Project Update: November 2017

Introduction

The life will be practically impossible for the local population without the availability of Non Timber Forest Products (NTFPs) such as leaves, fruits, mushrooms, medicinal plants which are picked in the environment (Malaisse, 2010). Indeed, the NTFPs like the mushroom play an important role for the local population of tropical Africa like source of food, of drugs and of incomes (Kamou *et al.*, 2015: Koné *et al.*, 2013; Yorou *et al.*, 2014). Yorou *et al.* (2002) demonstrated that the annual economic value of WEF accumulated over 15-20 years is higher than the one-time harvest of timber from native partner trees. Over 300 mushrooms species are consumed by local people in Tropical Africa (Rammeloo and Walleyn, 1993; Walleyn and Rammeloo, 1994). In Benin particularly, about 60 edible species are consumed by local people (Yorou *et al.,* 2014). African socio-ethnic groups have important ethnomycological knowledge, including elements of edibility, therapeutic medicine, witchcraft (Walleyn and Rammeloo, 1994). In Benin, some investigations have enabled to identify the species commonly used as well as the different uses by local populations (De Kesel *et al.,* 2002, Yorou et *al.,* 2002, Yorou and De Kesel, 2002; Codjia and Yorou, 2014; Boni and Yorou, 2015). However, the documentation of ethnomycological knowledge of many parts of Benin, including the township of Bassila, remain incomplete. The present midterm report aims at giving an overview on the different uses of mushrooms by local people in the township of Bassila.

Methodology

Study area

The study was undertaken in the forest reserve of Bassila situated between 08°52''-9° North latitude and 1°37'' - 1°39'' East longitude. The forest covers 3523 ha and it is situated in northern Benin (Botokou *et al.,* 2004). The forest has a dry tropical climate, and rainfall varying from 1200 to 1300 mm/year (Codjia *et al.*, 2001). The forest reserve of Bassila is characterized by four type of vegetation: riparian forest, dry evergreen forest, woodlands and savannahs. The presence of a permanent watercourse creates a favorable microclimate for the growth of mushrooms (rare species belonging to genera Boletus and Cantharellus) adapted to this kind of habitat. This forest represents a unique fungal hotspot in Benin (Yorou, 2010). We find in this forest several fungi classified in Benin as species in critical danger of extinction (CR) such as *Cantharellus conspicuus, Russula cellulata, Cantharellus congolensis, Cantharellus platyphyllus, Lactarius foetens, Cantharellus guineensis, Strobilomyces echinatus* etc. and vulnerable species such as *Amanita masasiensis, Amanita xanthogala, Termitomyces schimperi, Termitomyces letestui, Termitomyces clypeatus, Termitomyces microcarpus*, *Termitomyces fuliginosus* and *Pulveroboletus ravenelii* (Yorou et De Kesel, 2011). We find also in this forest, ectomycorrhizal partner trees classified in Benin as Endangered (EN) notably Afzelia africana which is also on the IUCN red list with the Vulnerable statute (VU), as well as other non-ectomycorrhizal species which are also registered in Benin and on the IUCN red list as threatened, notably the following species: Khaya senegalensis (Benin: EN, IUCN red list: VU), Vitelaria paradoxa (Benin: VU, IUCN red list: VU), and Milicia excelsa (Benin: EN, IUCN red List: VU) (Adomou *et al.*, 2011).

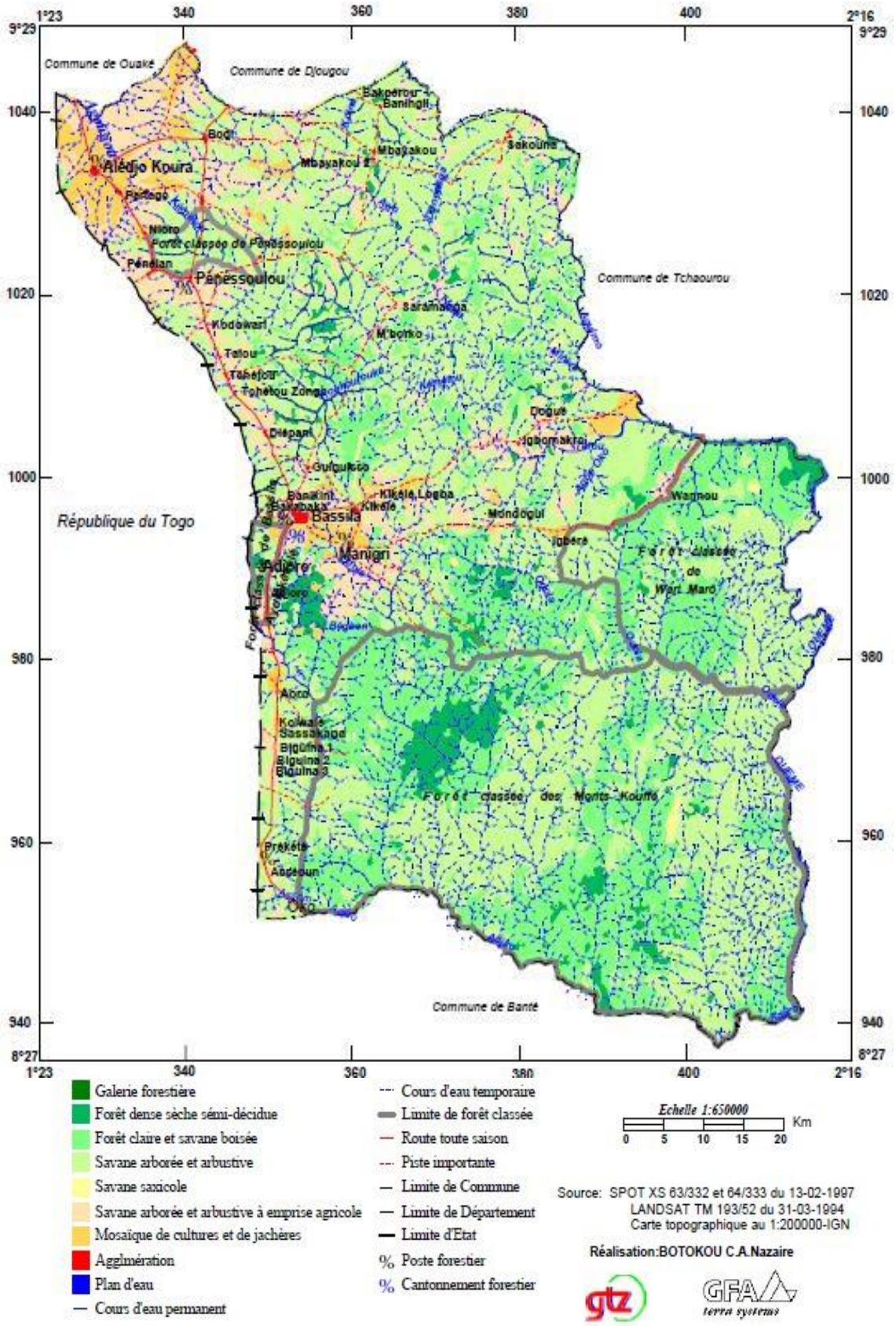

Figure 1: Map of study area

Data collection

The study was undertaken within five villages of the township of Bassila such as: Akpassa, Adjiro, centre Bassila, Barikini and Frignon. One hundred people were retained like sample. On the base of this sample, twenty peoples per village were selected for ethnomycological surveys. Our sample was taken into account ten ethnic groups such as: Anii, Lokpa, Kotokoli, Peulh, Nagot, Yom, Pila-pila, Ditamari, Ewé, Kabiyè with a high proportion of Anii and Lokpa. Edible mushrooms were collected directly in the field, and dried after preliminary morphological features according to protocol of De Kesel *et al*. (2002). For some specimens, professional pictures were taken directly in the field. The sampled specimens were used to make semi- structured and structured interviews. A detailed questionnaire containing the main topics to be addressed was elaborated for that. Otherwise, we also used a photo guide of edible mushrooms compiled from previous works (De Kesel *et al.*, 2002; Yorou *et al.*, 2002) to complete the diversity we collected in the field. The identification of mushroom species was realized using identification books (De Kesel *et al.*, 2002; Eyi-Ndong *et al.*, 2011).

Results

Habitat and ecology of edible mushrooms of Bassila area

The mushrooms collected are symbiotic (ectomycorrhizal or associated with termites named Termitomyces) or saprotrophic. Most of ectomycorrhizal species were collected on the ground near of their partner trees (Berlinia grandiflora, Isoberlinia doka, Isoberlinia tomentosa, Uapaca togoensis, Afzelia africana) in forest prospected. Termitomyces species were collected near of termite mound and saprotrophic species on the dead wood and dead leaves in forest and yard prospected.

Inter-ethnic variability in the recognize and the assessing of mushrooms

In study area, different uses of mushrooms were observed and the knowledge varies from one ethnic group to another. The different uses are inter alia: food and medicinal purposes. Most appreciated species by local people in taking into account all ethnic group surveyed are: Termitomyces clypeatus, Termitomyces letestui, Psathyrella tuberculata and Volvariella volvacea. Those species are most exploited and present same nutritive/food importance as bush meat, fowl and fish. According to respondents, mushrooms present the same taste as meat. However, among ten ethnic groups Anii, Lokpa and Nagot cited more mushroom species than others ethnic groups and most of use of mushroom are from those ethnic groups.

The study reveals that of all respondents, the women know mushrooms better than any other groups. Women look for, and pick mushrooms during field works, though the picking is free and none regulated. The women devote more time on mushroom activities above all food and trade.

However, ethnic groups use many local criteria to distinguish edible species from on edible species. In general, edibility criteria are related to the form, color, fatness, and cap. All species who present strange color (yellow for example) are considered as toxic. In the study area, we noticed that apart from Anii, Kotokoli and Nagot, others groups haven't the species notion. They make confusion among the specimens which we presented them physically as well as in pictures.

Diversity and exploitation of mushrooms

A total of 24 edible species were collected during this study. The table below presents the complete list of mushroom species with their local name enumerated by the majority ethnic groups (Anii, Lokpa, Peulh, Nagot and Kotokoli).

Edible mushroom species					
Scientific name	**Local names + appreciation**				
	Anii	**Lokpa**	**Peulh**	**Nagot**	**Kotokoli**
Termitomyces clypeatus	Kourouguidanou+++	Toutoum kèkpèka +++	Wouriho/Tchougounga +++	-	-
Lentinus squarrosulus	Gnonkra sangato + +	Akpatla Tapakpentu +	Krissouwé Titentendi +	Ossoussou dangni+	Akpenti tampunu+
Termitomyces microcarpus	-	N'Kpame kèkpèka+++	Mohi +++	-	-
Termitomyces letestui	Guéto+++	Tlé kèkpèka++	Gabonidi++	Ossousou koadja	Digbendè
Termitomyces schimperi	-	Tlé kèkpèka +++	-	-	-
Volvariella earlei	Ipélikoko Boutchafounkoko++	Awassa kèkpèka +	-	-	-
Chlorophyllum cf. *molybdites*	Agougou++	Naou kèkpèka++	Koutoukoutoutchèman++	Ossoussou malou++	Nan kovèka+
Volvariella volvacea	Okotoroko or Boupakoko+++	Paaou kèkpèka + + +	Goupii + +	-	Paaou Kovèka+++
Psathyrella tuberculata	Boukokopi + + +	Swoulouhontou + + +	Gabonidi + + +	Ossoussou wiwi +++	Kokopi + +
Amanita masasiensis	-	Wawa kèkpèka ++	-	Ossoussou odjou égan+ +	-
Amanita xanthogala	-	Napountou kèkpèka+	-	-	-
Lactifluus	Goutchélé koko+	Naoudjoun'dé kèkpèka+	-	Ossoussou kpai +	-
gymnocarpoides					
Russula congoana	Gatchitchrifoï quigniné +	-	-	-	-
Cantharellus guineensis	-	Tèr'n kèkpèka +	-	-	-
Unknown 1	Ewando+ +	-	-	-	-
Unknown 2	Anako+ +	-	-	-	-
Unknown 3	Gananarou+ + +	-	-	-	-
Unknown 4	Alorouma+ + +	-	-	-	-
Unknown 5	Gayaripi koko+ + +	-	-	-	-
Unknown 6	Itchrinanaou+	-	-	-	-
Unknown 7	Galim koko+ +	-	-	-	-
Unknown 8	Guinadanou+ +	-	-	-	-
Unknown 9	Gatchitchiléwon koko+	-	-	-	-
Unknown 10	Goukodocad+ +	-	-	-	-

Legend: + + +: much appreciated; + +: appreciated; +: less appreciated; - : knowledge unavailable on the edibility

Medicinal mushrooms uses

In the study area, many mushroom species are used in the treatment of several diseases. Anii use Boupa koko (palm tree mushroom) for gastric trouble, Guinadanou beef tongue) to cure epilepsy, N'gnonkra sangato for dermatosis. Lokpa use Doulen kèkpèka to cure osteoarthritis. Ditamari use the same species to cure abscess.

Composition and origin of local names of wild mushrooms

In general, local people of Bassila recognize two major groups of mushroom: edible and non-edible mushrooms. Edible mushrooms are well known and distinguished. However, non-edible species are grouped under the same name. Different ethnic groups (Anii, Lokpa, Kotokoli, Peulh, Nagot, Yom, Pila-pila, Ditamari, Ewé, Kabiyè) name respectively mushrooms in local name Boukoko, Kèkpèssi, Kovossi, Gabonidji, Ossousou, Gompim, Gompim, Gounga, Hounto and Kakpessi. However, Kabiyè use the same terminology with Lokpa to name mushroom and Pila-pila use also the same terminology with Peulh. Sometimes, the generic name of mushrooms is completed by one epithet that often related of the habitat, morphology, taste or the ecology. For instance, in Anii palm tree mushroom (Volvariella volvacea) is named "Boupa koko" (Boupa means palm tree). Also mushroom growing on Parkia biglobosa is named "Gourè koko" (Gourè means Parkia biglobosa). In addition, Lokpa name palm tree mushrooms (Volvariella volvacea) "Paaou kèkpèka" (Paaou means palm tree) and termite mushrooms (Termitomyces letesui) "Tlé kèkpèka" (Tlé means termitary). This ethnic group design for instance mushroom (Chlorophyllum cf. molybdites) eaten by beef "Naou kèkèpka" (Naou means beef). Anii ethnic group name Afzelia Africana mushroom (Lactifluus gymnocarpoides) "Goutchélé koko" (Goutchélé means Afzelia Africana).

Commercialization chain and the income generated in the rural household

The mushrooms are sold in all the villages investigated. The collection of mushrooms is free and non-regulated. Though appreciated in diets, the mushroom market is not functional in this region. Women who sell mushrooms don't find any interest to make it an activity. Indeed, mushroom commercialized in local markets, or house to house in the village provides only immediate income. The price of pile of mushrooms is constant (0.0013600 GBP). Thus, the current trend foresees a regression or a disappearance of mushroom trade in the localities studied because of the decline in fructifications from year to year.

Evolution of mushroom collection within the context of climate changes and different land uses

The majority of respondents reported that mushroom growing decreased over the years in the localities investigated. For the most of people, this situation is due to several factors including climate change (regression of rainfall), deforestation, the use of agricultural chemical products and soil compaction through the passage of cattle. Anii and Lokpa people noticed the disappearance of some species of mushrooms (Gayaripicoco and Naoyoulé).

Acknowledgement

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Annexes

Picture 1: Ethnomycological surveys with some people

Picture 2: Some edible species.
a- *Termitomyces letestui*; **b-** *Lactifluus gymnocarpoides*