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Local perceptions and importance of endogenous beliefs on sacred groves conservation in South Benin

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Turning forests into sacred groves remains an effective strategy as far as conservation of forests is concerned. Nowadays sacred groves are eroded to a wide range of adversities. In this paper, the authors analyzed (i) perception of population on sacred groves dynamic and (ii) the effect of modern religion expansion on sacred groves conservation. To these end, data were collected using individual interviews on 458 informants sampled in six localities surrounding sacred groves. A Chi-square independence test, analytic comparison of means and principal component analysis were applied for data analysis. Findings showed that the sacred grove areas have decreased by more than half during the last three decades (78.06% of interviewees). Categories of sacred forests that are religious groves were the most threatened (70.30% of interviewees). Twenty plants species belonging to 13 botanic families were identified as symbolic species in the sacred groves, *Milicia excelsa* and *Triplochiton scleroxylon* being the most common species. Sacred groves provide a wide range of services among which cultural service was found to be the most preferred by the local population (76.90% of citation). Religious groves and secret forests were found to be the ones providing the most diversified services. However, religious beliefs did not affect the use of sacred groves. The reinforcement of the conversion of forests into sacred groves by the introduction of the secret societies could be efficient towards conservation. Nevertheless, there is a need to identify biological factors which can indicate possibility of species extinction so as to ensure restoration of sacred groves.

Key words: Local perception, conservation, restoration, sacred groves, symbolic species, Benin.

INTRODUCTION

Sacred groves and natural sites as a whole reflect the general attention of people upon natural resources since centuries ago and this constitutes a particular evidence

why spiritual knowledge and values have been known long time ago before the appearance of the modern day methods of conservation (Wild and Mcleod, 2012).

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Sacred groves are widely distributed (Bhagwate and Rutte, 2006) and were detected long time ago (Aubreville, 1937; Chevalier, 1933; Jone, 1963). Such groves stem from forests ecosystem fragmented (Kokou and Sokpon 2006). Statistics show that about 400 to 800 million hectares of forests are under the control of local communities (Barrow and Pathak, 2005) and about 150 to 200 thousands of sacred groves are only found in India (Chatterjee et al., 2004; Gokhale, 2003). In Africa, specifically in Ghana, the number of sacred groves is estimated to be about 1900 (Wild and Mcleod, 2012). In Benin, the number of sacred groves is estimated at 2940 (Sokpon and Agbo, 1999).

They are wooded land, venerated and/or feared. They express cultural identity of a given community and their access and management are regulated by traditional powers. Majority are small in size, generally close to houses (Agbo and Sokpon, 1997) and have a spiritual value specific to communities.

Sacred groves play an important role in natural resources management and conservation of biodiversity (Mama, 1985; Kokou et al., 2005). In countries with few forest coverage like Benin and Togo, sacred groves conservation and the biological diversity they host have been largely documented (Juhé-Beaulaton, 2006; Kokou and Caballé, 2000; Kokou and Kokutse, 2006; Sokpon and Agbo, 1999). For example, sacred groves were found to be the exclusive ecosystems in some regions of south Benin (Juhé-Beaulaton, 2006). Their socio-cultural and ecological functions are very important in some parts of south Benin as they sometimes act as waters points useful for local communities during the time of drought. Nowadays, sacred groves are threatened and tend to disappear due to the escalating human pressure and expansion of modern religions which in turn is threatening the biodiversity they host (Kokou and Sokpon, 2006). From an ecological perspective, sacred forests serve as natural habitats for biological diversity. They protect sources of water for local populations (Agossou, 2012). Harvest of non-timber forest products such as fruits, firewood, medicinal plants, fodder and liana are sometimes allowed (Kokou and Sokpon, 2006).

It is therefore crucial to ensure that sacred groves are managed and conserved sustainably through establishment of urgent policies and strategies. This is why knowledge of symbolic in these ecosystems appears to be of great importance for their biological replenishment. Previous studies showed that socio-cultural values are the real frames of forests and sacred groves conservation and existence (Juhé-Beaulaton et al., 2005). However, these values have been poorly documented and are almost disappearing in Benin (Kokou et al., 2005, Kokou and Sokpon, 2006).

This study was not on the definition of the concept of sacred forests nor discussion on their social, cultural and conservation roles, but details have been reported elsewhere (Agbo and Sokpon, 1998; Juhé-Beaulaton and

Roussel, 2002); rather the dynamic of different categories of sacred forests as perceived by local communities who are their managers was reported. Thus, based on a sociological approach, this study analyzed perceptions on dynamic and socio-cultural values of sacred forests in relation to beliefs of local communities. The study searched to show the dynamic of sacred forests with emblematic species and the types of services derived from sacred forests based on perceptions of local communities. The study was based on the following hypotheses: (1) maintenance and existence of types of sacred forests depending on the predominance of the traditional cult of *vodoun*, (2) religion has an impact on services derived from sacred forests and (3) forests of divinity are the richest in terms of socio-cultural services. Knowledge on role and services provided by sacred forest could help in their preservation in partnership with local communities (Wild and Mcleod, 2012).

MATERIALS AND METHODS

Study area

This study was carried out in the south-east of the Republic of Benin, a West African country located between 0°40' and 3°45' of longitude east, 06°15 and 12°25' of latitude north. Data were collected in Dassa, Zagnanado, Adjarra, Pobé and Bonou districts, all located in southern part of Benin (Figure 1).

The climate for the study area is of the subequatorial type with two rainy seasons (March to July and September to November) and two alternated dry seasons (August to September and November to March). The annual rainfall ranges from 900 to 1300 mm. Annual mean temperature varies from 26 to 28°C. Ferralitic soils appear to be the principal type of soil in the area. According to Adomou (2005), this area is located in the Guineo-Congolese climatic zone and is dominated by coastal forests, mangrove vegetation, semi-deciduous forests and moisture vegetation. Population size of the study area was estimated at 545 852 habitants (INSAE, 2013) constituting mainly two ethnical groups, namely Fon and Yoruba and their relations (Idatcha, Nago and Holi) are found in the region. Agriculture is the main source of income among the people in these communities.

Data collection

Data were collected from Dassa, Zagnanado, Ifangni, Adjarra, Pobé and Bonou districts. They were selected based on the abundance of sacred groves. The sampling size was determined using the binomial approximation formula of Dagnelie (1998) as described in Equation 1.

$$n = \frac{Pi(1-Pi) \times U_{1-\alpha/2}^2}{d^2} \quad (\text{Equation 1})$$

Pi represents the proportion of people benefiting from sacred groves services.

Pi was determined using a pre-investigation on 30 informants per district. $Pi = 82.22\%$. $U_{1-\alpha/2} = 1.96$ is a statistical value from normal distribution with likelihood of 5% and d is the error associated with all estimated parameters. Value of d was fixed at 3.5%. The sample size based on this approach was estimated to 458 informants. Surveys were conducted from December 2013 to January 2014.

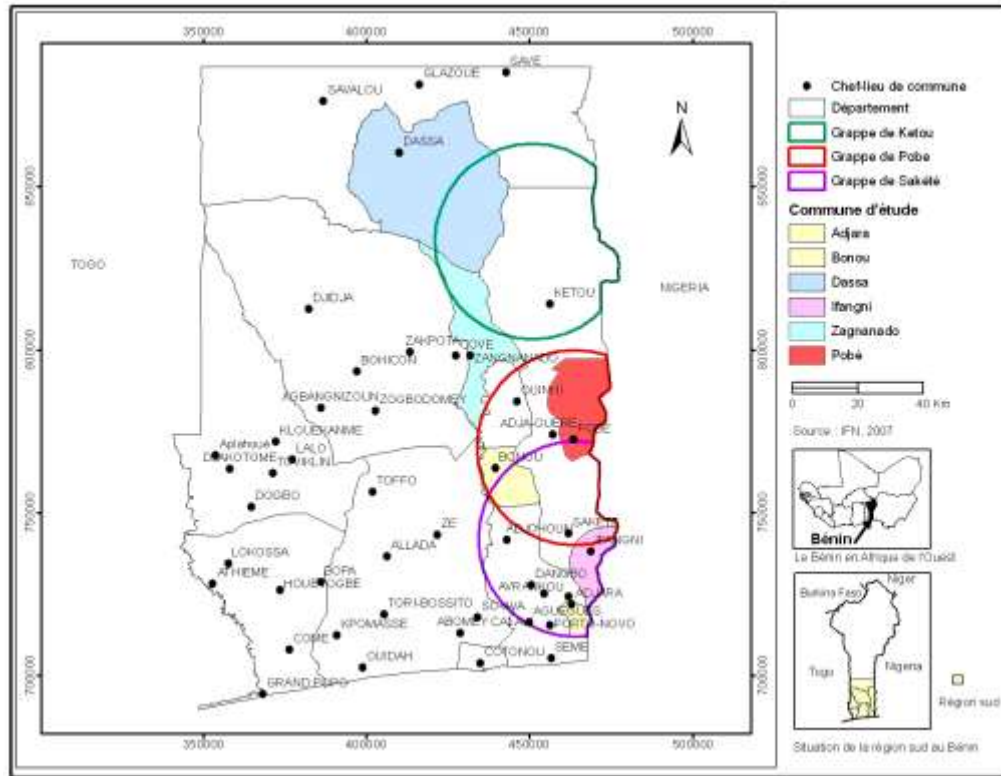


Figure 1. The study zone and sites.

People were firstly interviewed using semi-structured focus groups interviews. These interviews allowed designing a questionnaire for individual semi-structured interviews. Data collected included mainly local perceptions on the spatial and temporal dynamic of sacred groves, emblematic species, the services derived from sacred forests as well as their functions.

Data analysis

The informants were categorized on the basis of their ethnical groups (Idatcha, Goun, Nagot, Mahi, Holi and Ouéménou); religion (Muslim, Christen and Animist), sex (woman and man) and category of age (young: <30 years, adult: 30 to 60 years, old: >60 years) (Assogbadjo et al., 2008). Chi-square test (χ^2) was used to determine the relationship between services derived from sacred forests and socio-cultural categories (ethnic, religion, age and sex). Relative frequency of services provided by sacred groves to local population was calculated. Comparative analysis using relative frequency was used to assess the distribution of services among local populations according to their socio-cultural categories (ethnic groups, religion, age and gender). Because the data were not normally distributed, Kruskal-wallis test was applied in Minitab version 16. The matrix of relatives frequencies of services derived from sacred forests per ethnical groups was established. This matrix was submitted to principal component analysis (PCA) to determine the relationship between services provided by sacred groves and ethnical groups. These analyses were performed using R 2.15.3 (R Core Team 2014, <https://www.r-project.org>) software. Services' components from the PCA were then correlated to the relative frequencies of populations' beliefs using Pearson correlation test under SAS9.2 software.

Table 1. Relative frequency of sacred groves' existence according to the local populations.

Localities	ASG	ST	DSG	SSSG
Adjara	100	16.67	11.98	18.59
Bonou	0.00	16.67	20.06	20.28
Dassa	0.00	16.44	22.28	0.00
Ifangni	17.39	16.67	10.58	20.28
Pobé	82.61	16.67	14.76	20.28
Zagnanado	0.00	16.90	20.33	20.56

ASG: Ancestral sacred groves; ST: Sacred trees; DSG: divinity sacred groves; SSSG: secret society sacred groves.

RESULTS

Typology of sacred forests

Three categories of sacred groves were identified in the whole study site namely: religious/divinity sacred groves, ancestral sacred groves and secret societies sacred groves. There are specific distributions of each category of sacred groves (Table 1). It is apparent that ancestral sacred groves were exclusively recognized by population from the three areas, namely Adjara, Ifangni and Pobé

Table 2. List of threatened, rare and disappeared species of sacred groves in visited localities.

S/N	Species	Family (APGIII, 2009)	Citation frequency (%)
1	<i>Milicia excelsa</i>	Moraceae	14.21
2	<i>Triplochiton scleroxylon</i>	Sterculiaceae	14.21
3	<i>Ceiba pentandra</i>	Malvaceae	13.85
4	<i>Antiaris toxicaria</i>	Moraceae	13.85
5	<i>Celtis zenkeri</i>	Ulmaceae	9.23
6	<i>Cola cordifolia</i>	Malvaceae	3.20
7	<i>Caesalpinia bonduc</i>	Fabaceae	3.20
8	<i>Adansonia digitata</i>	Malvaceae	3.02
9	<i>Zanthoxylum zanthoxyloides</i>	Rutaceae	3.02
10	<i>Mansonia altissima</i>	Sterculiaceae	3.02
11	<i>Khaya senegalensis</i>	Meliaceae	2.84
12	<i>Xylopia aethiopica</i>	Annonaceae	2.49
13	<i>Dialium guineense</i>	Fabaceae	2.49
14	<i>Pterocarpus santalinoides</i>	Fabaceae	1.95
15	<i>Albizia ferruginea</i>	Fabaceae	1.95
16	<i>Morinda lucida</i>	Rubiaceae	1.95
17	<i>Rauvolfia vomitoria</i>	Apocynaceae	1.78
18	<i>Oldfieldia africana</i>	Euphorbiaceae	1.24
19	<i>Bombax costatum</i>	Malvaceae	1.24
20	<i>Crudia senegalensis</i>	Fabaceae	1.24

(Table 1) while sacred groves belonging to secret societies were recognized by all informants except those from Dassa. This could explain the absence of secret societies sacred groves category in this location. As for divinity sacred groves, they were recognized mainly in Dassa and Bonou. Results showed that relative frequency of informants recognizing sacred trees was the same among locations (Table 1).

Local perceptions on the spatial and temporal dynamic of sacred forests

As regards local perception on sacred grove dynamics, results showed that old people (more than 60 years old) understood the dynamic of sacred groves in the whole study location. The proportion of old people appreciating the depletion of sacred grove areas was significantly greater than 50% (proportion= $78.06 \pm 6.82\%$; $t = 4.11$; $P = 0.005$). It was noted that human pressure was the main reason for this depletion. In fact, human activities (56.89% of citation), population's growth (52.87% of citation) or the combination of both factors were the main causes of sacred groves' area regression. However, 9.82% of interviewees supported natural causes of sacred groves regression. Divinities sacred groves were the most threatened (70.3%). 60.3% of cases people believed that modern religions expansion and erosion of ancestral beliefs were the fundamental causes of sacred

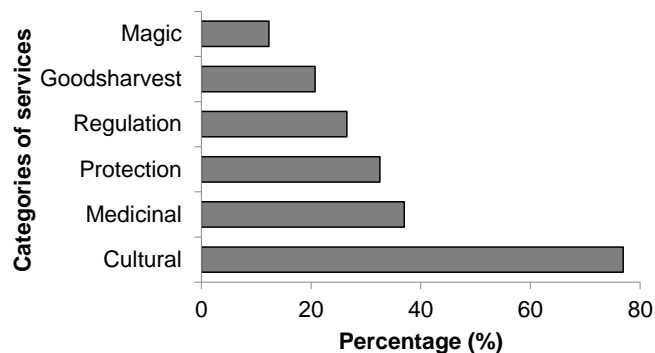


Figure 2. Proportions of people benefiting from sacred groves services.

groves regression. In addition, local populations identified 20 sacred species in the different sacred groves. Table 2 shows the list of such species per order of citation frequency.

Diversity of services provides by sacred groves to the local population

Six services were drawn from sacred forests which were: cultural, medicinal, protection, regulation, goods harvest and magic (Figure 2). At least, one service is benefited by

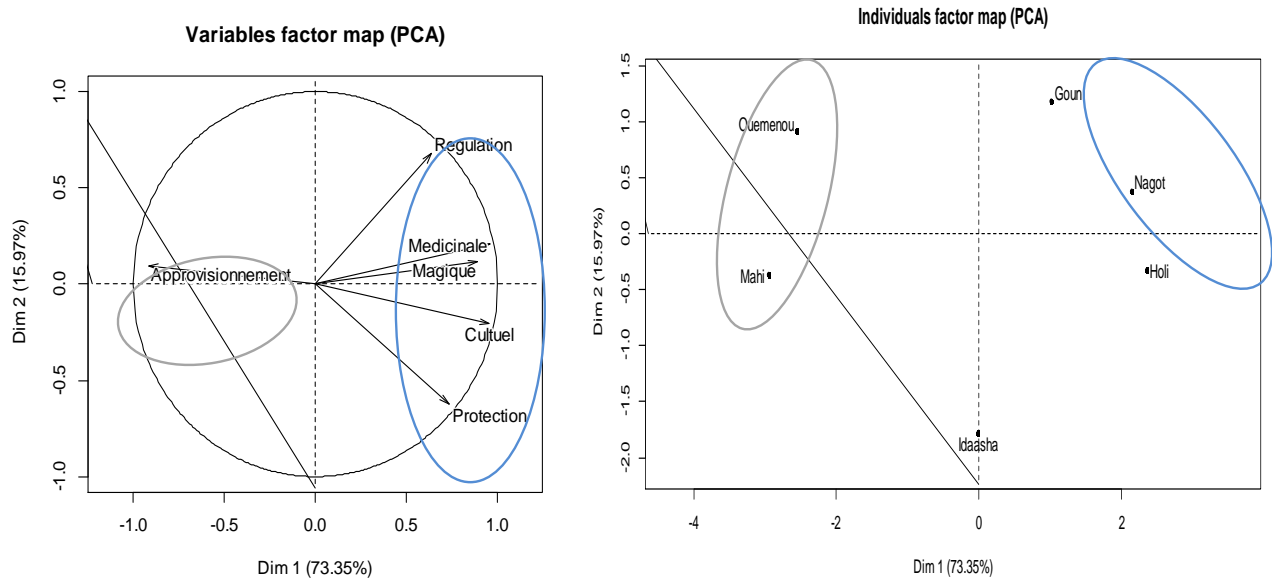


Figure 3. Principal components analysis showing relationship between ethnic groups and services benefited from. a) Correlation circle of services benefited from; b) factorial map of ethnic groups.

all respondents. Cultural services appeared to be the most important (76.90% of citation). Services benefited by local populations were significantly related to their ethnic groups, religions, ages and sex ($P < 0.001$). Relative citation frequency of services was on average smaller than 50% and this indicated the abnormal distribution of different services among local populations. Frequency of citation varies significantly according to the ethnic groups, religion, ages ($P < 0.05$) but not related to the sex ($P > 0.05$).

Results from the principal components analysis revealed that the first two axes, 1 and 2 explained 89.31% of the total variance in benefited services. All the services were positively correlated with the first axis (axis 1) except resources harvesting service (Figure 3a). Projection of the ethnic groups onto the system axis defined by the two axes showed that ethnic groups such as "goun", "nagot" and "holi" benefited more from other services than goods supply (sacred groves harvesting) which was preferred (64.38% of citation) by "mahi" and "ouémènou" ethnic groups (Figure 3b). Cultural services (92.19% of citation) and magic services (74.19% of citation) were the most preferred by "holi". Spiritual services (58.57% of citation) were the most preferred by "idaasha" whereas weather regulation services (56.60% of citation) were preferred by "goun". Medicinal services (75% of citation) were preferred by "nago" (Figure 3b). Correlation analysis showed that religion has no significant impact on services desired by local populations (Table 3).

Table 4 shows functions benefited by local populations according to sacred groves category. Divinities and secret society sacred groves provide a wide range of functions to local populations.

Table 3. Correlation between sacred groves services and religions using principal components.

Religions	Component 1	Component 2
Animist	-0.44 ns	-0.83 ns
Christen	0.12 ns	0.60 ns
Muslim	0.52 ns	0.61 ns

DISCUSSION

Typology of sacred groves and local perception on their dynamic

Most forest communities in the study area were isolated remnants sacred groves which are highly diversified in terms of typology and cultural significance (Kokou and Sokpon, 2006). The current study identified three types of sacred groves including divinities or cemetery, ancestral and secret society sacred groves. Similar result was reported by Kokou and Sokpon (2006) and Agossou (2012). Among these categories of sacred forests, forests of gods or geniuses were cited everywhere but mostly in the regions of Dassa and Bonou. These findings confirm the predominance of the traditional cult *Vodun* in south Benin. In fact, the mental and psychosocial universes of communities in south Benin is highly influenced by the deity *Vodun*. Agossou (2012) showed that *Aja Tadonu* people and *Yoruba* and *Nago* people, even if coming from opposed geographical origins, they all venerated divinities called *Vodun* for the first and *Orisha* for the second. Forests of secret societies were also found

Table 4. Distribution of functions according to sacred groves categories

Categories of sacred groves	Services	Functions
Ancestral/cemetery (Kings cemetery, people that died of accidents, pregnancy, epidemic diseases)	Cultural	Kings and people burial
	Medicinal	Harvest of medicinal plants
	Magic	Kings enthronement ritual
	Protection (spiritual)	Protection against witchcrafts
	Regulation (weather)	Improvement of rainfalls conditions
Divinities' sacred groves (Safeguard divinities and genius; protect taboo trees and living populations).	Religious	Annual ceremonies (Ahanbiba); din for asking prosperity; ritual; dance; initiation; wedding; births celebration; oracle consultation; rain ceremonies; sacrifice; peace and happiness ceremonies; praying for soil fertility; family blessing
	Medicinal	Source of medicinal plants; treatment of malaria, ulcer, sterility, yellow fever, madness, hypertension, chicken pox, bellyache, icterus, measles, hepatitis, pregnancy, leprosy, bewitchment, madness, epidemics, diabetes, etc.
	Magic	Against spiritual diseases; - deliverance ; other magical issues-Exorcism
	Goods harvest	Fuelwood; - timber wood; -food; -fish; - water.
	Protection	Against bad spirits and witchcrafts
Secret societies sacred groves (Idols houses such as Orozoun or Oro forest, Kouvitouzoun or Kouvito forest, Zangbétozoun or Zangbéto forest and Fâzou or Fâ enthronization forest)	Regulation	Rain ritual, and climate regulation
	Cultural	Annual ceremonies (Ahanbiba); din for asking prosperity; ritual; dance; initiation; wedding. Births celebration; oracle consultation; rain ceremonies; sacrifice; peace and happiness ceremonies; praying for soil fertility; family benediction.
	Medicinal	All diseases in particular chicken pox, malaria. Bellyache, icterus, measles. Hepatitis, pregnancy, leprosy, bewitchment, madness, epidemics, diabetes, etc.
	Magic	Reproduction; exorcism; bewitchment; magic rings; arresting of witches and rubbers; communication with dead
	Goodsharvest	Plant harvest for mystic bath
	Protection	Disease and evil spirits; against diseases spiritual or mystic; against witchcraft; against fly and attacks; manufacturing of magic potion; against accidents; security
	Climate regulation	Rain ritual and climate regulation

everywhere, except the localities of Dassa. Among *Vodun* of pantheon of South Benin, there were also some divinities of secret societies (*Oro*, *Kouvito* and *Fâ*) which are also influenced by culture and the languages, Yoruba, Nago and namely the divinity *Oro* mainly found in forests. The high similarity between ancestral and cemetery sacred groves is probably due to the fact that ancestral sacred groves are used as cemetery (Kokou et Sokpon, 2006).

Analysis of local perceptions showed a regression of sacred groves with time and a disappearance or rarefaction of some important and emblematic species of sacred forests. The presence of woody emblematic trees is linked to some utilitarian, ritual and sacramental needs. It is the case for *Milicia excelsa*, *Antiaris toxicaria*, *Cola cordifolia*, *Ceiba pentandra* which shelter divinities and *Triplochiton scleroxylon* which is the preferred sacred tree by the divinity *Oro*. Other tree species such as

Caesalpinia bonduc, *Adansonia digitata* and *Zanthoxylum zanthoxyloides* whose leaves are used in all liturgical and purification ceremonies are of high importance in sacred forests. Similar perceptions were also observed by local populations from other localities in Benin (Inoussa et al., 2013; Ali et al., 2014) and in other African countries especially in Burkina Faso (Kaboré, 2010; Savadogo et al., 2011), Congo (Luketa, 2000), Cote d'Ivoire (Tahous, 2002), Cameroon (Oyono, 2004), Tanzania (Ylhäisi, 2004) and Togo (Kokou et al., 1999).

Anthropogenic pressure, human population growth or the combined effect of both factors were the principal causes of sacred groves degradation in the study area.

Juhe-Beaulaton (2010) reported that sacred groves lost more than the half of their surface area from 1998 to 2007 due to high intensity of human pressures and population growth. Moreover, traditional religions extinction coupled with the modern religions expansion were also

found to be among the main causes of sacred groves degradation (Bhagwat and Rutte, 2006; Juhe-Beaulaton, 2008). Ancestral/cemetery forests and forests of god or of geniuses were the most exposed because of the expansion of modern religions, the erosion of ancestral beliefs and weakening of the power of traditional chiefs and priests of *Vodun*. Bhagwat and Rutte (2006) and Juhe-Beaulaton (2007) reported similar results. These authors reported that the increasing conversion of local people to monotheist religions and particularly to western beliefs constitute the main reason for the degradation of sacred forests. Results also showed that forests of secret societies are currently the most protected and conserved, probably because of the rules of restriction on resources exploitation imposed to local communities. In fact, the principle of conservation is based on the fear inspired by the divinities of the secret societies. The latter organizes seasonal maintenance of the forests (management of the entrance and roads, pruning, weeding, etc.).

Diversity of uses of sacred groves and importance of endogenous beliefs on their conservation

Sacred forests offered six services to local communities, cultural service being the most cited (76.90%) followed by medicinal service (37%), protection (32.54%), regulation (26.5%) and provisioning (20.76%). Nevertheless, the preferences of the services vary with ethnical groups. The sacred forests are assigned a number of prohibitions related to their uses which protect them (Juhé-Beaulaton, 2010). The variability of the sacred character of sacred forests is highly linked to the diversity of their functions, the multiplicity of their divinities and to the legend that determines their origins (Kokou and Sokpon, 2006; Garcia et al., 2006). People religion did not affect the services they sought from sacred forests. The "sacred" status of a forest then seems to be more anchored in *Vodun* beliefs and determines the maintenance and the conservation of these forests. Similar observations were made by Wadley and Colfer (2004) and Bhagwat and Rutte (2006) who reported that the "sacred" status of sites and forests in India and Indonesia is linked to animist belief and societies of hunters.

This study suggests that sacred groves can provide other advantages to local populations apart from their spiritual status. Like all forest ecosystems, sacred groves provide a range of goods and services to the local populations. Sacred groves in the study area were found to provide six services and the highest diversity of services was observed for divinities and secret societies' groves. Services provided by sacred groves of divinities could explain their abundance throughout studied localities. According to Kokou and Sokpon (2006), 60% of sacred groves are divinity ecosystems. The salience of the cultural function confirms the traditional nomenclature of these types of forests. Indeed, this nomenclature system is highly based on the cult *Vodun* (Agossou,

2012; Juhé-Beaulaton, 2007). The therapeutic function is also ensured by all the categories of sacred forests but more intensely by forests of divinities and secret societies that supply medicinal plants and offer magico-therapeutic stays. Similar study in India showed that services of protection and medicinal plants provisioning are the most offered by sacred forests. In spite of these known services, several factors that have contributed to their isolation progressively concur to their encroachment and even degradation (Boraiah et al., 2003).

Conclusion

This study has facilitated a better understanding of the categories of sacred forests in south Benin. Forest of gods or geniuses also named forests of divinities are the most common but the least conserved. The size of the majority of the sacred forests has declined and emblematic species, very important to the existence of the sacred forests, are also prone to disappearance. The causes are mostly of human origin. However, the forests of secret societies were the most conserved because of access restrictions and prohibitions on the harvest of forest resources. The study also revealed six majors services provided by sacred forests, the two most important being cultural service and medicinal service. These services are influenced by ethnical groups, sex and age of interviewees. In spite of the acknowledged services, several factors however favor encroachment and degradation of sacred forests. Introduction of restrictions on access and use of the forests and divinities of secret societies in the forests of gods and geniuses and ancestral forests could reinforce their conservation and persistence with time.

Conflict of interest

The authors declare that they have no conflict of interest.

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