Climate Change, Perceptions, and Adaptation Responses Among Farmers and Pastoralists in the Cameroon Highlands

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Abstract

Local communities’ perceptions of climatic changes can be used to complement meteorological data-scarce areas and places where climate changes are spatially highly variable, such as mountain environments. Local perceptions can also help identify adaptation strategies which are acceptable within, and work for, local cultures. Focusing on two mountains in the Bamenda Highlands (Mts. Oku and

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W. Leal Filho et al. (eds.), Handbook of Climate Change Management, https://doi.org/10.1007/978-3-030-22759-3_311-1
Mbam), the study investigated how livelihood strategy (farming vs. pastoralism) affected the perception of climatic changes, their impacts on livelihoods, and how people had adapted to them. Focus-group discussions (FGDs, n = 20) with village elders were used. No differences were observed between farmers and pastoralists on the climatic changes reported, but important differences were observed in perceived impacts and adaptation strategies used. All respondents reported changes in the amount and distribution of rainfall, fog and temperatures. Meteorological data on rainfall and temperature agreed with local perceptions. Farmers and pastoralists used farming and non-farming activities as adaptive strategies. Fulani pastoralists had started farming, which was not reported in previous studies in Cameroon. However, pastoralists had fewer options, as they are landless and most NGOs have overlooked them. The study highlights the need to consider pastoralists in climate change adaptation in the region, and also the importance of investigating fog when studying mountain ecosystems.

Keywords

Climatic changes · Adaptation · Farmers · Pastoralists · Mountains

Introduction

Mountain environments experience more rapid changes in temperature than lower elevations because the rate of warming is amplified with elevation (Pepin et al. 2015). With increasing temperature, cloud base raises and overall cloud incidence may be reduced, which is particularly alarming because clouds (termed fog when you are within) are an important source of water in numerous forests found on mountains (Bruijnzeel et al. 2011). To date, little information is available on the changes observed in cloud/fog incidence in African mountains (see Cuni-Sanchez et al. 2019a; Batumike et al. in review). In Mt. Marsabit in Kenya, a 60% reduction in fog hours per year was recorded at a meteorological station, which supported local communities’ perceptions of changes in fog occurrence (Cuni-Sanchez et al. 2019a). Changes in fog occurrence have likely been observed on other African mountains, but there are few meteorological stations located on African mountains. Local communities’ perceptions could be used to identify changes in fog, as shown in Kenya. The important role local communities’ perceptions of climatic changes can play in complementing meteorological data-scarce areas, such as mountains, is increasingly being recognized (Reyes-Garcia et al. 2016; Savo et al. 2016).

Understanding local communities’ perceptions of climatic changes is also a topic of interest for extension workers and policymakers. Perception is of key importance because it influences the motivation to take action (Grothmann and Patt 2005). Insights regarding what influences climate change perceptions can help policymakers design targeted approaches to adaptation (Milfont et al. 2014). Several factors are known to influence climate change perceptions, and therefore, adaptation. These include age, gender, wealth, education, access to extension services, access to
weather information, and household size, among others (Deressa et al. 2011; Silvestri et al. 2012; Habtemariam et al. 2016; Opiyo et al. 2015). Age (or farming/herding experience) is important because longer attachment to a place facilitates the identification of local environmental changes, with older people having accumulated greater knowledge (Akerlof et al. 2013; Liu et al. 2014). Wealth and access to extension services affect perceptions as they can determine the capacity to respond to change (Adesina et al. 2000; Semenza et al. 2008). Previous information on climate change, or access to weather information, can also influence perceptions of climatic changes and responses. For example, the use of weather forecasts increased the likelihood of livestock migration among pastoralists in Kenya and Uganda (Silvestri et al. 2012; Nkuba et al. 2019).

Once exposed to climatic changes and the impacts (e.g., severe drought and subsequent crop failure), communities might react to these in different ways and at different timescales. Coping strategies can be described as ad hoc (reactive) responses evolved to manage impacts ex-post (e.g., consuming fewer meals per day during a drought event) while adapting strategies can be described as those implemented to “prepare” beforehand or evolved to reduce overall vulnerability to climate shocks (proactive responses) (e.g., cultivating drought-resistant varieties of certain crops) (Morton 2007). Some authors identify coping strategies as those short-term, while adaptive strategies refer to long-term strategies (e.g., Filho et al. 2020). For pastoralists, examples of coping strategies include, e.g., migrate longer distances, selling livestock to buy food, consume livestock, buying feed or water, hire land for grazing, or turn to forests for fodder; while examples of adaptive strategies include, e.g., preserving pastures, storing adequate feeds, de-worming healthy stock, changing herd composition, or diversifying livelihoods (Speranza 2010; Cuni-Sanchez et al. 2019a). Here the term “adaptive strategies” is used to refer to both coping and adaptive strategies, as strategies that might begin as coping strategies in exceptional years can become adaptations for households or whole communities over time (Morton 2007).

Local communities’ knowledge can also be used to develop more effective and locally tailored strategies for adapting to climatic changes (Cuni-Sanchez et al. 2019a). Although an important amount of the literature about local communities’ perceptions of climatic changes and adaptation strategies used has been published in the past decade (for reviews see Reyes-García et al. 2016; Savo et al. 2016), most literature focused on farmer communities (Reyes-García et al. 2019). In Africa, some studies have documented pastoralists’ perceptions or adaptation (for reviews see Cuni-Sanchez et al. 2019a; Menghistu et al. 2020), but most studies available focused on the dry lowlands of West or East Africa, with no insights from highlands, although pastoralists can be found on highlands.

The Bamenda Highlands of Cameroon are internationally known for their unique flora rich in endemism, which is highly threatened (high population density, land-use change, climate change) (Myers et al. 2000; Onana and Cheek 2011). These highlands are inhabited by numerous ethnic groups, including Fulani pastoralists, who generally do not own land but have the rights to graze their animals on the communal lands of their “host” farmer communities (Mbih et al. 2018). Projected changes in rainfall by the late century (2071–2100, RCP4.5) indicate a reduction in rainfall in
most of the Bamenda Highlands (Platts et al. 2015), which will challenge the livelihoods of both farmers and pastoralists.

In order to guide future interventions with regard to climate change adaptation in these Highlands, the differences between farmers and Fulani pastoralists in perceptions of climatic changes observed, impacts on their livelihoods, and adaptation strategies used were investigated. The findings were compared with available studies from Cameroon and pastoralists elsewhere in African mountains. The study provides novel data on Fulani adaptation to climatic changes in mountain areas, and on changes related to fog—not investigated in any previous study in Cameroon.

**Study Area**

The study focused on Mt. Oku (06°11’N, 10°31’E; 3011 m) and Mt. Mbam (5°57’N, 10°44’E; 2335 m). These mountains were selected as they have similar climates and vegetation (Ngute et al. 2020), and they are both inhabited by Fulani pastoralists. Mean annual rainfall is 2400 mm year⁻¹ in Mt. Oku (Forboseh et al. 2003), and it is believed to be similar in Mt. Mbam (Njabo and Languy 2000; field measurements of rainfall are unavailable). There are two seasons: the rainy season (April–October) and the dry season (November–March), the latter being characterized by the influence of the Harmattan, a dry wind blowing south from the Sahara (Mbue et al. 2016). At high elevations, montane forests are commonly covered in fog during the rainy season (April–October).

In Mt. Oku montane forests cover an area of about 9500 ha, in Mt. Mbam these only cover 2000 ha (Njabo and Languy 2000; Momo-Solefack et al. 2012). In both mountains, forests are managed as community forests in which extraction activities are regulated using customary laws (e.g., firewood collection of dead trees only). In Mt. Oku, two conservation projects organized by BirdLife International promoted white honey production and commercialization as an alternative livelihood for forest edge communities (Abbot et al. 2001). “White honey” is produced in hives placed near *Nuxia congesta* trees found at high elevations within the montane forest. These trees are also found in Mt. Mbam (Ngute et al. 2020) but white honey is not produced there.

Both mountains are populated by farmers and Fulani pastoralists. Farmers on Mt. Oku are Oku, Banso, and Kom, those in Mt. Mbam are Banso and Bamoun. The largest farmer community in each mountain was studied: Oku farmers (Mt. Oku) and Banso farmers (Mt. Mbam). Banso (also called Nso) and Oku ethnic groups are both from the Grassfields’ Bantoid Group which claims Tykar ancestry, the Oku chiefdom believed to be founded by a Nso prince (Nfi 2014). Both groups are ruled by a “Fon” (divine king), respected by his people and the national government. Current estimates indicate that there are 240,000 Banso individuals (2005 census, available at http://www.bucrep.cm) relatively widespread in the northwest region of Cameroon; and that there are 87,000 Oku individuals mostly confined to Mt. Oku and its surroundings (see www.ethnologue.com). Both groups practice subsistence rainfed farming and have secure land titles. In Mt. Oku, the major crops are maize and beans (subsistence) and Irish potatoes (subsistence and trade at local markets). On Mt. Mbam the major crops are maize, beans, cassava, and groundnuts, all for...
subsistence (no Irish potatoes are grown in this mountain as villages are located at slightly lower elevations than in Mt. Oku). Both groups are mostly Christian.

The Fulani (Fula or Fulbe) people are the largest nomadic pastoral ethnic group in Sub-Saharan Africa (20 million according to Ayodele et al. 2014). They are widely distributed across the Sahel and the Sudanian zone of West Africa, from Mauritania to Cameroon and South Sudan. In general, they do not own land but have rights to graze their animals on the communal lands of their “host” farmer communities (Mbih et al. 2018). Fulanis have become increasingly sedenterized over the past decades, due to population growth, climatic changes, environmental degradation, farmer-herder conflicts, and continued marginalization (Ayodele et al. 2014). In the Bamenda Highlands, most Fulanis have adopted a relatively sedentary lifestyle: movements are limited to seasonal changes of cattle during dry periods (Mbih et al. 2018). In the studied mountains, Fulani families spend the rainy season near the top of the mountains, to benefit from the fresh grass; and they migrate to lower elevations during the dry season so that their cows can eat the residues in farmers’ fields. Most Fulanis are Muslim.

In the Bamenda Highlands, farmers and Fulani pastoralists co-exist rather peacefully, although there is a general tendency to frame economic conflict in “ethnic terms” (Pelican 2015). In both mountains, there have been some minor disputes over land and water resources, but these were solved, in the worst case, through a court case. The largest concern in the study area is the overall insecurity related to the “Anglophone crisis,” which sparked in 2017 as a low-scale armed insurgency between the separatists of the North-West and South-West English-speaking administrative regions and the Francophone-lead central government of Cameroon. This increasing conflict, which has killed and displaced many by 2020, negatively impacts the livelihoods of both farmers and pastoralists as market prices and availability of goods (e.g., pesticides and veterinary care) vary considerably across time and space.

Data Collection and Analysis

In each mountain, focus-group discussions (FGDs) were organized in five farmer and five pastoralist villages (January–June 2018). In Mt. Mbam, all villages around the mountain were sampled. In Mt. Oku, all Fulani pastoralist villages were sampled and five Oku farmer villages from different access routes (footpaths) to the forest were randomly selected.

Each FGD involved 4–8 male participants including the village chief (as this is a custom in the study area). The study focused on elders as they can recall longer periods of time because of their age, which is relevant for perceiving climatic changes. In the study area, males are the household heads and are the only ones to make decisions on livelihood activities. Male elders command high respect and are sought after for advice by other village members. By only including male elders in the FGDs results represent only a partial sample of local viewpoints. Due to lack of resources, separate FGDs with females, needed due to cultural norms in the region,
were not organized. Future works investigating females’ views and that of younger generations are recommended.

After the aim of the study was explained to the village chief, he explained it to the elders available in the village that day, and some of them decided to participate (on a voluntary basis). Firstly, participants were informed that the aim of the study was to better understand their views on changes in climate and the impacts. After informal discussions centered on perceived changes in climate, the impacts these had on their livelihood strategy, and the adaptive strategies they had used to cope with or adapt to these changes. A native speaker of the same ethnicity facilitated and translated each FGDs. There were no differences in the organization of the FGDs between villages.

Data were pooled per FGDs (n = 20) and thematic analysis (Braun and Clarke 2006) was used to identify the main themes of the discussions. To analyze the effects of livelihood strategy (farmer vs pastoralist), FGDs were pooled by livelihood strategy (n = 10 each group). As there were no differences between mountains in climatic changes reported, impacts observed, or adaptive strategies used, data from both mountains was pooled together.

Results and Discussion

Perceptions of Climatic Changes and Impacts

In both mountains, there were no differences in the climatic changes reported by farmers and pastoralists (Fig. 1). In 19 of the 20 villages sampled, participants mentioned changes in rainfall quantity and distribution, with comments such as “the rainy season is now shorter and now there are dry periods during the rainy season.” In 19 of the 20 villages sampled, participants also mentioned that there has been a reduction of fog during the rainy season, e.g., “during the rainy season before one could not see the sun for 3–4 days and now fog only lasts a few hours.” In 18 villages it was also mentioned that temperatures during the dry season (which is

![Fig. 1](image_url) Climatic changes as reported by farmers and pastoralists in the study area. * refers to temperatures during the dry season. One focus-group discussion was organized in each village.
the coldest) have increased, e.g., “it is not as cold as it used to be.” The overall agreement between farmers and pastoralists supports the notion that groups having different livelihood strategies but living in the same area report similar changes in climate (e.g., Cuni-Sanchez et al. 2012, 2019a).

The climatic changes reported in the study agree with farmers’ perceptions elsewhere in the north-west region of Cameroon: increased temperatures during the dry season, a shorter rainy season, and increased variability in rainfall (late onset of the rainy season, extended dry spells/more floods) (Mbue et al. 2016; Nguh and Zeh 2016). In south-west Cameroon, farmers also reported increased maximum temperatures and reduced amounts of rainfall (Beckline et al. 2016). Previous studies did not report changes in fog, as they did not focus on communities living at higher elevations where fog is a common feature during the rainy season.

Compared with other studies in African mountains or highlands, increased temperatures were also reported by farmers on Mt. Elgon and the Rwenzori Mts in Uganda, while a late (or unpredictable) onset of the rainy season was also reported from Mt. Elgon in Uganda and the Virunga Volcanos in Rwanda (Bomuhangi et al. 2016; Few et al. 2017; Zizinga et al. 2017). Reduced fog was reported from mountains in northern Kenya, and for the East Usambara Mountains in Tanzania (Hamilton and Bensted-Smith 1989; Cuni-Sanchez et al. 2019a). Temperatures are projected to increase, and projected changes in rainfall by late century (2071–2100, RCP4.5) indicate a reduction in rainfall in most of the Bamenda Highlands (Platts et al. 2015).

Historical data from Bamenda meteorological station (about 60 km south from Mt. Oku) indicates increased temperatures and an increase in extreme events (very wet and very dry years), especially during the past 15 years (Mbue et al. 2016) – which agree with local perceptions in Mts. Oku and Mbam. Unfortunately, there are no historical measurements of fog for the area. Several authors have shown the agreement between local perceptions on climatic changes and meteorological data (see Savo et al. 2016 for a review), and the study also supports this notion.

In both mountains, farmers and pastoralists related changes in rainfall and fog patterns to forest health: as the forests have been degraded, “there are fewer large tall trees to collect fog water and to attract the rains” (comments made by participants in both Mts. Oku and Mbam). The link between forest degradation and fog reduction was also made in, e.g., the mountains of northern Kenya (Cuni-Sanchez et al. 2019a).

With regard to the impacts of the climatic changes observed, differences were observed between farmers and pastoralists. Farmers reported negative effects on crop yields and white honey production, and pastoralists reported negative effects on fodder availability and quality. Farmers in Mt. Oku and Mt. Mbam reported that changing rainfall and fog patterns have affected crop yields. They stated that drought spells during the rainy season and/or rain showers during the dry season (when the crop is ripening) can have devastating effects on maize, beans, or Irish potatoes. In Mt. Oku, farmers reported that Potato blight (Alternaria solani / Phytophthora infestans) is a major challenge in wetter years (farmers do not grow potatoes on Mt. Mbam). Reduced crop yields and increased disease prevalence were also reported as consequences of changing rainfall patterns in other parts of north-
western Cameroon (Mbue et al. 2016; Nguh and Zeh 2016), and in the Virunga Volcanos in Rwanda (Few et al. 2017). Remarkably, Mbue et al. (2016) report that some farmers perceived positive effects of changing rainfall patterns: with more floods, the production of certain crops increased in some areas (but the authors highlighted that there had also been improved agricultural practices). Increased prevalence of floods was not mentioned in Mt. Oku or Mt. Mbam, probably, because of the higher elevations studied.

In Mt. Oku, farmers also reported that observed changes in rainfall patterns had a negative effect on white honey production, with reduced production by bees in dry or wet years (in dry years yields there are fewer flowers, in wet years some hives get de-colonized). Farmers in Mt. Mbam are not involved in white honey production. In central Cameroon, a reduction in caterpillar abundance was related to changing rainfall patterns (Ngute et al. 2019). In Benin, a decrease in honey abundance linked to climatic changes was reported by both beekeepers and hunters of wild honey (Paraiso et al. 2012). Several studies have highlighted that non-timber forest products (NTFPs) such as wild fruits, honey, or caterpillars can be used as sources of food when crops fail (e.g., Cuni-Sanchez et al. 2012; Bele et al. 2013; Balama et al. 2017). However, few studies have investigated changes in NTFPs abundance over time, related to climatic changes. More research on the impacts of climatic changes on NTFPs, including the highly valued white honey, are urgently needed.

In both mountains, Fulani pastoralists reported reduced availability of grass because of a longer dry season and drought spells during the rainy season. Pastoralists in the mountains of northern Kenya also reported reduced availability of grass because of a longer dry season and drought spells during the rainy season (Cuni-Sanchez et al. 2019a). A reduction in grass availability, and increased disease prevalence, were also mentioned by pastoralists in eastern and southern Africa as major impacts of observed climatic changes (Filho et al. 2020).

**Adaptation Strategies**

Important differences were also observed on the adaptation strategies used by farmers and pastoralists. In both mountains, farmers reported using drought-resistant crop varieties (all 10 villages), more pesticides (7 villages, 5 for Potato Blight), and diversifying livelihoods, including vegetable farming near streams (3 villages), increasing white honey production (5 villages), wood carving (2 villages), or finding labor jobs in town (all villages, Fig. 2). All villages also invested in rearing sheep or goats (under zero-grazing), or kept a few chickens so they could sell them when crops fail. The main differences between farmers in Mt. Oku and Mt. Mbam were that farmers in Mt. Mbam did not cite white honey production or wood carving. As abovementioned, white honey production was initially promoted by a conservation NGO in Mt. Oku (but not Mt. Mbam). Wood carving to be sold to tourists only takes place in M Oku as no tourists visit Mt. Mbam (it is more remote and less known than Mt. Oku which is the second-highest mountain in Cameroon).
Similar adaptation strategies were already reported by farmers in the north-west and south-west regions of Cameroon (Beckline et al. 2016; Mbue et al. 2016). In the Rumpi Hills in the south-west, farmers reported cultivating more land (to compensate for lower yields) and reusing household organic matter (to boost crop yields), strategies not mentioned in the study. Cultivating more land is complicated in Mt. Oku, given the high population density and limited spare land that is not already under cultivation or community forest management.

In both mountains, Fulani pastoralists reported using trees for fodder (8 villages), migrating longer distances with herds (all 10 villages), finding labor jobs (6 villages), and starting farming (8 villages) (Fig. 2). Pastoralists highlighted that farming had the benefit of food storage: “as seeds can be stored during drought events, while cows die” (comments made by participants). White honey production was mentioned in two Fulani villages in Mt. Oku. Buying feed or rearing chicken, strategies reported by other Fulani pastoralists in the region (Mbue et al. 2016), were not mentioned in the study. In south-western Nigeria Fulani pastoralists reported migrating longer distances, buying feed, seeking an alternative source of income and selling some livestock before droughts (Ayanlade et al. 2018). Remarkably, these two studies (Mbue et al. 2016; Ayanlade et al. 2018) did not report that pastoralists had started farming as an adaptation strategy to climatic changes. Increased adoption of farming was reported by pastoralists in Niger, Benin, Burkina-Faso, Uganda, and Kenya (Cuni-Sanchez et al. 2012, 2019a; Egeru 2016; Kariuki et al. 2018; Snorek et al. 2014; Zampaligré et al. 2014). However, in a recent review of climate change adaptation strategies implemented by pastoralists in Africa (Menghistu et al. 2020) increased farming was only mentioned in four studies.

In the Bamenda Highlands, as most pastoralists are landless, starting farming means farming at high elevations – often clearing forested land as this is perceived as
having richer soils for farming. In both mountains, this is against local regulations on forest use and should be discouraged as it degrades the forest. Given the socio-economic situation of the pastoralists (most are landless), it is unlikely that they will gain access to land for farming at lower elevations. Instead, it would be preferable to promote white honey production among them – a strategy already used by some pastoralists in Mt. Oku. However, the effects of climatic changes on white honey production should first be further investigated. In Turkana in Kenya, pastoralists also used honey production as an adaptation strategy to climatic changes (Opiyo et al. 2015).

Turning to the montane forest for fodder (cutting branches and leaves to feed animals during droughts), already reported for pastoralists living around montane forests in Kenya (Cuni-Sanchez et al. 2019a), was also mentioned in eight of ten Fulani villages in the study. Several authors have reported that Fulanis use tree species from drier woodlands or agroforestry systems to feed their cows during the dry season or droughts (e.g., Khaya senegalensis, Gaoue and Ticktin 2007). But the study is the first to document that they may also use forest species, such as K. anthotheca or K. grandifoliola (see Cuni-Sanchez et al. 2019b). Oku farmers might also use forest species to feed their goats (Pers. Obs. 2018), but this was not highlighted during the FGDs, possibly, as most Oku farmers who have goats keep them under zero-grazing (instead of in the montane forest). The use of crop residue for livestock feeding has been identified as an adaptation strategy (e.g., in Ethiopia, Tilahun et al. 2017), but in the Bamenda Highlands, this was not identified as such, as it was considered “normal”.

Several factors are known to influence the choice of adaptation strategy among pastoralists, the most important being household income, labor availability, access to information and markets, and institutional/government support (Tilahun et al. 2017; Menghistu et al. 2020).

While institutional/government support often refers to veterinary services which help protect livestock from emerging and reemerging diseases that are associated with the changing climate (e.g., Opiyo et al. 2015; Ayel et al. 2018), this could also include extension support to help diversify livelihoods into farming and white honey production. Remarkably, combining pastoralism with tourism, the preferred income diversification strategy by pastoralists in eastern and southern Africa (see Filho et al. 2020), was not mentioned in the Bamenda Highlands, probably, because even in Mt. Oku where there are tourists, farmers, which tend to be better educated than Fulani pastoralists, are those getting jobs as guides (Pers. Obs. 2019).

The study findings support the view that pastoralists’ landscapes and pastoralists themselves are not homogenous (Cuni-Sanchez et al. 2019a). The study shows that even pastoralists living in similar mountain environments use different adaptive strategies (white honey production or not, depending on training received and access to markets). Filho et al. (2020), focused on pastoralists in East and Southern Africa, highlighted the need to enhance access to climate information services, and the importance of identifying the responses needed during both drought and for post-drought herd recovery. In the highly populated Bamenda Highlands of Cameroon, where most Fulani pastoralists are landless and are hosted by nearby farmer communities, the priority is increased access to credit and training for livelihood
diversification. Lack of funds is often a major constraint to adaptation (e.g., Silvestri et al. 2012; Cuni-Sanchez et al. 2019a). Interdisciplinary approaches involving rural communities can help assess both, the most suitable adaptation strategies for a given area, and the constraints to take up these strategies (Mugi-Ngenga et al. 2016).

The study findings also suggest that a shared appreciation of climatic changes could be used as a common ground for engagement in land management, and as conflict resolution between ethnic groups, as suggested elsewhere (e.g., Negev et al. 2019). Both farmers and pastoralists identified the same climatic changes, and they both reported the negative impacts these changes have had on their livelihoods. Although farmer-herder conflicts in the Bamenda Highlands remain small, compared to those reported in, e.g., Nigeria (Ayodele et al. 2014); climatic changes and environmental degradation could increase farmer-herder conflicts in the future, in particular with regard to access to water and pasture. Considering pastoralists as part of the socio-ecological farmer-dominated systems is important if we are to help them adapt to predicted changes in climate.

**Conclusion**

The study highlights that considering livelihood strategy is of key importance for Climate Change Adaptation in Africa. Livelihood strategy (farming, pastoralism) does not affect local communities’ perceived changes in climate, but it does affect the impacts observed and the adaptation strategies used. The study shows that Fulani pastoralists have fewer options for adaptation, as they are landless and most NGOs promoting livelihood diversification (including white honey production) have focused on farmer communities and have overlooked them. More research on strategies that could be developed for pastoralists (growing fodder grass, or fodder trees) is recommended, while also considering integrating them into other strategies used for farmers (e.g., white honey production). Honey production does not only help as an alternative source of income, but it has also helped promote forest conservation (reduced fires caused by farmers clearing land for agriculture) in Mt. Oku (Forboseh et al. 2003). The conservation of montane forests is known to be of key importance for local climate regulation in mountain regions (Bruijnzeel et al. 2011). Therefore, adaptation strategies which also promote forest conservation should be a priority in forested mountains.

The study also shows how local communities’ perceptions can be used to identify the climatic changes already observed in mountain regions, helping complement meteorological data-scarce areas (Reyes-Garcia et al. 2016; Savo et al. 2016). To fully understand the impacts of predicted changes in climate, numerous climatic variables – including fog – should be considered, as fog can be an important source of water in mountain regions, water being key to local populations, farmers, and pastoralists.

**Acknowledgments** The study was partially funded by Marie Skłodowska-Curie Actions Global Fellowships, Number 743569.
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