people in both forest reserve settings. They collect NTFPs known as shown in the table above. Local people extracted NTFPs primarily for meeting household needs, as well as for earning additional income to support or supplement their livelihoods. NTFPs harvested from the BFR have been classified according to the benefits identified by the respondents including direct and indirect benefits. Direct benefits included human food, animal feed, medicinal plants, and poles, and wood fuel. Indirect benefits include environmental conservation and watershed protection (ecosystem services).

3.1 Amount of NTFPs used and sold per household per year in the BFR

Table 3 shows the amount of NTFPs used and sold per household per year in the BFR. Bitter kola, eru, bush mango, njansang, kola nuts, snails were the most traded NTFPs in the area. It was learned that the demand for these resources was higher compared to the supply. It was estimated that a household can generate up to 1990000 FCFA per year from the selling of NTFPs. The amount of revenue was low because the forest is protected by the village, government, and the entry to the forest and the harvest of NTFPs was through the permit and they also have their limit where they can collect NTFPs. About 53%, 24%, and 23% of the respondents agreed that eru, bush mango, njansang, bitter kola, and snails, respectively could be used to assist households to cope with climate change.

Products	Amount used per household per year	Average amount sold per year	The average amount earned per year (FCFA)
Bitter kola (buckets)	2	15	300000
Bush mango (buckets)	4	30	450000
Black pepper (buckets)	2	10	20000
Chewing stick (bundles)	1	20	10000
Eru (kg)	50	50	300000
Kola nuts (buckets)	5	22	250000
Monkey kola (buckets)	1	5	20000
Njansang (buckets)	7	16	400000
The rattan cane (Bundles)	5	15	90000
Snail (buckets)	10	30	150000
Fuelwood (bundles)	17	50	-
Bush Plum (buckets)	2	5	-
Total			1990000

Table 3: NTFPs used and sold per household per year

Source: fieldwork, 2018

3.2 Local perceptions of respondents on the impact of climate change on NTFPs and livelihoods

Forest resources in the form of NTFPs serve as safety nets, sustaining the livelihoods of some forest communities in BFR. They play a vital role in income generation and household food security Nkem et al., (2010). The results of this study indicate that the collection and sale of NTFPs is a major livelihood activity and a source of income for households especially in Munyenge and the access to NTFPs is open to the peoples in both forest reserve settings. They collect NTFPs known like eru (*Gnetum africanum.*), sails (*Gastropoda*), bush mango (*Irvingia Gabonensis*), bitter cola (*Garcinia cola*).In this study, 31% of the households agreed that heavy rainfall prevented the collections of NTFPs especially fuelwood which is used by the entire households in BFR. Most of the households eat unready prepare food because the fuelwood collected is wet and produces mostly smoke instead of flames when it is burnt. Households involve in the collection of NTFPs as the main livelihood activity especially the Kotto households communicated that the harvesting of fruits from the different tree species is at times poor as a result of poor flowering and fruiting of the tree species, Also heavy rainfall is affecting the collection of NTFPs especially the harvesting of certain fruits in some trees species according to some households in Bova is very poor due pests and diseases that affect the flowering of this fruits based on their local knowledge While some households (55%) communicated that there has been the decrease in eru which they attributed it to climate change and variability. Besides,(22%) of the households agreed that drought as one of the climate impacts on climate-sensitive resources in these communities. Drought has caused a serious problem in collections of some NTFPs species especially Njansang which have become very difficult for back to decompose and cracking to remove the nuts and decrease in the number of snails (40%) of households pointed out that it was due climate change and variability

Responses on climate change and variability impact impacts on NTFPs	
Responses	% Responses
Drying of water sources	35
Drought	20
Heavy Rainfall	31
Decrease in Eru	55
Decrease in Snails	40
181	
Total	

Table 4: The figure represents th parentages of respondents

Figure 3 : Frequencies of responses on climate change impacts on NTFPs

3.3 Changes in temperature around the BFR

The majority of the respondents agreed that there have been changes in the temperature in the area. About 71% of them reported that there has been an increase in temperature for more than 20 years ago around the BFR (Figure 2). However, about 12% of the respondents noticed the contrary, a decrease in temperature. While only 5% believed that there has been no change in the temperature for the last 20 years. Trend analysis of the annual temperature around BFR shows an increase in the temperature for the past 30 years (Figure 2). The climatic data records were in line with the people's perceptions

Figure 4: local perceptions on changes in temperature around the BFR

Figure 4: Average annual temperature around BFR from 1971 to 2015

Source: Manfe Weather Station, 2018

3.4 Rainfall changes around BFR

The majority of the respondents (88%) agreed that there have been changes in the rainfall patterns over 20 years. They noticed a change not only in the total amount of rainfall but also in the timing of the rains; with rains coming either earlier or later than expected. But only 10% of the respondents believed that there were no changes in rainfall patterns from the last 30 years. Figure 3 indicates that 54% of respondents noticed an increase in the amount of rainfall or a shorter heavy rainy season (unpredicted rainfall). It was further revealed that 21% of the respondents felt that there has been a decrease in the amount of rainfall including dry season starting early and was also longer than usual in the area. However, only 9% believed that there has been no change in annual rainfall for the last 20 years. The trend analysis of the annual rainfall from 1960 to 2015 shows fluctuations with increased annual rainfall (Figure 3). The people's perceptions were in line with the climatic data records

Figure 5: local perceptions on changes in rainfall patterns around the BFR

Figure 6: Average annual rainfall around BFR from 1960 to 2015

Source: Manfe Weather Station, 2017

- **The Availability of NTFPs**

Eru was identified as key and rare NTFPs in the study area. The majority of the respondents (55%) admitted to harvest and consume eru during the wet season. A total of 25 bags harvested from the forest were listed during PRA (Table 4). This implies the BFR is rich in wild eru and people were knowledgeable on edible eru found in the forest. It was reported by respondents that fuelwood is available during the dry season as the rainy season has been too rainier in the past years while the collection of snails is during the rainy season especially during August to September which is considered as the peak season for snails collection as identified by respondents.

NTFPs Scientific Name	Local Name	Availability
<i>Garcinia cola</i>	Bitter kola	Rainy season
<i>Iringiagabonensis</i>	Bush mango	Rainy season
<i>Piper quinensis</i>	Bush pepper	Dry season
<i>Acacia Seyal delile</i>	Fuelwood	Dry season
<i>Gnetum Africana</i>	Eru	Rainy season
<i>Cola nitidia</i>	Kola nuts	Dry season
<i>Cola lepidota</i>	Monkey kola	Rainy season
<i>Helix aspersa</i>	Snail	Rainy season
<i>Gnetum Africana</i>	Eru	Rainy season

Table 4: NTFPs and their availability

3.6 Adaptation strategies to cope with climate change and variability

The need for a multi-disciplinary approach in climate change mitigation and adaptation research is dictated by the multi-disciplinary nature of problems related to climate change. At the center of this communication and collaboration, Vignola et al., (2009) advocate an ecosystem-based framework in which addressing the problems of ecosystem degradation and the conservation of natural capital are the main focus. In this study, 4.2% of the households used fertilizers in their farms to increase yields. The local agriculture system depends on natural temperature, sunshine, and rainfall. This implies adjusting and improving (technically, financially, and materially) agriculture activities which will reduce the vulnerability and increase the adaptive capacity of households. The planting of trees to protect winds 5.9% of the household have planted trees especially around their houses to protect strong winds during torrential rainfall which is accompanied by strong winds in the study site which use to up roof their houses and most households used their traditional methods to protect winds by tying red pieces of cloth around their farms land. An additional 7.6% of the household have adopted an irrigation system of farming during the prolonged dry seasons and drought, they moved to swamps areas and opened new farms where water is available throughout the year the local farmers used watering cane to send water into their farms. Furthermore, 32.8% of household have diversified their crops, sustaining the diversity of crops it is an appropriate adaptation option for food security and livelihood in these communities. Household in the study area has expressed their willingness to integrate other livelihood activities like food crops and livestock rearing (sheep) have increased their source of income especially small farmers in the study area. This is similar to the findings of Yengoh et al. (2010). This study also shows that diversification as an adaptation option at the local levels, cuts across different sectors (environment, forest and wildlife, livestock and fisheries, agriculture and rural development, scientific research, finance, and commerce), thus it requires the development of inter-sectoral coordination. This finding is supported

by that of Yengoh et al., (2010), which draws attention to the fact that coordination and collaboration are required between sectors that build the capacity of rural livelihoods.

In this result, 69.7% of households have diversified their occupation to reduce their vulnerability to local climate and uncertainty. Engaging in non-climate dependent alternative jobs such as driving, masonry works, sale of assorted goods "provision store", shoe repairing, painting, sewing, or dressmaking was ranked the second-highest among the coping measures described by respondents. Although the dominant occupation is farming and therefore it is expected that most people will give priority to any coping measures that will help sustain their dominant livelihood activity, household members especially the young migrating to urban centers in search of jobs resulting in rural exodus in the study site.

Also, 78.2% of respondents have increased their farm sizes. According to the household, they increase their farm sizes every beginning of farming seasons as an adaptation option to local climate variability and uncertainty. The expansion of agricultural land is a coping and adaptation strategy for these forest-dependent communities. This supported finding carried around the same area Bele et al.,(2013a,2013b) and Chia et al.,(2013). Increasing the agriculture land to compensate for losses has put more pressure on other natural resources on which the communities depend, resulting in a perverse cycle that could increase their vulnerability even more. Increase climate variability and uncertainty seems to be one of the main disturbances shaping current vulnerability in these communities. It was revealed that 85.2% of respondents consume and sell NTFPs from the forest as a climate change variability coping strategy. They use NTFPs like bush mango, fuelwood; bush Blum, snails, bitter kola, kola nut to be sold in Mbonge, and Munyuka markets. Finally, 52.3% of respondents sell timber trees from their farm as coping strategies to climate change and variability.

Adaptation strategies	% Response
Used of fertilizers	4.2
Planting of trees	5.9
Irrigation	7.6
Diversification of crops	32.8
Diversification of occupation	69.7
Increase in farm sizes	78.2
Used of NTFPs	85.2
Timber selling from own farm	34.3

Table 5: Responses on various adaptations as coping strategies to climate change

Figure 7: Frequencies of respondents on coping and adaptation strategies

Conclusion

The coping and adaptation strategies of the communities to the changing climate were as follows. Improving cocoa production using suitable measures and the introduction and enhancement of agroforestry systems are also crucial for household food security and income. Second, planting trees to protect strong winds; thirdly irrigation system to improving alternative livelihood and income activities is of great importance for communities. Activities such as beekeeping, growing livestock, and the sustainable collection and marketing of NTFPs will enable households to gain income and food security from activities other than agriculture. Crop diversification is also of importance to the communities within this aspect of livelihood diversification, the local market has been organized for commodities (crops and NTFPs), and stable prices communities say, will improve prices and better income from commodities. Furthermore, there is a need for access to information about climate change issues and knowledge sharing and capacity building for local communities. Training on the different new farming techniques which communities think are needed and the other alternative livelihood activities are imperative with material support. The study reveals that, activities aimed at enhancing adaptive capacities cut across different sectors (agriculture and rural development, forest and wildlife, environment, livestock). And the actors within these sectors and other stakeholders located at different governance levels have specific roles to play in the design and implementation of such strategies. These roles cannot be carried out independently; it requires a combined effort based on efficient communication, collaboration, networking, knowledge, and information sharing between policymakers, local communities, and civil society, scientist and researchers, etc. In this policy process, policymakers need to mainstream the adaptation from international policies into national policies such as scientists and researchers need to communicate results and facilitate understanding to other scientists and non-scientists such as policymakers, civil society, and forest communities.

Abbreviations

BFR: Bamboko Forest Reserve; DRYAD: Latin word meaning Tree; NTFPs: Non – Timber Forest Products; IPCC: Intergovernmental Panel on Climate Change; ICRAF: World Agroforestry Centre; PRA: Participatory Rural Appraisal; REDD+: Reduced Emission from Deforestation and forest Degradation and Plus.

Declarations

Authors Contributions:

All authors were involved in analyzing and editing the paper. All authors read and approved the final manuscript.

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Competing interests

The authors declared that they have no competing interests.

Availability of data and materials

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Ethics approval and consent to participate

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Informed consent

Informed consent was obtained from individual participant included in the Study.

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Figures

Figure 1

Figure 2

Frequencies of NTFPs captured per Transect

Figure 3

Frequencies of responses on climate change impacts on NTFPs

Figure 4: local perceptions on changes in temperature around the BFR

Figure 4: Average annual temperature around BFR from 1971 to 2015

Source: Manfe Weather Station, 2018

Figure 4

local perceptions on changes in temperature around the BFR Average annual temperature around BFR from 1971 to 2015 Source: Manfe Weather Station, 2018

Figure 5
local perceptions on changes in rainfall patterns around the BFR

Figure 6
Average annual rainfall around BFR from 1960 to 2015 Source: Manfe Weather Station, 2017

Figure 7

Frequencies of respondents on coping and adaptation strategies