



Non-timber Forest Products in Cameroon's Food System and the Impact of Climate Change on Food Security in Dschang

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INTRODUCTION

The world's reservoir of forest genetic resources, especially in tropical areas, is threatened by a series of human and natural factors, such as population pressures and climate change. The destruction of forest ecosystems is increasingly restricting the range of possibilities for generations of current and future users in rural and urban communities (Bele et al., 2011; Nkem et al., 2010; Tieminie et al., 2021). Globally, the area of tree cover declined by 10% from 2001 to 2020, with 94% of the loss in Africa due to shifting agricultural uses (WRI, 2021). The forests of Cameroon, one of the major components of the Congo Basin forests, do not escape this reality. From 2002 to 2020, Cameroon lost 3.7% of its

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humid primary forest (Global Forest Watch, 2021), the type of forest that provides the greatest density of biodiversity and cannot easily be regenerated (Marchese, 2015). There are many edible fruit species in Cameroon's forests (Eyog-Matig et al., 2006). There is also a vibrant trade in other foods such as game, caterpillars, snails, mushrooms, leaves, bark and seeds.

The loss of biodiversity might outpace efforts to catalogue the varieties of foods and their harvest methods and uses, since almost all forest landscapes in Cameroon are affected by climate variability and climate change. Sustainable urbanism implies sustainable use of natural resources, including forest resources, and research into the linkages between urban food systems and forest ecosystems is an important contribution to sustainability efforts. The changes to Cameroon's forest ecosystems due to shifting weather patterns are already being observed by people living and working in the forests (Kamga, 2020; Nkem et al., 2010; Tieminie et al., 2021). The potential impact of climate change on Cameroon's urban food systems makes it an urgent need to understand these linkages.

Many plant and animal products other than timber—non-timber forest products (NTFP)—support a food system through which rural and indigenous communities harvest food from the forests and sell it to traders, who then supply the food to consumers in urban and rural markets across the country. The majority of the population of Dschang uses NTFPs, which provide them with food and medicinal products. In addition, through various informal channels, these products offer employment opportunities and generate income for the many players involved in their exploitation and marketing. At the national level, the economic dimension of NTFPs is practically unknown because of the informal nature of the trade and the lack of research into these dimensions of the food system. At the international level, NTFP trade exists between the Republic of Cameroon and many African and European countries. Unfortunately, no official statistics exist on the trade between Dschang and other cities. The sale of NTFPs exploited from different plant formations allows indigenous and local populations, and even those living in urban centres, to obtain the income necessary to meet different social obligations, plan for their futures and access adequate food for their families.

The following sections explore the consumption, trade and production of NTFP food products. Each section is based on a different research study and the relevant methodological background is embedded in each section. The next section demonstrates the importance of NTFPs in the

diets of households in Dschang. It is followed by results from a survey of small-scale food traders in Dschang, with a focus on *safou* sellers. The subsequent section presents findings from ethnobotanical research with communities that harvest NTFPs for sale, with a focus on bitter kola. The chapter ends with a reflection on the threat climate change poses to the food system and to the sustainability of cities such as Dschang.

URBAN CONSUMERS OF NTFP FOODS

Cameroon is an urban country and UN-DESA (2018) anticipates that by 2050 three in four Cameroonians will live in urban areas. Urban food systems research is lagging far behind the growing need for baseline data to identify opportunities to improve the resilience and sustainability of Cameroon's urban dwellers. Recent urban food research in Cameroon has focused on urban and peri-urban agriculture (Gwan & Kimengsi, 2020, p. 19; Karg et al., 2020; Ngome & Foeken, 2012; Prain et al., 2010; Tata et al., 2019), and the impact of food prices on dietary change (KC et al., 2018; Legwegoh & Fraser, 2017), with little detailed study of informal food-trading systems. There has been some work establishing the importance of "wild foods" to urban food systems and household food security, which documents the popularity and widespread availability of many NTFP foods in urban Cameroon (Sneyd, 2013). A common theme in the literature is that the rapid expansion of urban populations and built environments, coupled with anaemic food policies that rely on imports rather than investment in agriculture, threatens the sustainability of Cameroon's development. The threat to urban food systems posed by climate change and forest ecosystem loss adds a new element to this conversation.

The information in this section is drawn from original research conducted in Dschang, Cameroon, in December 2017 that examined multiple dimensions of food security and the food system from the household scale (Legwegoh et al., 2020). The in-person survey was conducted with 964 households across the population of Dschang Municipality, which includes a gradation of characteristically urban, peri-urban and rural environments. The survey included questions about food consumption, food access, livelihoods, agriculture and the consumption of indigenous foods (Legwegoh et al., 2020).

Dschang is the urban centre for a small agricultural area in Menua District, West Region. The urban area has a population of about 200,000,

although the influx of internally displaced people from neighbouring North West Region due to political violence and the circular migration of students and staff attached to the local university mean that the actual population at any given time is much higher. While about one in four household members was born outside of Dschang, within the highly mobile age range of 15–44, about 40% were born elsewhere (usually in another city in Cameroon). Dschang’s food system operates mainly through traditional periodic markets, with the main central market (Marché B) operating daily, with much higher activity on Big Market Day (every eighth day) and Small Market Day (four days after Big Market Day) (Republic of Cameroon, 2011). Subsistence agriculture is a key component of Dschang’s food system (Temgoua et al., 2012). Two in five households produce food in a rural area for their own consumption. Food trading is also an important source of income: when asked to list all sources of income for the household, the informal production and sale of fresh produce was the most widespread income source (29% of households) and 16% had income from the informal sale of fresh produce they had not produced. The informal food system is an important source of food and income for most residents of Dschang, where only 16% rely exclusively on formal income sources and 24% do not produce any of the food they consume.

The large population of migrants from other regions of Cameroon shapes the food culture in Dschang, although it continues to be shaped as well by the multitude of foods specific to the environment and the Bamiléké cultural traditions of the region. The survey included a list of 20 indigenous foods developed by the local research team to reflect what one might expect to find locally (Table 15.1). Many NTFP foods are consumed by a large number of households. *Njansang*, a seed from the *Ricinodendron heudelotti* tree (CIFOR, 2021a) and bush onion, a fruit from the *Afrostryax lepidophyllus* tree, whose seed is also used as a spice and whose leaves and bark are used for medicinal purposes (Moukette et al., 2015), were both consumed by two-thirds of households. Half of all surveyed households consumed *safou*, also known as “bush butter”, the fruit from the *Dacryodes edulis* tree that provides nutritious oil and fatty acids (CIFOR, 2021b). Bitter kola, the nut from the *Garcinia kola* (*G. kola*) tree (Kamga et al., 2019), was consumed by 42% of households. These foods are cooked and consumed together as traditional meals. This is the case, for example, of the mixture made from potatoes, bananas,

Table 15.1

Indigenous food
consumed by the
households surveyed in
Dschang

<i>Indigenous foods</i>	<i>Number of households</i>	<i>Percentage of households</i>	<i>NTFP (Y/N)</i>
Njansang	635	66.0	Yes
Bush onion	625	65.0	No
Spices	525	54.5	Yes
Safou	481	50.0	Yes
Honey	425	44.2	Yes
Bitter kola	406	42.2	Yes
Raffia palm	388	40.3	Yes
Rondelle	341	35.4	Yes
Okok/Eru	325	33.8	Yes
Cola nut	289	30.0	Yes
Bushmeat	288	29.9	Yes
Mushrooms	223	23.2	Yes
Mbongo	207	21.5	Yes
Bush mango	133	13.8	Yes
Pèpè	101	10.5	Yes
Forest snails	94	9.8	Yes
Fruit of Raffia palm	90	9.4	Yes
Termites	73	7.6	Yes
Green grasshopper (Ngoh)	69	7.2	No
Caterpillar	7	0.73	Yes

NB Multiple responses

beans and red oil (palm), commonly known as *tchoumtom* and *tchoukolo* in the area around Dschang.

A variety of local ingredients, spices (*njansang*, rondelles), condiments (fresh or dried) or bush onion are widely used in the preparation of different dishes. This is the case with fish broth or forest snails, accompanied by rice and/or plantain (ripe or not) and sweet banana. Other examples are *Folong*, a vegetable prepared with peanuts with smoked fish, and *N'dolé*, a vegetable cooked with meat and/or smoked fish and accompanied by rice, plantain, cassava, macabo, sweet potato and couscous (mixture of simple corn flour cooked at 100 °C). Other foods identified in the locality that are eaten directly or over the embers include bush mango, cola nuts, bitter kola, honey and *safou*. They play an important role for more than 100 million people in the sub-region because they

are a source of food as well as medicine. Regular consumption of these products can also correct micronutrient deficiencies (FAO 2011).

Figure 15.1 shows that some of the indigenous foods are consumed on a frequent basis. Bush onion and *njansang* were consumed on a weekly basis by the majority of households. *Safou* was consumed by half of all households, but rarely on a weekly basis. Other foods such as mushrooms, green grasshoppers and caterpillars were less popular and when households consumed them, it was usually just once a year. The indigenous foods in this survey were mainly purchased, with some exceptions. These included bush mango (*Irvingia gabonensis*), which is grown and

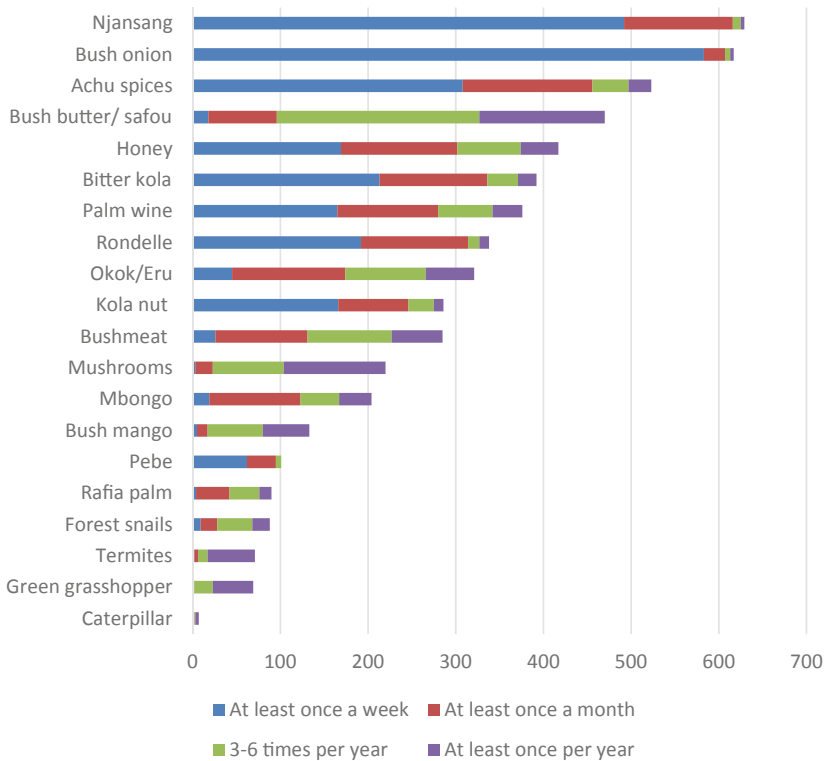


Fig. 15.1 Frequency of consumption of selected indigenous foods

collected in rural areas by 13 and 15% of consuming households, respectively; cola nuts, which are grown and collected in rural areas by 20% and 18% of consuming households, respectively, and bushmeat, grasshoppers and termites, which tend to be collected about as frequently as they are purchased by consuming households. Because most of these products are purchased, the frequency of consumption depends on their availability on the market, which in turn depends on the seasonality of different foods. Foods that are consumed by several households weekly or semi-weekly are available almost all year on the market. This availability would be linked to the ecological conditions of each production basin and the variety of ecosystems in which the trees can grow. The *Dacryodes edulis* tree that produces *safou* grows in different regions, with fruit maturing in different months in different parts of the country. This staggering of seasons could explain the consistent availability on the markets of large urban centres and therefore the fruit's accessibility to households. The high frequency of NTFP food consumption demonstrates that forests are a basic food source for households living in Dschang.

SAFOU AND THE INFORMAL FOOD SYSTEM IN DSCHANG

The household food security survey was followed by a survey of small-scale food-trading businesses (fewer than five employees) in Dschang in August 2019 (Kamga et al., 2021). The survey questions addressed issues about the location of vendors, demographic characteristics, enterprise characteristics (structure, practices and business environment), sanitation and food production patterns. The survey included 854 trading businesses representing a distribution of types of businesses in line with a rapid survey conducted as a framing exercise (Kamga et al., 2021). The survey was implemented in 21 locations across Dschang's urban area, with the largest share (25%) conducted at the main food market (Marché B), followed by the informal residential areas of Foreké (15%) and Foto (14%). Three-quarters of the enterprises were owned and operated by one person, with the remaining 25% having between one and five employees. About two-thirds of the respondents were women and one-third were men. The majority of businesses (73%) operated without paying any kind of licensing or market fee (Kamga et al., 2021).

The survey included an open-ended question about what foods the businesses sold, in which each respondent named up to five foods that were the main items they sold and responded to a series of questions

pertaining to each food. There was a wide variety of foods, with the most popular being bread (20%), rice (17%) and peanuts in various forms (15%). The most widely offered NTFP food was *safou*, sold by 39 traders (4.6%). Other NTFP foods sold were *eru* (11%), bitter kola (seven percent), cola (seven percent), *njansang* (six percent), *fruits noirs* (two percent), rondelles (two percent) and snails (two percent). These findings demonstrate that many NTFP foods are available in Dschang, confirming the findings of the household survey. They also put into perspective the scale of the NTFP foods relative to cultivated foods in Dschang's informal system. The small percentage of small-scale food traders selling each of these products illustrates that they are a small part of the informal food system relative to other cultivated and processed foods.

A closer look at the types of businesses selling the most popular NTFP food, *safou*, helps to paint a picture of the marketing of this product. Owners of businesses selling *safou* were 83% female and nine percent had primary education or less, reflecting a demographic with statistically fewer opportunities for formal sector employment than the average person in Dschang, and hence more economic vulnerability. Some characteristics that made these businesses more “informal” were that only six percent were paying fees of some kind, 75% were located in roadside stalls and another nine percent had no fixed place of operation. Each business owner named their usual source for *safou*, and 48% sourced it from a market in Dschang, 23% from a wholesaler, 20% from a rural market, and three percent each from the following sources: harvested by the respondent; purchased directly from the harvester; and purchased at a market in another city. These sources show that in almost all cases the supply chain for *safou* consumed by households in Dschang has multiple intermediaries between the harvester and the consumer.

The livelihoods of people engaged in this supply chain—including harvesters, wholesalers and retailers—are affected by the health, biodiversity and productivity of Cameroon's forests. As discussed below in more detail, rural communities living in and near the forests witness the signs of climate change in their daily lives. Yet there has been little research on the perceptions of climate change in urban communities in Cameroon. The food trader survey in Dschang found that 78% of respondents were aware of climate change. The top source of information about climate change was the change people observed in their environment (71%). According to about 64% of those who knew of climate change by observing a change in their environment, they observed dropping temperatures, rising

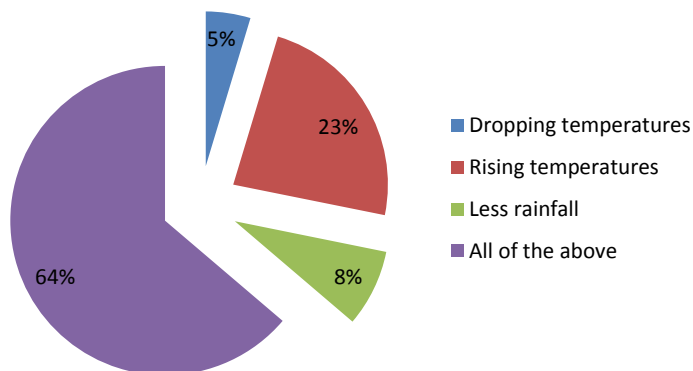


Fig. 15.2 Proportion of the main effect of climate change in Dschang Area

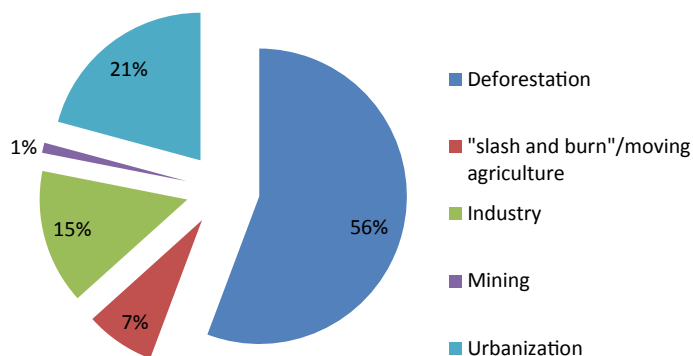


Fig. 15.3 Perception of the main human activity causing climate change

temperatures and less rainfall (Fig. 15.2). The majority of respondents (56%) believed that the main cause of climate change is deforestation, followed by urbanization (21%) (Fig. 15.3). This result is in part a reflection of the cultural importance of forests for most Cameroonians and in turn the cultural importance of forest products for rural and urban Cameroonians alike. The following section focuses on the rural communities whose livelihoods are arguably the most directly affected by the depletion of forest biodiversity. They play an important role in the connection between forests and urban consumers of NTFPs.

THE EXPLOITATION AND TRADE OF *G. KOLA*

This section provides information about the source communities for NTFPs found in Cameroonian cities such as Dschang. The section is based on ethnobotanical research conducted in 2017 and 2018 in markets and villages in Central and Eastern Regions of Cameroon into the harvesting and marketing of products derived from the *G. kola* tree (Kamga et al., 2019). *G. kola* yields consumable fruit, nuts and bark and is endemic to the humid lowlands rainforest ecosystem of West and Central Africa, from Sierra Leone to the Democratic Republic of the Congo (Adebisi, 2004; Kouame et al., 2016). The nuts have high nutritional values and are widely used as a stimulant, aphrodisiac and digestive aid (Alaje et al., 2014).

In investigating the socio-cultural and economic importance of *G. kola* and practical information about harvesting and marketing practices, interviews were conducted in the markets of Lomié (a small town adjacent to the Dja Faunal Reserve, a UNESCO World Heritage Site, located in East Region), and Makénééné, a large town in Central Region (Kamga et al., 2019). The semi-structured interviews lasted about 25 to 40 minutes each. The 81 people interviewed were mostly male (63 men and 18 women), distributed into three age classes: 18 people over 50 years old, 56 people aged 25 to 50 and seven people younger than 25 years old. The criterion for selection of the 81 respondents was regular or seasonal exercise of the exploitation and/or marketing activities of bark or seeds of *G. kola* (Kamga et al., 2021).

The NTFP markets in the small towns of Lomié and Makénééné supply a variety of NTFPs for domestic trade and for export. The trade in *G. kola* products is mostly informal, in the sense that there is little regulation or government oversight of the market. No organizational or professional structure was identified during the study, in part because the taxation of NTFPs in Cameroon is poorly developed in comparison with that of timber. In this market, transportation is the limiting factor, as producers deal with both the law of supply and demand and the law of supply and transportation. If there is less supply, transportation becomes scarce, and if transportation is scarce, supply decreases and prices rise. This scenario causes a dislocation of the system and production capacity, which benefits only a narrow set of stakeholders who have a supply at hand near a consumer market with low supply (Ruiz Pérez et al., 2000). When the

commercial sector presents a good interconnection with a regular transport network, the producers become interested, and this can be beneficial for all the actors involved.

The challenges and opportunities facing producers vary geographically. In the area served by Makénéne Market, most of the trees are parts of plantations that have been preserved by farmers (Kamga, 2020). In this area, trees are closer to the villages (two to 3.5 hours' walk). In the area served by Lomié Market, the trees are mainly in the wild forest reserve and farther from villages (five to 12 hours' walk). The distance to the harvest site is the key limiting factor, considering the return walk requires carrying loads of up to 40 kg of fresh bark, fruit or seeds. Harvesters need to have adequate time and physical strength to engage in harvesting. Much of what is collected is used locally, especially if markets are difficult to access and prices are low. In the area around Lomié Market, only 23% of harvesters harvested for commercial purposes, while the figure was 75% in the Makénéne area.

The income resulting from the sale of *G. kola* products, especially the *G. kola* seeds, varies according to the market and the various categories of people involved in the distribution chain. Generally, seeds are free in the farms or forest and harvesters benefit from 100% of the sale price, often after investing considerable time and energy to harvest and process the fruits into nuts. Income generated from the sale of *G. kola* is used for subsistence and other household expenses. The *bayam-salams* are market women who operate across Cameroon, often as intermediaries between harvesters and other traders or consumers (Fonjong, 2004).

Respondents estimated that the profit margin for *bayam-salams* was 30–40%, and up to 60% when they store the products until there is a scarcity in the market. There was a geographical difference in the gender of marketers. In the Makénéne Market area, 82% of traders were women, whereas in the Lomié Market area most of the traders were men. The men trading bitter kola in the Lomié Market area were mainly hunters, and several people indicated that the scarcity of bitter kola pushed most of the *bayam-salams* to focus on other NTFPs, including foods found in Dschang such as bush onion and *njansang*.

The harvesting practices have varying degrees of effect on the health of trees. The harvesting techniques applied by respondents were leaf removal (62%), followed by barking and uprooting (58%), felling (28%) and ring removal of the bark (19%). Most of the fruit and seeds were collected from the ground or the tree canopy. Collecting on the tree does not affect

the survival or regeneration of species. Collecting from the ground can be dangerous for the dynamics of the species if all the products are harvested. Felling trees or uprooting certain species reduces the productive potential of the forest in the short term and can even affect the specific richness, if it becomes intensive for certain categories of species. The intensity of exploitation depends on the domestic and commercial demand for the product. The impact of logging on the structure and composition of the forest is closely linked to the intensity of the harvest and could lead to the disappearance or death of individual trees (Avana-Tientcheu et al., 2018; Guedje, 2002). This strong pressure can lead to a reduction in the availability of products on the market and, consequently, could drastically reduce the income of all actors involved in the value chain, in particular households that harvest the products. This pressure increasingly risks the future livelihoods of the people who depend on these NTFPs (Kamga et al., 2019; Loubelo, 2012; Ndoye et al., 1999).

Climate change poses a major threat to biodiversity, as species that cannot adapt or relocate risk extinction (Díaz et al., 2019). In addition, many ecosystem services will be affected by climate change, and individuals and communities that rely on NTFPs will be impacted. Disturbances in the development schedule of *G. kola* trees, such as drop of buds, aborted fruits and lack of flowering, were observed by the local population after the flowering periods (Kamga, 2020). They attributed these events to climate change, noting that during some years it is colder than the normal range and in those years the trees (which are vulnerable to frost) bloom late; in some cases, not at all. Despite the average global increase in temperatures due to climate change, the effect of climate change in Cameroon is a cooler climate that is less favourable to fertilization and pollination. This situation will lead to a drastic drop in production, and a concomitant drop in the income of the actors involved in the value chain (producers/farmers, harvesters, transporters, sellers and so on), as mentioned by the local population in these forest regions (Kamga, 2020; Kamga et al., 2019). As well, the scarcity or even the absence of some climate-affected NTFPs, such as bitter kola nuts, pushes the local populations to turn to other, more abundant NTFP species. A number of NTFP fruits are now widely available in urban markets: *Afrostyras lepidophyllus*; *Pentaclethra macrophylla*; *Ricinidendron heudelotii*; *Carapa procera*; *Monodora myristica*; *Baillonella toxisperma* (whose tasty pulp is eaten fresh); *Coula edulis* (whose almonds are eaten fresh or

cooked); *Tetrapleura tetraptera*; *Iringia gabunensis*; *Dacryodes edulis*; and *Cola nitida* (Kamga et al., 2019).

Many ecosystem services are affected by the effects of climate change. This is the case with the supply of forest (Dale et al., 2010) and agricultural resources (Howden et al., 2007, p. 6). Tropical African forests provide the livelihoods of around 100 million people, directly for 60 million rural people and indirectly for 40 million urban dwellers living near forest environments, by providing them with food, medicine, fuel, fibre and non-timber products. These products also serve social and cultural functions (Mayaux et al., 2013). These ongoing climate change effects pose new challenges for biodiversity conservation, as they strongly influence environmental factors and many vital ecosystem services for local populations. Indeed, food systems are highly dependent on biodiversity and a considerable proportion of medicinal drugs is directly or indirectly of biological origin. For example, tropical forests provide an array of medicinal plants used for health care. Eighty percent of people in developing countries depend on traditional medicines derived from plants and trees. The change in the rhythm of the seasons due to climate change also has consequences on the flowering of plants that are needed for foraging bees to make honey. An in-depth study remains necessary to assess the effects of climate change on household vulnerability. Sustainable planning will require a broader awareness of the role of forests in Cameroon's food system and a fuller picture of the threats facing forests. There has been an overemphasis on the threat that forest communities pose (e.g. through bark harvesting and shifting agriculture), as the impacts of these practices are small and manageable compared to the looming threat of climate change.

CONCLUSION

The popular perception in Cameroon that deforestation is the main cause of climate change reflects the importance of forests for Cameroonian cultures and livelihoods. Cameroonians are perhaps more keenly aware than others of the importance of forests, which are home to more than 80% of the earth's biodiversity and represent one of the last refuges for many animal and plant species. It is estimated that 27,000 animal and plant species disappear each year due to climate change. This loss of biodiversity, which can be irreversible, cuts off humanity from invaluable services and resources; deforestation is therefore a disaster for humans as

well as for other species. As noted by Mekou Youssoufa Bele et al. (2011, p. 369): “In developing countries such as Cameroon, forest resources are frequently the principal assets of the poor, and the most proximate opportunity for food security and poverty alleviation”. Indigenous foods such as *njansang*, bush onions, *safou* and bitter kola are frequently consumed by the majority of households in urban areas such as Dschang. The commercialization of these products in local markets provides incomes that contribute to the livelihood of those involved in trading activities.

Climate change is a new challenge for biodiversity conservation, as it threatens the availability of NTFPs as well as agricultural activities. Conservation-oriented exploitation is possible with knowledge about sustainable levels of exploitation, uses and potential commercialization of NTFPs. This chapter combines research in markets and households in the secondary city of Dschang with communities and households in rural forest areas in Eastern and Southern Regions of Cameroon to trace the vital importance of forests for urban food security. It should inspire further research with communities in forested and urbanizing areas engaged in the exploitation, commercialization and consumption of NTFPs. Further work is required to develop sustainable guidelines for forest exploitation that would benefit all communities and raise awareness of the practical importance of forest ecosystems.

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