



"TRANSHUMANCE MAP AND PASTORAL CALENDAR OF CATTLE HERDS EXPLOITING THE FORAGE RESOURCES OF THE CLASSIFIED FOREST OF UPPER ALIBORI NORTHERN BENIN"

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ABSTRACT

The Classified Forest of Upper Alibori (CFUA) is one of the favorite destinations of national and foreign transhumant who are attracted by its availability of water and forage resources. The agricultural and pastoral pressures on the biological resources of this reserve forest are intensifying, and it is important to develop the transhumance map and the pastoral calendar. The semi-structured and structured interviews with 300 actors of transhumance were conducted. The surveys had shown that transhumance within CFUA was mainly due to fodder and water research (81%), and the avoidance of conflicts between farmers and herders due to field damage (16.1%). The calendar, the itinerary followed and the length of stay of transhumant were depended on the availability of pastoral resources (61.1%) and the frequency of forest patrols in the CFUA (8.5%). The period of departure or return in transhumance remained variable according to the rainfall of the current year. Thus, the cattle herd movements started from the Sahelo-Sudanian zone (Niger, Burkina-Faso) or the riparian villages, either to join CFUA or to cross it in the direction of South Benin or Togo. These results lay the foundations for a better exploitation of the pastoral resources of the classified forest of Upper Alibori.

Keywords - Alibori; Benin; Pastoralism; Protected area; Pastoral mobility.

INTRODUCTION

Transhumance is a seasonal and cyclical movement of herders with their herd. It is an adaptation strategy aimed at optimizing livestock access to water and quality grazing to ensure its annual production (Diop *et al.*, 2012). It thus enables pastoral communities to live off their livestock activities, to limit the continued degradation of natural rangelands; and to enhance the ecological complementarities between the Sahelian zone and the Sudanian regions (Kagoné, 2004). Nowadays, the distance traveled during transhumance changes from one season to the next depending on the climatic conditions, availability and distribution of pastoral resources in the receiving areas (Diop *et al.*, 2012; Kiéma *et al.*, 2015).

In Benin, the northern departments of the country alone account for more than 85 % of this cattle herd (Alkoiret *et al.*, 2011), whereas they have special status land (protected areas), which are not accessible to pasture because they are forbidden access. The most of the protected areas in this pastoral area of Benin contain resources for livestock (water resources, forage resources). These protected areas are very attractive for transhumant herders. Entry into these protected areas dates back to the 1973 and 1984 droughts (Toutain *et al.*, 2004 and Boutrais, 2008) and the eradication of tsetse flies (Toutain *et al.*, 2012), which forced the transhumant of the Sahel (Niger and Burkina-Faso) to descend to the protected areas of northern Benin. These protected areas each year host national and cross-border transhumant with a very large number of herds. Like the protected areas of northern Benin, the most protected areas in West Africa are under severe pressure from transhumant herds (Tamou, 2002; Paris, 2002; Convers, 2002). More than 1171 herds totaling 101,309 cattle were recorded in the WAPOK complex (W, Arly, Pendjari, Oti-Mondouri and Keran) and its periphery (Bouche *et al.*, 2003). The determining factors in the pastoral exploitation of these protected areas remains the presence of forage and water resources (Kagoné *et al.*, 2006).

Thus, the classified forest of Upper Alibori is now one of the favorite destinations of national and foreign transhumant and the agricultural and pastoral pressures on the biological resources of this forest are increasing (Assani *et al.*, 2016). The pastoral exploitation of the CFUA is also the source of recurrent conflicts between the transhumant and the conservators of this protected area and the farmers. The pastoral mobility has long been regarded as responsible for soil deterioration, pollution of the groundwater and degradation of the range of protected areas (Convers, 2002; Tamou, 2002; Toutain *et al.*, 2004). Several research papers (Sinsin, 1997; Houinato and Sinsin, 2000; Benhammou, 2005) have shown the

impacts of transhumance on soil and erosion with direct effects on vegetation and water resources. In this context, the lack of control of the transhumant movements will accentuate the damage to the pastoral resources. Moreover, the multiple transhumance itineraries are also the source of conflicts between the herders and several other actors (farmers, local herders, foresters, fishermen, foresters) coveting the exploitation of the same resources.

Thus, the wandering of cattle in farmers' fields, the itineraries and periods of departure and return fixed by law for transhumance not adapted to the reality of the ground are fundamental causes of these conflicts (Boutrais, 2008; Assani, 2015; Hiya Maidawa *et al.*, 2016; Lesse, 2016). In this research, it will analyze how to manage transhumance in the CFUA by controlling the periods of herd attendance in this forest, the reception areas, the itineraries followed and the causes of their presence.

The study presents the transhumance map and the pastoral calendar of the cattle herds that frequent this forest and proposes interventions on the system that could help to secure the pastoral system and the achievement of the objectives of nature conservation actions.

1. MATERIALS AND METHODS

1.1. Study area

The classified forest of upper Alibori (CFUA) was created by Decree No. 6459 of August 20, 1955. It covers an area of 250,205.73 hectares and forms a vast area covering six commons (Pehunco, Kerou, Banikoara Gogounou, Sinende and Kandi) and straddling the departments of Atacora, Donga, Borgou and Alibori. According to the vegetation map of the forest, this forest presents five strata: woodland, gallery forest, tree and shrub savannah, savannah with agricultural presence and mosaic of crops and fallow. The climate of the area is tropical with two seasons observable during the year: a dry season from November to March and rainy season from April to October. Rainfall is unevenly distributed in time and space with water depths ranging from 900 mm in June to a high of 1316.5 mm in July and August (PGFTR, 2010). The population of the six (6) riparian commons to the CFUA is estimated at 808 968 inhabitants made up 50.2 % of women against 49.7 % of men (INSAE, 2013). There are three (03) socio-cultural groups are represented by: Bariba, sedentary Fulani; transhumant Fulani. This population consists of Muslims, animists and Christians. Livestock is the second economic activity in the study area after agriculture. The cattle population of the riparian commons of this forest is estimated at 784 800 head in 2013, whether 36.23% of the national cattle population (FAOSTAT, 2017).

1.2. Methodology

Interviews with resource persons and field observations were the approaches used. In order to understand the reasons for the entry of the farmers in this forest and the itineraries followed, the sampling method used was an empirical method according to the circumstances. Nine (09) villages were retained in the nine (9) management units of the Upper Alibori classified forest to develop the pastoral calendar. Management units (MU) are geographical divisions of the classified forest. They aim to group a part of the forest on a number of villages sharing the classified forest for its management. The choice of these villages was made in consultation with the responsible of herders of the commons of Gougounou, Kerou, Banikoara, Pehunco and Sinende.

The criteria for this choice are based essentially on the proximity of the villages to the classified forest of Upper Alibori (villages located within a radius of 10 km of this classified forest), the concentration of cattle breeding and the reception of transhumant herders. A focus group was organized at each village. A total of nine (09) villages served as a sampling frame for primary units (camps, hamlets and villages). The primary units are selected according to a reasoned choice based on the importance of the transhumance activities (pastoralist households and transhumant herders, livestock markets, areas frequented by cross-brooder transhumant in the Beninese territory). The choice of secondary units (agro-pastoralists and / or sedentary herders) was made randomly. All the transhumant herders encountered are systematically retained. Data were collected on the basis of semi-structured and structured interviews. The sampling method used in this study was simple random sampling (Ardilly, 2006). A sampling rate of 40% determined the sample size (n) using the Dagnelie (1998) formula:

$$\frac{U_{1-\alpha/2}^2 \times P(1-p)}{d^2}$$

where $U_{1-\alpha/2}$ is the value of the normal random variable for a value of the probability; for a significant threshold $\alpha = 0.05$, $U_{1-\alpha/2}^2 = 3.84$ and $d = 0.03$ is the margin of error which has been fixed taking into account the previous research work on this area on transhumance actors (Houinato *et al.*, 2013; Lesse, 2016). Thus, the number of cattle herders to be surveyed is 300, proportionally distributed among the 09 nine management units (Table 1).

Table 1. Distribution of households sampled by village

Commons	Management units	Village	Sample size
Pehunco	Gnemasson	Gnemasson	30
Sinende	Sekere	Yarra	35
	Niaro	Niaro	31
Gogounou	Bagou	Diadia	31
	Lougou	Lougou	34
Kandi	Sam	Sam	36
Kerou	Fetekou	Fetekou	30
	Pikire	Pikire	35
Banikoara	Gbassa	Gbassa	38

1.2.1. Elaboration of the pastoral calendar

The methodology for developing the thematic calendar was inspired by the work of Bosma *et al.* (1999) on sheep in Burkina Faso and work on the pastoral calendar of Kagoné (2000) in Burkina-Faso and Djenontin (2010) in Benin. The pastoral calendar includes the division of the year into different known periods according to the design of local populations (Ba *et al.*, 1993). Then, from the thematic point of view, the periods of pastoral and agricultural activity are specified, as well as the position of the herd during the year. The cattle herders were surveyed by village with the interview guide; it was analyzed with herders the questions about the different periods of the year and their durations, the peak periods of forest frequentation during the year, the activities of local and foreign herders during these periods. It was drawn on a sheet, a strip representing the year, and marks the periods and events. The game of pebbles allowed to determine the relative importance of each event during each period (Figure 1 and 2).

Concerning the number of animals frequenting this forest, the lists of the herders who have paid access rights to this forest have been collected from the co-management committees of this protected area. Outside, the herders regularly registered, others do not pay these rights of access. Thus, an estimate of the number of herd with the average number of cattle was obtained at different focus groups. It is then necessary to ask the groups of people to estimate the proportion of the cattle present in this forest during each period of the pastoral calendar.



Figure 1: Games of stones for the elaboration of the pastoral calendar



Figure 2: Focus group on the elaboration of the pastoral calendar in the village of Didia

The content analysis was applied to data collected after integrity analysis and reliability analysis (Apostolidis, 2006). The content analysis consists in identifying and classifying trends (pastoral calendars, types of pastoral behavior, etc.) and statements relating to the different themes of the study (determination of the periods of use of the CFUA and the

pastoral calendar) and to aggregate them into single categories. The reliability analysis was used to submit the data collected to the assessment of resource persons selected among the farmers, herders, the authorities in charge of transhumance management in the riparian commons. The integrity of the data collected was carried out with their classification on the basis of references or paradigms peculiar to the herder's territory.

1.2.2. Mapping of transhumance axes

The spatialization of the structuring elements of the transhumance axes (attachment territory, transit zone, transhumance corridors, and reception area) was carried out using a Garmin GPS (etrex vista TM) and GIS software (Arc View). Surveys of "waypoints" in the field are supplemented by survey data. Finally, the map of transhumance axes was obtained by superimposing an IGN topographic map, 1992, on top of the study data.

2. RESULTS

2.1. Pastoral calendar of transhumant herders attending CFUA

The figure 3 shows the succession of periods in the pastoral pastoralist calendar in the CFUA. The pastoral timetable of the study area was five periods and each period corresponds to agricultural activities of local and foreign herders (Table 2). The superimposition of the pastoral calendar on the climate diagram allows a clear understanding of the climatic manifestations of each calendar period (Figure 4).

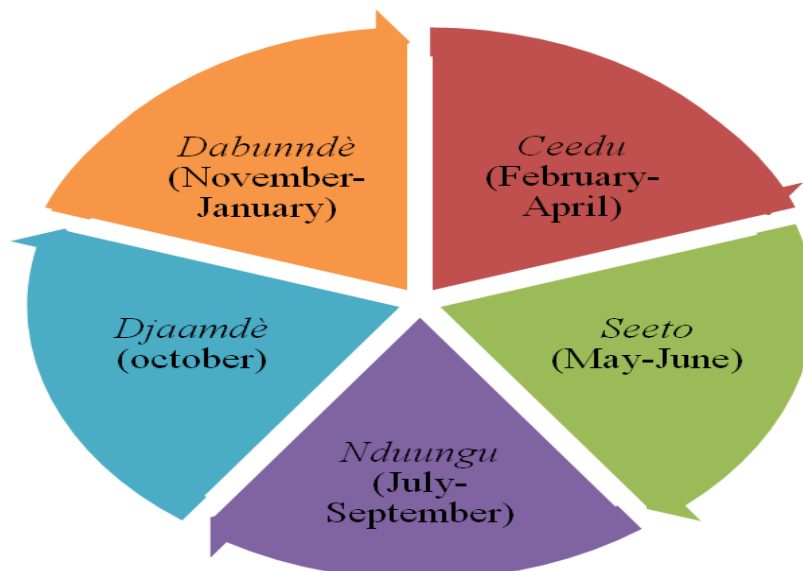


Figure 3: Succession of period in the pastoral calendar of herders

Ceedu: which in Fulani means "hot dry season" represents the period of the dry season and which corresponds to the reception of the herds for the great transhumance in the CFUA. The pastoral activities during this period were the exploitation of forage trees mainly *Azelia africana*, *Khaya senegalensis*, *Pterocarpus erinaceus*, *Daniellia oliveri* and watering in Alibori streams. This period also corresponds to peaks in the use and exploitation of the pastoral resources of this area protected by foreign transhumant herders. The cattle population in this protected area during this period is more than 125,800 heads, ie a density of 0.50 bovine/ha.

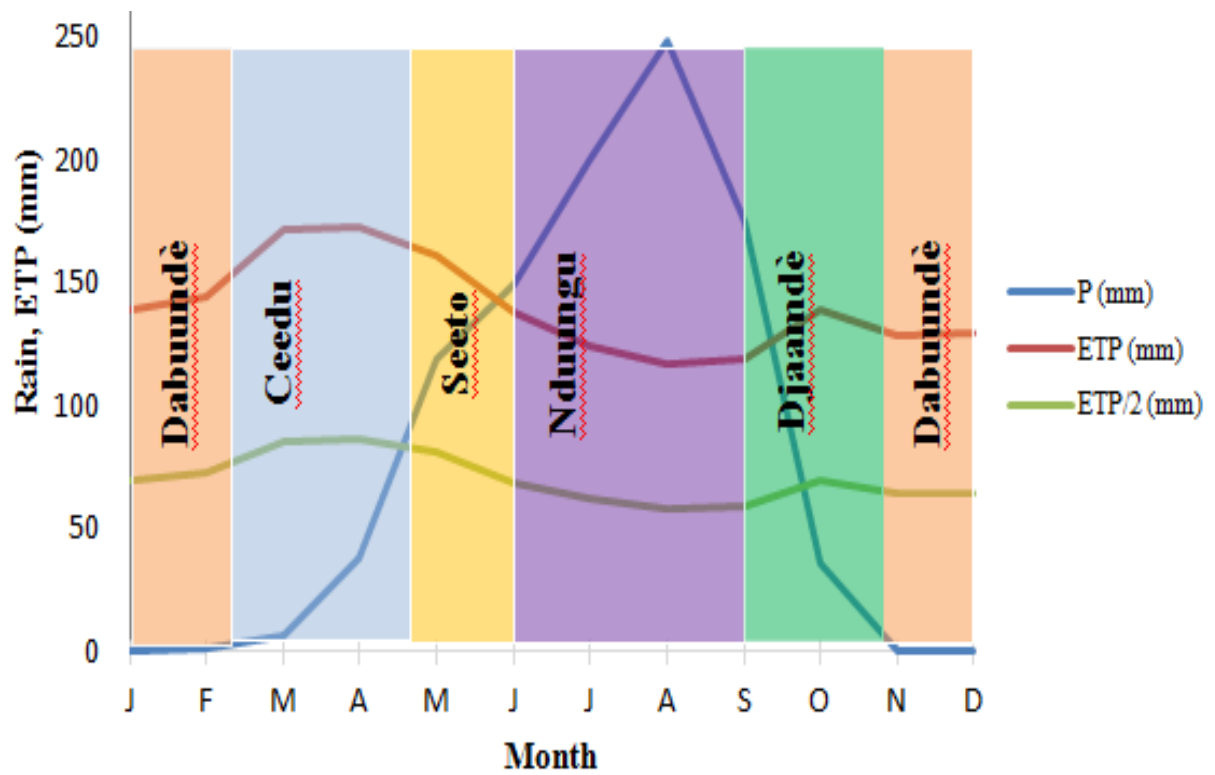
Seeto: means "beginning of the rainy seasons" in Fulani. During this period, the regrowths of *Setaria pumula* are grazed and watering is done in the rivers and courtyards of Alibori. It is the period of the return of the great transhumance. The number of cattle in this forest decreased with the departure of large herds and increased to 62,500 heads, ie a density of 0.24 bovine/ha.

Nduungu: means "Season of abundance or rainy season" in Fulani. It is a period of small transhumance. It corresponds to the rainy season. Some riparian herders still use this protected area during this period. The cattle population in this forest during this period is on average 42,600 head of cattle, ie a density of 0.17 bovine / ha.

Djaamdè: in Fulani means "crop season". It is the period of the end of the rainy season; the cattle herds remain at this moment in their zones of attachment. During this period, lignifications pastures are the most widely used. Rare herders are still in this forest. The cattle population in this forest during this period is on average 40,000 head of cattle, ie a density of 0.15 bovine / ha.

Dabunndè: means "cold dry season or harmattan period" in Fulani. It is the period of departure of the cattle herds for the great transhumance and corresponds to the beginning of the arrival of the foreign transhumant in this classified forest. The number of cattle in this forest during this period begins by gradually increasing to an average of 85,000 head, ie a density of 0.33 bovine / ha.

The superposition of the pastoral calendar with the climatic diagram has made it possible to understand the management of time and space by transhumant pastoralists in the upper Alibori forest (Figure 4)



P: Rain, ETP: Evapotranspiration

Figure 4: Superposition of the pastoral calendar on the climatic diagram

2.2. Transhumance map of cattle herders in the CFUA

Figure 5 shows the transhumance map and highlights the transhumance axes, the starting and receiving areas of herds in transhumance in the classified forest of Upper Alibori.

Table 2: Calendar of transhumance in the classified forest of Upper Alibori

Period Variables	<i>Dabuundè</i>			<i>Ceedu</i>			<i>Seeto</i>		<i>Nduungu</i>			<i>Djaamdè</i>
	<i>November</i>	<i>December</i>	<i>January</i>	<i>February</i>	<i>March</i>	<i>April</i>	<i>Mai</i>	<i>June</i>	<i>July</i>	<i>August</i>	<i>September</i>	<i>October</i>
Season	Beginning of dry and cold season			Full dry season			Beginning of the rainy season		Full season of rain			End of rainy season
Positions of Animals	Departure of the great transhumance			Greater transhumance in reception areas			Return of the Great Transhumance		Small transhumance			attachment zone
Pastoral activities	Grazing of grass in lignifications, Grazing on crop residues (sorghum, maize, cotton, peanut ...) Watering in non-dry rivers			Pasture on crop residues in reception areas , Pasture in the forest of : <i>Azelia africana</i> , <i>Khaya senegalensis</i> , <i>Pterocarpus erinaceus</i> , etc., Pasture regrowth of perennial herbaceous plants, Watering in the Alibori rivers			Grazing of fresh grass of early grasses : <i>Setaria pumula</i> , Watering in the Alibori rivers		Fresh grass pastures abound around the camp, fallows, and the flanks of the mountains; Watering in rivers, dams and puddles			Herbaceous pasture in lignifications, Use of crop residues begins
Agricultural activities of local herders	Harvesting sorghum, cotton, and corn. Land clearing, plowing for yam cultivation			Arrangement of crops in granaries Dead period			Land clearing and cleaning fields Plowing and sowing		Field Maintenance			Beginning of harvest crop
Activities of foreign herders	Start of arrival of foreign transhumant			Massive arrival of foreign transhumant. Exploitation of CFUA Crossing of some herders			Exploitation of CFUA		Return of foreign herders			Rare foreign herders in CFUA

2.2.1. Entrance corridors and transhumance axes of cattle herds

All Management Units (MU) in the CFUA have served as a point of entry for national herders. The presence of Burkinabe and Nigerien cross-border transhumant is also observed in all management units, with dominance in the MU of Bagou, Lougou, Fetekou, Sekere, Niaro and Gnemasson. According to the results of the surveys, the transhumance axis during the dry season is chosen most often by the cattle owner (90%) after receiving advice and information from the *garso* or *rouga*. But the constraints during the displacement can also influence the transhumant herder (65.6%) to change the itineraries chosen by the cattle owner, in particular the availability of pastoral resources on the axis (60.3%) and the patrol of forest agents (35.6%). The information reported by the scouts or *garso* can also be used to choose the axis. The Burkinabe, Nigerien (Northwest) herd and Karimama (Extreme north of Benin) cattle herd stay sometime in the transit zones of Park W, Founougo, Goumori and Kerou before joining the Alibori forest reserve. They spend the season of transhumance if the rainfall and food conditions (grazing and water) allow it. Otherwise, they continue their journey to southern Benin, Togo or Ghana republics. Within the Upper Alibori classified forest, the axes are: the corridors of passage when they exist in the earth crossed; the edges of the river during the great transhumance; the fallows during small transhumance; the hills and mountainsides when the corridors are clogged by the fields at the return of the great transhumance or at the beginning of the small transhumance.

2.2.2. Reception area for transhumant herders in CFUA

The areas of departure are mainly constituted by the commons of the extreme north of Benin (Malanville and Karimama), of certain riparian commons (Kandi and Banikoara), the Sahel countries (Burkina Faso, Niger) and Northern Nigeria. The preferred reception areas are management units located to the south of this forest (Lougou, Niaro, Gnemasson and Sekere) and other protected areas to the south of Benin and Togo.

Different zones of the CFUA receive transhumant from diverse horizons:

- The reception areas at the level of the riparian villages at CFUA (Sam, Gbassa, Diadia, Lougou, Pikire, Fetekou, Gnemasson, Yara, Guessebani and Yanro) which receive national and foreign transhumant. Riparian areas in this classified forest, these areas remain a source of attraction for herders.
- The reception areas of Mali, Fouka and Donorou inside the CFUA

The time spent in these reception areas depends for the most part on the transhumant surveyed of the availability of pastoral resources in water and fodder (44.8 %), the degree of

patrol in the camped area (33.5 %) and the climate of reception of indigenous peoples (12.1 %). Thus, depending on the availability of resources and the degree of patrolling of forest agents, the herders decide to follow or go in such and such managements units of CFUA.

Other areas that host transhumant outside the CFUA are: the classified forests of Trois Rivières, Ouénou-Bénou, Mékrou, Goungoun, Sota and Parc W. The municipalities located south of this forest also receive this transhumant. These are N'Dali, Parakou, Djougou, Tchaourou and the zone of Bante-Bassila, which respectively shelter the forests of the Upper Oueme; Okpara, the forests of Wari-marou and Toui-Kilibo, and of the Kouffè Mountains. They are also crossed by the permanent streams of Beterou, Terou; Ouimou, Ajimon and Nanouhe. The classified forests crossed by watercourses are therefore the target of transhumant herd.

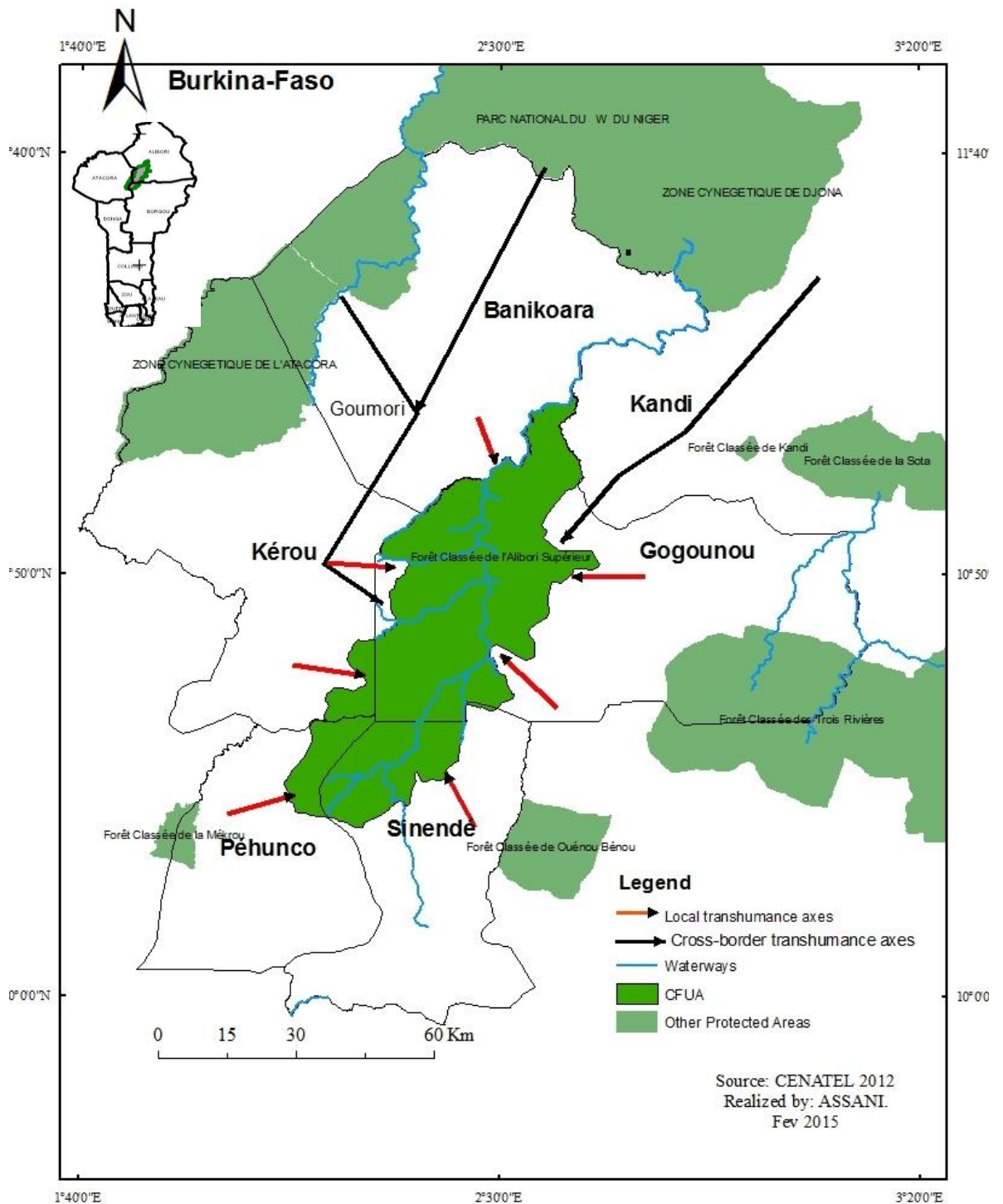


Figure 5: Map of transhumance itineraries to the classified forest of Upper Alibori

2.2.3. Causes of entry and choice of the itineraries of cattle herd to CFUA

The causes of transhumance in the CFUA are food for cattle herd (80 %) and incidentally of the safety of cattle herd and herders (12 %). Lack of pastoral space and excessive numbers of cattle are the main causes of the illegal use of this protected area. The choice of the itineraries of movement and night camp is a function of the availability of water, grazing mainly timber, crop residues, and the existence of markets, security and

reception of the populations of the areas to cross. These functions are of variable importance depending on the herders. All herders (100%) surveyed base the choice of the itineraries and night camp on the availability of water. Water is a source of life, they say.

For the other factors determining the choice of the itinerary and the night camp the opinions are diversified as shown in Figure 6. The pasture (40.1%), crop residues (20.9%) and perceived safety in terms of disease of cattle and men, of cattle thefts, are the main criteria of choice of the itinerary of movement and night camp.

The surveyed herders (82.4%) also stated that several factors influence the position of their herds in the Upper Alibori classified forest. It is: the frequency of forest officer patrols, the period of installation and the duration of rainfall.

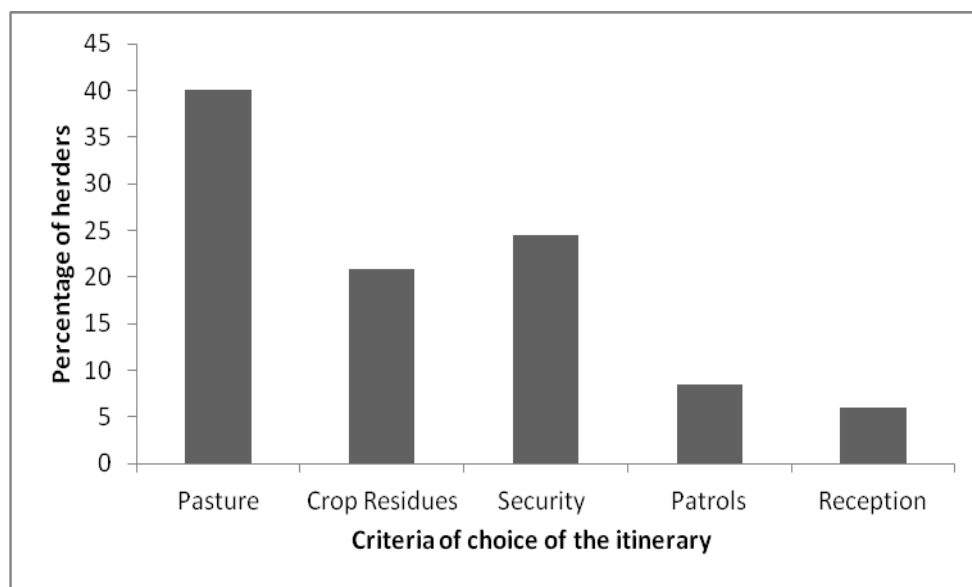


Figure 6: Criteria of the choice of the itinerary and the night camp

3. DISCUSSIONS

3.1. Pastoral seasons of herders

The pastoral calendar of local and foreign herders consisted of five (05) cutting periods of the year. According to the climatic diagram of the study area, the period of early rains would correspond to "*Seeto*"; the pre-wet period at "*Ceedu*"; the wet season at "*Nduungu*" and "*Djaamdè*"; and the post-wet period to "*Dabuundè*". Our results are similar to those of Djenontin (2010), Tamou (2002) in Benin, Kagoné (2000) in Burkina-Faso and Dongmo et al. (2009) in Cameroon which also found these 5 distinct periods in the pastoral calendar of the herders in their respective countries. The pastoral character of this calendar is

that it allows the herder to know the availability and quality of the fodder and the water indispensable for the maintenance or production of the cattle herd or for the subdivision of the pastoral territory (Djenontin, 2010). It should also be added that this calendar has deep roots linked to the development of livestock from 6000 to 7000 years (Brooks, 2006). Vall and Diallo (2009) also identified these five periods, but they add that each period is characterized by two functionality variables (availability and accessibility to water, availability and forage quality) and a risk variable (potential conflicts with farmers). The division of time into five periods is consistent with the conduct of herds in various pastoral units by herders (Dongmo *et al.*, 2009, Vall and Diallo ; 2009). By cons, Sawadogo (2011) identified four (4) seasons among Gourmantchés herders in Burkina Faso whose dividing of the year is almost identical to those described in the Fulani herders with some nuances related to the local context.

Some differences in terminology may also be noted, but there are the seasons of our calendar with sometimes a slight delay in the time related to the climatic context of the study area, also to inaccuracies within the limits and extent of each of these seasons.

3.2. Multiple transhumance itineraries sources of damage to pastoral resources

Cross-border transhumant enters the CFUA by the Commons of Banikoara, Kerou, and Kandi. While nationals the transhumant make their entry from all the managements units of this forest. Thus, several transhumance itineraries are observed in the Upper Alibori classified forest. The axes of transhumance and the reception areas chosen depend on the availability of permanent watercourses (Alibori), the availability of grazing in this case, and crop residues and information on forest officer patrols (Kagoné, 2004 ; Manceron, 2011). The presence of multiple transhumance itineraries chosen according to the availability of pastoral resources is not without consequence on these resources. Indeed, during the dry season, the disappearance of the herbaceous layer containing the main forage grasses of the herd makes it difficult to feed them. In this context, transhumant herders, concerned about the survival of their animals, severely prune certain forage trees such as *Pterocarpus erinaceus*, *Khaya senegalensis*, *Azizelia africana* (Houinato and Sinsin, 2000; Kagone *et al.*, 2006). Moreover, at the point of watering of the cattle herd, the filling and pollution of the streams are often observed. The defalcations in rivers are sources of disease for both animals and their herders, as well as for populations downstream of the watercourse (Bouraima, 2007; Assani, 2015). The overgrazing of pasture causes degradation of vegetation cover and consequently reduces forage resources (Bouraima, 2007). This overexploitation of pastoral resources along the

passage corridors negatively affects the floristic composition, the floristic richness and the structural organization of these pastures (Daget and Godron, 1995; Boutrais, 1996). Convers *et al.* (2008) also reported that pastoral overexploitation results in glacification of soils limiting infiltration to runoff. This phenomenon then leads to the degradation of the paths of transhumance and grazing areas on the one hand and on the other hand the colonization of pastoral areas by species not very palatable (*Zornia glochidiata*) and /or unwanted species *Sida cordifolia* and *Cassia tora* in the whole area (Convers, 2002 ; Hiernaux et Le Houérou, 2006).

The multiple transhumance itineraries of pastoralists in the Upper Alibori classified forest cause the siltation of ponds and watercourses and the degradation of the soil by compaction. It should be noted that the silting up of these water resources is caused by the erosion of the paths which are mainly due to the animal load. These same observations were reported by Houinato and Sinsin (2000) and Convers (2002) respectively on the water resources of the riparian zone of the Pendjari Biosphere Reserve and the areas frequented by livestock in the regional park W and its periphery. Water resources are the set of water points used for watering the animals during the dry season in the territory of attachment and along the transhumance itineraries. Ponds are also threatened by silting up against the growing pressure of the cattle transhumant in this area (Sinsin, 1997; Assani *et al.*, 2016).

3.3. An alternation of periods of transhumance in phase with pastoral seasons

The transhumance calendar is the same for all groups of transhumant herders in the sense that they all practice in principle a small transhumance (during the rainy season) and the great transhumance that takes place during the dry season. Each of these transhumance periods corresponds to pastoral seasons, so the departure and return of herders for the great transhumance in the study area correspond respectively to the cold dry season period (*Dabuundè*) and the beginning of the rainy seasons (*Seeto*). While during the dry season (*Ceedu*), herders are in the reception areas of the great transhumance. The small transhumance takes place during the rainy season (*Nduungu*), with the herds returning to their home area during the crop harvest season (*Djaamdè*). Our results are similar to those of Djenontin (2010), who also made the same rapprochement between the movement of herds and the pastoral calendar of the herders in the North of Benin. The intermediate periods of *Korsè* and *Barsellè* have been reported by Djenontin *et al.* (2012) in herders in northern Benin, but these periods are very difficult to separate from the *Ceedu* and *Seeto* periods respectively.

However, the period of departure or return in transhumance remains variable. It can be early or late depending on the installation and the length of the rainy season and the rainfall of the current year. Kiéma *et al.* (2015), working on the transhumance calendar of herders in the Sahelian zone of Burkina Faso have identified two cases of departure and return of the transhumance, the first case leaves between January and February and regains their soil in June and July. While the second case of departures reaches the reception areas between April and June and returns between October, November and December. However, these authors note that the availability of crop residues could delay the departure dates in transhumance for some herders in this area of Burkina Faso. Kagoné *et al.* (2006) find that in the region of the regional park W (Benin, Burkina-Faso and Niger); transhumance starts are spread out from December to May, with a peak in April. These departures follow the drying up of watering points and the exhaustion of fodder resources in the zone of attachment. The return of the great transhumance takes place from the month of June. While in most of these transhumant herders, transhumance departures are always made at about the same time. By cons, the returns of transhumance are very difficult to predict because of the great variability of the climate in the zone of attachment.

CONCLUSION

The study established the transhumance map for herders frequenting the classified forest of Upper Alibori and identified the peak periods of herders' attendance in this forest. The areas of departure of the herds are mainly the villages and encampments riparian to this protected area and the extreme north of Benin (Malanville and Karimama). Other transhumant herds come from Niger, Nigeria and Burkina Faso. The riparian transhumants exploit this forest in all seasons, while cross-border transhumants cross this forest during the period from January to June. The timing, itineraries and length of stay of transhumant depend on the availability of pastoral resources and the frequency of forest patrols in CFUA. These results lay the foundations for better exploitation of pastoral resources.

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