

Conditions and Determinants of Access to Forests for the Non-Timber Forest Products Harvesting in Burkina Faso

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Abstract: Forest resources, including non-timber forest products are important to eradicate poverty and ensure food security for the surrounding populations of the forests in Burkina Faso. Access to these resources in the community and classified forests depend on the physical conditions and sociological determinants. Through surveys administered to 341 households of 9 villages bordering to the Biosphere reserve of “Hippopotamus Pond”, the classified forest of Toessin and the community forest of Saponé, we have identified the distance, the presence of forest officers as the main conditions of access. The residence’s status, the number of non-timber forest products collected, the status of the forest and population age are the determinants. Analysis of the variables correlation by the Person Method also has shown that access to non-timber forest products is significantly related and moderately associated with these variables.

In view of the results obtained, it is necessary to take into account these conditions and determinants of access in forest management mechanisms. This could ensure rational exploitation and equitable access to forest resources.

Keywords: Access, Conditions, Determinants, Correlation, Forest, Non-timber forest products.

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Introduction

Forest resources are essential products against poverty and they ensure food security in African countries. Nearly 600 millions of people largely depend on forestry activities and products (Lingani, 2011). Particularly, plants from natural forests and woodlands provide ecological services and are used by Africans rural populations for food, medicine, construction and furniture (Kristensen and Balslev, 2003; Teklehaimanot, 2004; Bélem *et*

al., 2007; Mamo *et al.*, 2007; Shackleton *et al.*, 2007). Although the importance of common property resources to rural West Africans is known (Williams, 1998; Becker, 2001), issues of equity and access among various forest users are a major challenge to forest management and resources exploitation (Byron and Arnold, 1997; Scherr, 2000; Adhikari *et al.*, 2004; Anderson *et al.*, 2006;). Thus, constraints and factors determine the access to forests and the type of natural resources collected.

Several factors may influence an individual's ability to gather products from forests, such as the gender, the age of the household head, the residence's status and other external factors like the status of forest and the number and type of collected products (Malaisse, 1997; Goebel, 1998). Distance to forests and markets, presence of forest officers are external forces that may often accelerate or reduce forest products extraction (Angelsen and Kaimowitz, 1999).

Africa has strong customary tenure systems and forest rights as well as rights of use and management. More 98% of African forests are considered to be State property, even if there is an increase in community ownership of forests (Ribot and Peluso, 2003). Management policies developed by governments are often imposed to the population. Those ones are not freely exercising their rights to use and profit from the potential of protected areas. Access to forest resources in African countries has experienced significant changes due to the degradation of the forests and the introduction of new management approaches (Robinson *et al.*, 2005).

Non-timber forest products are used not only for the daily food from the leaves, fruits, seeds, but also for therapeutic care (Havinga *et al.*, 2010; Shinkafi *et al.*, 2015; Zizka *et al.*, 2015). Although the picking of non-timber forest products is free in forest ecosystems, modes and forests management regulate access to those resources.

Burkina Faso has several protected areas whose some are erected to classified forests and international biosphere reserves. They represent biological resources that depend on local communities. Statistics show that Burkina Faso forest ecosystem abounds in more than 376 woody species whose diversity is still unknown (CONEDD, 2006). Although there have had some studies on the food and socio-economic aspects of the non-timber forest products (Guinko and Pasgo, 1992; Bélem *et al.*, 1996; Helmfrid, 1997; Millogo, 2001; Bognounou, 2002) and forest management activities (Delnooz, 1999; Hagberg, 2001; Yelkouni, 2004), those about factors and conditions that determine access to products, in different types of forests, have not been thoroughly investigated.

The objective of this study is to apprehend the conditions of access discerned by the populations and to analyze the determining factors in the riparian villages of three categories of forests existing in Burkina Faso whose the Biosphere reserve of "Hippopotamus Pond" (RBMH), the classified forest of Toessin and the community forest of Saponé.

Materials and Methods

Study Areas

The choice of the Biosphere Reserve of "Hippopotamus Pond", the classified forest of Toessin and the community forest of Saponé and their riparian villages was based on the phytogeographical sectors and on the categories of forests existing in Burkina Faso (Figure 1).

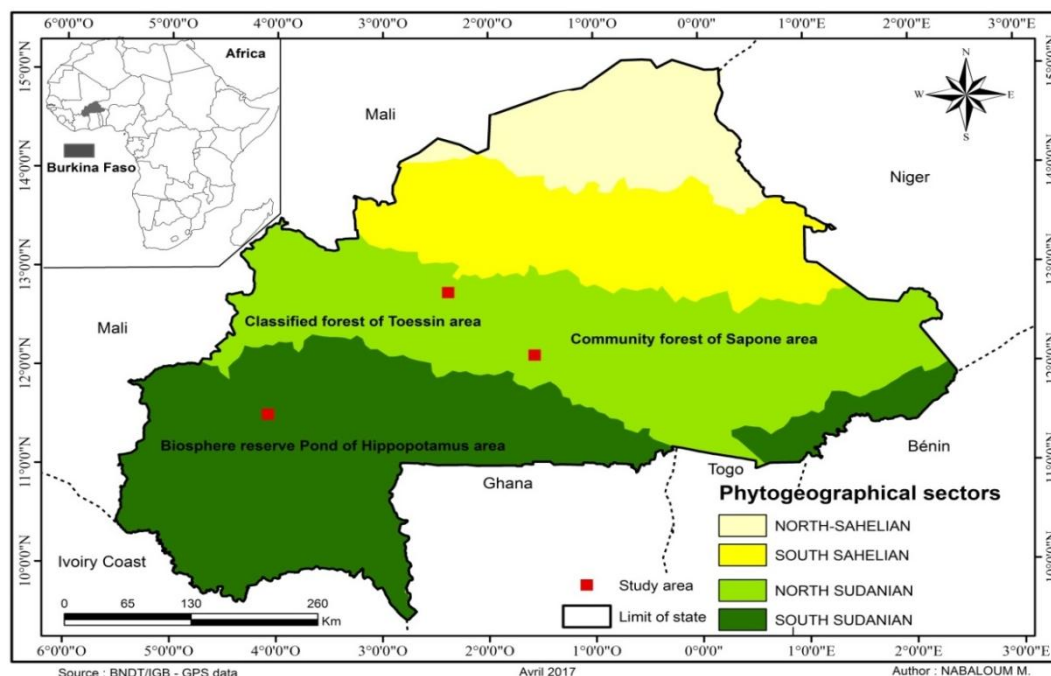


Figure 1. Phytogeographical map of Burkina Faso and location of the study sites

Figure 1 shows the location of the three sites study. In Phytogeography, the reserve is located in the south-sudanian sector. The classified forest and community forest are included into the north-sudanian phytogeography sector (Guinko, 1984).

***Biosphere Reserve of “Hippopotamus Pond” site**

The Biosphere Reserve of “Hippopotamus Pond” (RBMH) covers an area of 19200 hectares and is located between $11^{\circ} 30'$ to $11^{\circ} 45'$ N and $4^{\circ} 05'$ to $4^{\circ} 12'$ W. It is situated about 60 km North of Bobo Dioulasso (West Burkina Faso) and is located in Satiri department (province of Houet). The reserve gained its conservation status in March 26th, 1937 and has been registered by UNESCO in the network of Biosphere reserves since January 12th, 1987. It is divided into three zones (Dibloni, 2011):

- a central zone that is strictly protected;
- a plug zone surrounding the central area;
- a transition zone and an experimental research zone that ensure the functions of traditional use and form the zone of cooperation of the reserve.

The Biosphere reserve is also included in the list of Ramsar Wetlands. According to the data of the direction of Burkina Faso national meteorology, the climate is south-soudanian type and the average annual rainfall is 1080 mm during the period 1986-2015. The reserve is surrounded by 10 villages whose 3 were retained in the present study. These are Bala, Sokourani and Tierako. According to sanitary districts, the population of these three localities was estimated to 7644 inhabitants in 2015 The Biosphere reserve is essentially constituted of galleries forests, savanna trees and savanna shrubby (Bélem, 2008).

***Classified forest of Toessin and community forest of Sapone sites**

The classified forest of Toessin is an area of approximately 700 hectares and is located in Samba department (province of Passoré) in North of Burkina Faso. It is located between $12^{\circ}45'$ to $12^{\circ}47'$ N and $2^{\circ}25'$ to $2^{\circ}22'$ W. This forest obtained its conservation status in July 4th, 1935 (Bélem, 1993). 5 riparian villages surround this classified forest in which 4 have been considered for the present study. There are Toessin, Mesga, Itian and Minissia.

Approximately 122 hectares of area, the community forest has been created in 1974. It is a complex of about 122 ha and was made up of sacred woodlands and of the plantations of various species (Ouadba, 2003).

This forest is located between 12°06' to 12°08' N and 1°32 to 1°34 W in south of Burkina Faso, in the commune of Saponé (province of Bazega). The climate of these two forest sites are sudano-sahelian types.

In 2015, the population in classified forest site was estimated to 10446 inhabitants and 2085 inhabitants for study villages of the community forest (sanitary districts data).

According to climatic data of the national meteorology, the average annual rainfall was 700-750 mm for the period 1987-2015.

The natural vegetation of classified forest and community forest are qualified as savannah trees or shrubby. The Neighboring villages of the forests are strongly anthropised and marked by the presence of species such as *Vitellariaparadoxa*, *Lanneamicrocarpa* and *Parkiabiglobosa* in the agroforestry parklands (Ouadba, 2003).

Social surveys

The surveys have been carried out on 9 riparian villages of the three forest sites. The chosen localities depended on their distance to forests. Distance between the forests and the villages are indicated in table 1.

The household was the survey unit. In each locality, 10% of households were surveyed, giving in total 341 households. The number of households in each village was obtained from health surveys given by sanitary districts. The respondents were heads of the households, man or woman. Personal's information have been collected for each respondent. There are ethnic groups, residence status and education level. The interviews were conducted directly in concessions.

Table 1. Distance between riparian villages and forests

Province	Department	Forest name	Village	Distance village-forest (in km)
Houet	Satiri	Biosphere reserve	Bala	4.27 km
			Sokourani	0 km
			Tierako	0 km
Passore	Samba	Classified forest	Minissia	2.52 km
			Mesga	2.5 km
			Itian	1.43 km
			Toessin	1.9 km
Bazega	Sapone	community forest	Tanghin	0.73 km
			Talfmenga	2.51 km

Table 1 indicates the provinces and departments of the study sites. Is registered the distances between each forest and the riparian villages retained in this study the nearest villages were Tierako and Sokourani for Biosphere reserve site. The furthest were Bala for Biosphere reserve, Minissia and Talfmenga villages for the two others sites.

Statistical analysis

To appreciate the degree of the link between the variable access and the independent variables the ethnic group, gender, age, the residence and status of forest and with the dependent variables whose distance, the presence of forest officers, the deliverance of permits, presence of wild animals and the number of non-timber forest products collected, we used the IBM SPSS statistic 21 software.

The determination of the relationship between the variables has been done by the method of correlation of Person (r). This coefficient of correlation between two variables X and Y takes values situated between -1 and +1 (Cusson *et al.*, 2010).

* "- 1" represents a perfect negative linear relationship (variables are related by a relationship perfectly inversely proportional);

* "0" the total absence of relationship between variables;

* "+1" represents a perfect positive linear relationship (variables are related by a linear relationship perfectly directly proportional). Between these two values, the correlation coefficient indicates that variables are more or less linked between them.

Results and Discussion

Respondents social characteristics

For the study, 52% of the respondents were men, 48% were women, 79% were natives and 21% were migrants. Concerning ethnic groups, 62% were Mossi, 23% were Bobo, 11% were Fulani and 4% were others ethnics including Bwaba, Dafins, Dioula, Samo and the Gourounsi.

73% of the respondents were tillers, 9% were farmers, 5% were sellers, 7% local beer makers, 2% were agropastors and 2% had others occupations. The figure 2 shows the education level of the respondents.

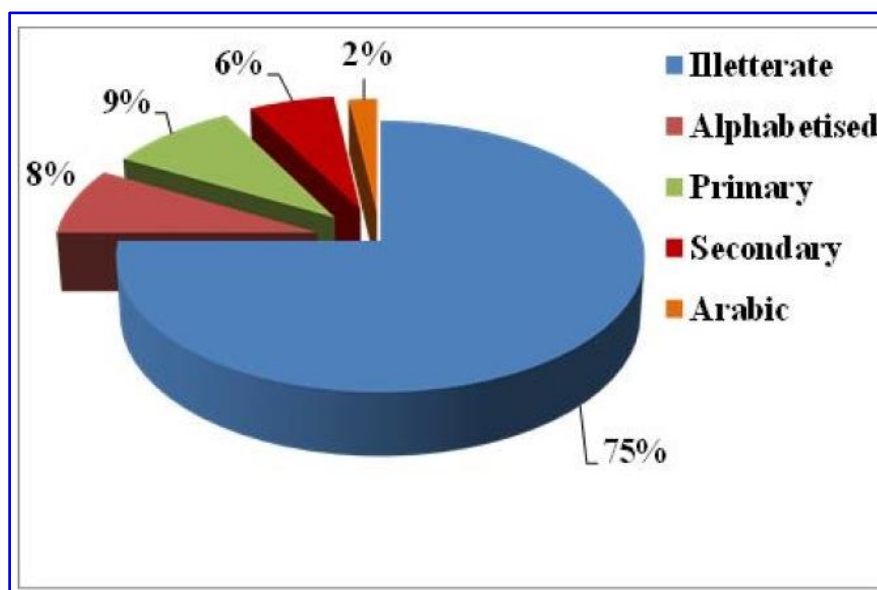


Figure 2. Education level of respondents

According to figure 2; 75% of the respondents were illiterate, 9% had primary school education level, 8% were alphabeticized, 6% had secondary school education level and 2% had learnt arabic.

Natives were Mossi people in the classified forest and in the community forest villages and Bobo in the Biosphere reserve localities. Mossi were migrants in the Biosphere reserve villages. Fulani were migrants in all studied localities.

Regarding the age of respondents, the age of the surveyed population was between 19 and 78 years (Figure 3).

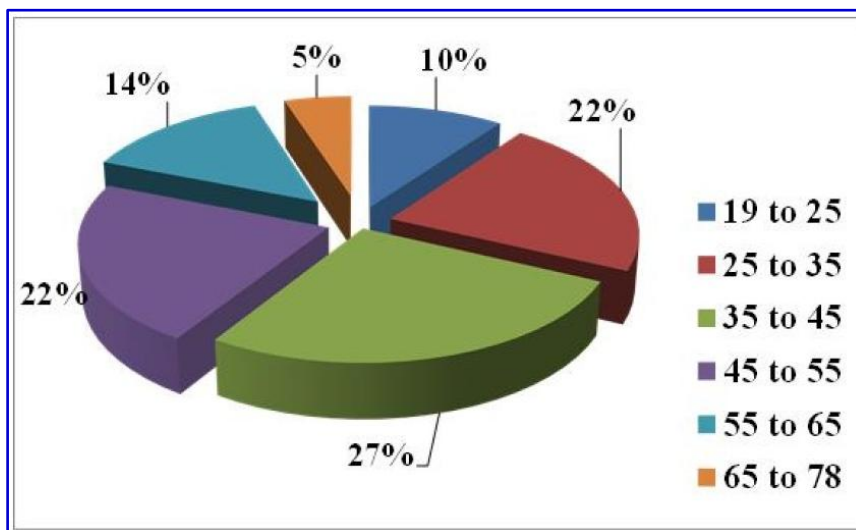


Figure 3. Age of respondents

Otherwise, the figure 3 shows 10% were 19-25 years, 22% were 25-35 years, 27% were 35-45 years, 22% were 45-55 years, 14% were 55-65 years and 5% were 65-78 years.

Conditions of access to non-timber forest products

As described in the table 2, the results of the analysis of correlation by the method of Person between the access to non-timber forest products (NTFP) and variables distances, presence of forest officers, number of products collected has indicated average values to enough average correlation. Those of the status of forest, the deliverance of permits, the presence of animals and age, the coefficient values have been quite weak. Thus, the main conditions to the access were the distance and the presence of forest officers, illustrated by figure 4. The key determinants were the number of products, residence and forest status and the age.

Table 2. Values of the coefficient of correlation of Person between access to non-timber forest products (NTFP) and variables

Variable		Number of NTFP	Forest status	Residence status	Delive- rance permit	Presence of forest officers	Age	Distance
Access to NTFP	Person correlation (r)	-.760**	-.112*	-.351**	-.112	-.438	-.236	-.564
	Sig (bilaterale)	.000	.040	.000	.040	.000	.000	.000
** The correlation is significant to the level 0.01 (bilateral)								
* The correlation is significant to the level 0.05 (bilateral)								

This table indicates the correlation was significant to the level 0.01 (bilateral) between access to NTFP and the variables number of NTFP and residence status. The correlation was also significant but to the level 0.05 (bilateral) between access to NTFP and forest status.

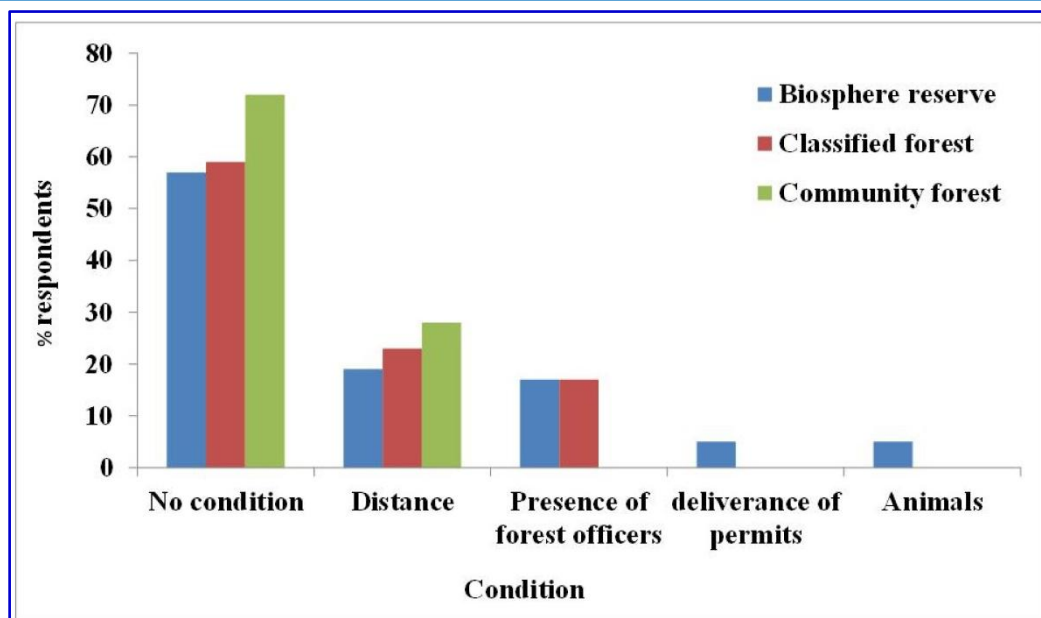


Figure 4. Responses for the main conditions to access

Figure 4 shows the percentage of responses concerning the perceived conditions access to the forests in the study sites. No condition is more mentioned in the community forest than Biosphere Reserve and classified forest.

***Distance from the villages to forest**

For the study, access to the NTFP is significantly correlated to distance, $r = -0.564$ ($p = 0.000$). The value of this coefficient of person indicated an average correlation between the two variables. It did show, moreover, that there is a statistically significant, inversely proportional relationship between these two variables. Indeed, 19% of respondents cited and recognized this condition. 19% of respondents of riparian villages of the biosphere reserve declared not to go to the forest because of its distance to their concessions especially for the inhabitants of Sokourani and Tierako.

In the classified forest of Toessin site, 23% of respondents told not to collect NTFP due to the distance separating Minissia, Toessin and Mesga villages to the forest. On the other hand, 28% of households in community forest villages affirmed not to enter in the forest to collect NTFP (figure 4). Populations found it difficult to access to the forest for NTFP harvesting because it requires physical effort.

Our results are similar to those of Tamirat and al. (2015) who have found 22% of responses concerning the factor distance to the forest in Ethiopia. In this sense, Epprecht and al. (2010) also concluded with us that physical accessibility is a precondition for access to natural resources and access is partially based on their physical distance to the people. While, Robinson and Kajembe (2009) specified that two types of time exist for access and NTFP harvesting: the time taken to reach forest and the time to collect.

***Presence or absence of forest officers to the surroundings of the forests**

The result of analysis of the relationship indicated that access to the NTFP is correlated significantly to the presence of officers. The coefficient of Person is $r = -0.438$ ($p = 0.000$). The R value has showed an average statistically significant and inversely proportional relationship between the two variables.

So, the presence or absence of forest officers has been perceived by 12% of respondents of the study. Only 17% of respondents have mentioned it in the villages of the Biosphere reserve and the classified forest.

Forest officers are perceived as a condition by the residents of the villages of RBMH and those of classified forest (figure 4). It is justified by the international character of this reserve; registered to Africa biosphere reserves network (AFRIMAB) and to world network of biosphere reserves (United Nations for Education, Science and Culture Organization-Man and Biosphere).

The presence of forest officers is generally perceived by population living around classified forest and biosphere reserve as forest repression because of regular inquiries from users who have committed offences such as: cutting green wood without authorization, collection of immature fruits, hunting and making bush fires; confiscation of materials used and often physical punishment are carried out by the forestry administration. This almost daily presence of forest officers around forest reserve has strongly marked the spirit of the local residents.

Our results corroborate those SAED (1989). This author has showed that the presence or absence of the forest officers was considered as a condition of access for the native residents and was related to the seizing of wood and the military character of foresters. Our results seem to rejoin with Djogbenou and al. (2011) who found a bad perception of the riparian populations on the presence of forest officers around classified forests in Benin.

Yet, none of respondents of riparian villages to the community forest did perceived this presence of forest officers as a condition to forest access. This lack of notification is due to the status of this forest which requires a low involvement of forest officers in its management.

Determinants of access to NTPF

***Residence status**

The analysis indicated that access to NTFP is correlated at $r = -0.351$ ($p = 0.000$) degree with residence status. This value confirms a fairly average relationship, statistically significant, inversely proportional between the two variables. Indeed, nearly 53% of natives and 5% of surveyed migrants declared access to the forests for NTFP picking (figure 5).

Moreover, 46% natives and 8% of surveyed migrants of the villages of Biosphere reserve said access to the forest. In the villages of the classified forest, 52% of natives and 4% of surveyed migrants confirmed enter in this forest.

This weak rate of access to the two sites migrants is explained, on the one hand, by their status of breeders whose most of them are installed on removed lands of villages, and on the over hand, the type of conditions cited by migrants. Migrants have more cited the status of forest and the presence or absence of the forest officers than natives (figure 6). The presence or absence of the forest officers is the most important condition notified by migrants in particular Fulani in the villages of the biosphere reserve and classified forest. Our results corroborate those of Mbodj (2014) who pointed up that the majority of natives are the owners of the legitimacy on their territory and the definition of the rules access to resources. These reiterate their permanent wish to control resources. We also agree with this author that migrants are settled in outlying hamlets of the villages and constitute a barrier for access to NTFP.

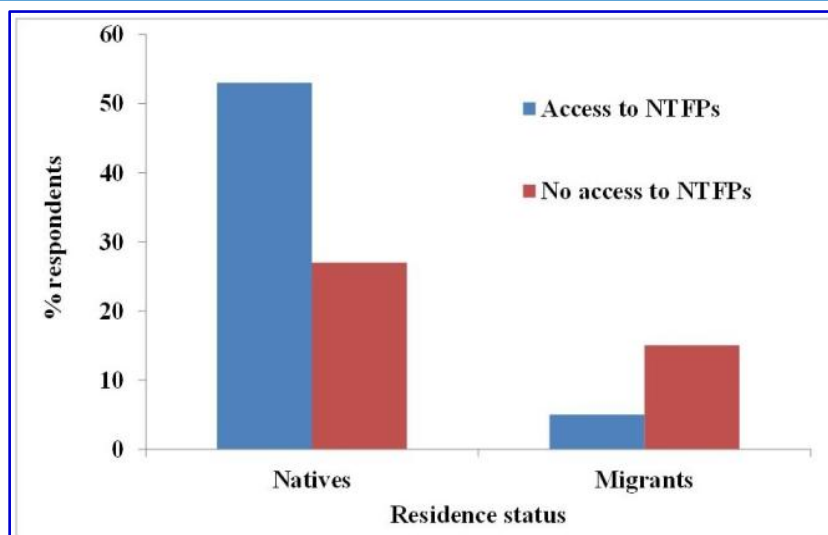


Figure 5. Access to the NTFP according to residence status

The figure above illustrates the percentage of the responses regarding the accessibility to the NTFP according to natives and migrants surveyed in the three study sites. Natives had more access to the forests than migrants in the study sites.

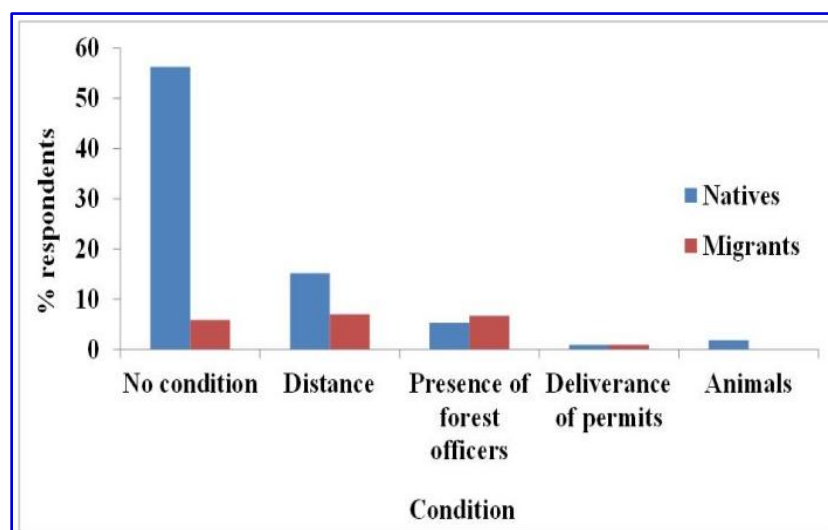


Figure 6. Conditions of access according to residence's status

The figure 6 indicates the percentage of responses concerning the perception of the conditions of access to the forests in the study sites according to residence's status of the populations. No condition is more mentioned than the others conditions.

***Number and type of NTFPs collected**

As indicated in table 2, the coefficient of Person is $r = 0.760$ ($p = 0.000$). The degree of correlation between access to the NTFP and the number of collected NTFP is a high value; this shows a fairly strong and directly proportional relationship between the two variables.

In other point of view, the number of collected products in the 3 forests is included between 1 and 8 NTFP. 3 NTFP are harvested by 14% of respondents. 2 NTFP are picked by 10% of respondents, 4 NTFP are harvested by 11% of surveyed and 5 NTFP collected by 8% of respondents (figure 7).

Furthermore, as indicated by the figure 8, for the most important species:

- 42% of surveyed picked the fruits of *Vitellaria paradoxa*,
- 32% of respondents collected the fruits of *Parkia biglobosa*,
- 28% of interviewees harvested the fruits of *Lannea microcarpa*,
- 20% surveyed picked the fruits of *Saba senegalensis*,
- 10% harvested the flowers of *Bombax costatum* and the fruits of *Tamarindus indica*.

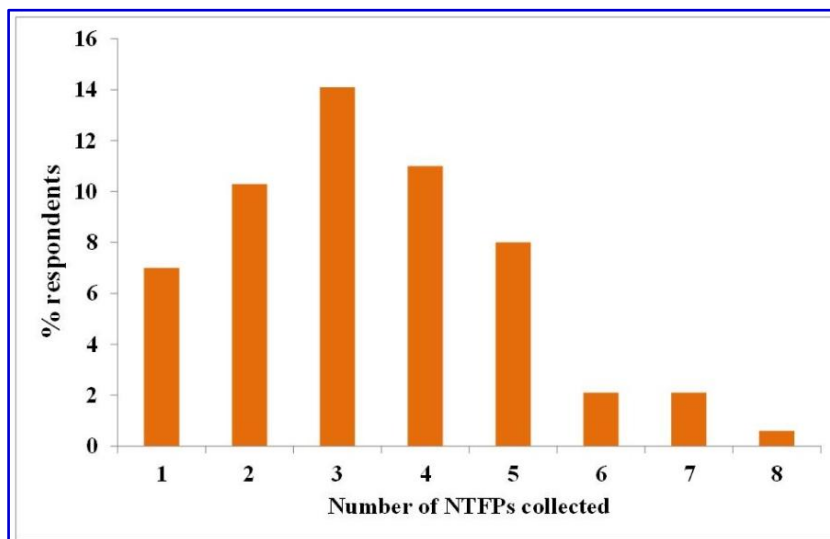
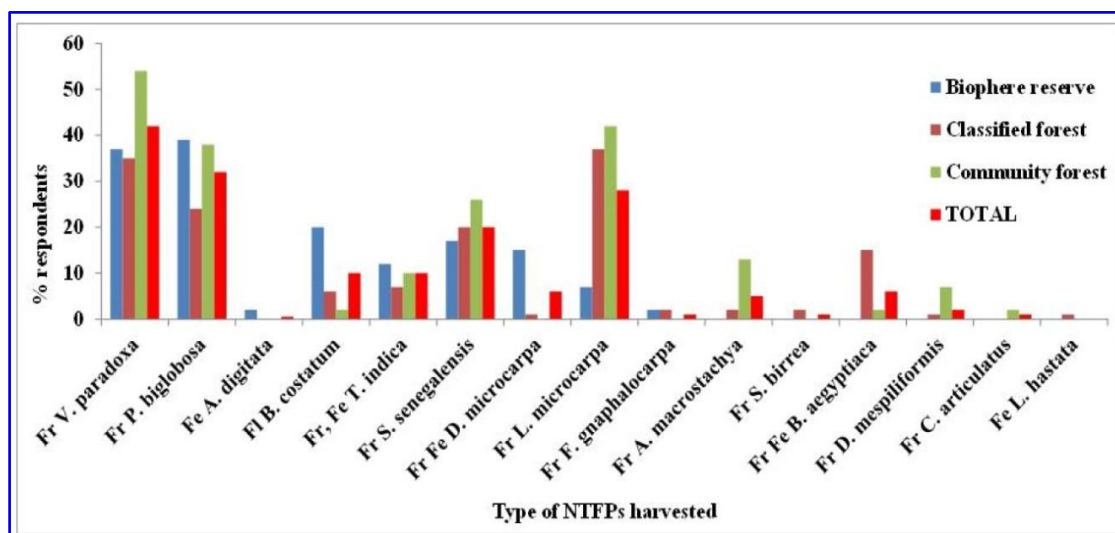


Figure 7. Number of collected NTFP by surveyed households

The figure above present so the number of PFNL collected according to the households in the studied sites



Fr: fruits, Fe: leaves, Fl: flowers; V: Vitellaria; P: Parkia; A: Adansonia; B: Bombax; S: Saba; D: Detarium; L: Lannea; F: Ficus; A: Acacia; S: Sclerocarya ; B: Balanites; D: Diospyros; C: Cyperus; L: Leptadenia

Figure 8. Number of types of NTFP harvested in the studied forests

The reading of figure 8 shows that the fruits of *Parkiabiglobosa* are best picked in biosphere reserve and community forest. But the fruits of *Lanneamicrocarpa* are exclusively harvested in classified and community forests. Only the flowers of *Bombaxcostatum* are harvested in biosphere reserve.

Our results rejoin those of Curtis (2014) who has found that majority of riparian populations in natural forest of Mpolonjeni in Swaziland collected only fruits. Our results are also similar to those of Bélem and al. (2010) who estimated that *Tamarindus indica*, *Parkia biglobosa*, *Vitellaria paradoxa* and *Bombax costatum* was among prior species for the fruits and flowers in RBMH. Number of collected products, in generally, depends on their availability related to the phenology of species (Fournier, 1991). These factors explain why in our case the fruits of *Parkia biglobosa* and flowers of *Bombax costatum* are most harvested in biosphere reserve and fruits of *Lannea microcarpa* in classified forest of Toessin.

***Status of the forest**

The analysis of results has showed that populations have more access to community forest than Biosphere reserve or classified forest. Indeed, 66% of respondents said access to community forest, 54% and 56% of respondents asserted access respectively to Biosphere reserve and the classified forest of Toessin. In terms of conditions of access, the presence of the forest officers is fairly perceived by respondents of the villages of Biosphere reserve and classified forest. Some of respondent has mentioned the presence or absence of forest officers as a condition in the villages of community forest.

These results are comparable to those of Olunga *et al.*, (2015) who also found that rural households had more access to forest products under system community management than protected and private management in Kenya. The regime of forest management influences use and access to forest resources. However, these authors have taken into account all forest resources while our study has focused on NTFP. In our study, Biosphere reserve is, as its name suggests, an international reserve forest and is recognized by United Nations for Education, Science and Culture Organization (UNESCO). It belongs to the world biosphere reserves network. It gets technical and financial support from Burkina Faso government, non-governmental organizations and local populations organized in local units for its management.

***Age of the respondents such as a determinant**

Data analysis indicate that access to the NTFP is related to age of respondents, the coefficient of correlation is $r = -0.236$ ($p = 0.000$). This value of correlation is significant and confirms a relationship statistically and inversely proportional between the variables. Indeed, our results have showed that the age group 25 to 55 years has access to forests 3 times more than the age group 55 to 78 years. The respondents whose the age group is 45-65 years have mentioned distance as condition in relation to the respondents of age group 25-35 years.

Our results corroborate those of Godoy and al. (1997) who found that the access to forest resources, in general, is dependent of the individual's physical strength which is bound tightly to his age. However, for Cavendish (2000), oldest peoples have difficulty performing agricultural tasks and they may turn to harvesting NTFP that demands less physical efforts, and the relationship age-access to forest depends on the type of forest products gathering.

Conclusion

The results of this study have showed that the distance and the presence or absence of forest officers, are the two main conditions of access to forest for NTFP gathering. The presence of wild animals and the deliverance of permits are also mentioned by few of respondents. The number of harvested products and residence status determine access to forests. The analysis of correlation between these variables and access for collection of NTFP gives coefficients of Person Values R among -0.760 and -0.351 indicating strong and average links.

The status of forest is not an important determinant of access to forest for products gathering in our study sites. Likewise, analysis indicated that the others social profiles such as gender, main occupations and education level are not tied to access. However, participatory forest management must be taken into account in other studies on the constraints. The participatory forest management seems to appear to be a new restriction of access for villagers in the harvesting of NTFP.

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