

Review Article

Transhumance and protected areas in West Africa: State of play and Management mechanisms review

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Abstract: Protected areas are increasingly frequented by transhumant cattle herds. This phenomenon has grown in recent decades in West Africa. In order to make a state of play of the use of areas protected by cattle herds, through its history, the causes of their presence and the consequences on natural resources and propose mechanisms for managing transhumance in protected areas, a bibliographical review of scientific work carried out in this direction has been made. It shows that the search for pastoral resources during the drought has been the basis for the entry of transhumant herders into these protected areas. From an ecological point of view, the debate is between those who claim that livestock is in direct competition with wildlife for access to forage resources and those suggesting that livestock and wildlife interact through a complex combination of competition / facilitation depending on the season and abundance of resources. The mode of management of transhumance in West African forests depends on the category of protected areas. Some protected areas have opted for strict management and others for concerted management. This is the case for Park W, which, through the regional project (ECOPAS) has developed a common strategy for the management of transhumance in this protected area. Despite these various proposals, the protected areas of West Africa continue to suffer pastoral pressure. It is then necessary to propose a sustainable management mode which will make it possible to make judicious use of the pastoral resources of these protected areas without compromising their biodiversity.

Keywords: Forestry; natural resources; Pastoral mobility; protected area-livestock interaction; sustainable management.

INTRODUCTION

In West Africa, all categories of protected areas are affected by the phenomenon of dry season transhumance [1]. Despite the prohibitions, many transhumant herders exploit national parks and wildlife reserves [2]. This illegal use of pastures in protected areas constitutes a threat to biodiversity conservation [3]

Thus, regional park W and other protected areas in northern Benin are under severe pressure from transhumant herds [4, 5, 6, 7]. More than 1171 herds totaling 101,309 cattle were counted in the WAPOK complex (W, Arly, Pendjari, Oti-Mondouri and Kéran) and its periphery in 2003 [8], this number rose to 682 herds is 52,646 cattle in 2012 [9]. Similarly, in Senegal, Niokolo Koba Park is home to important herds including small ruminants from the Sylvopastoral zone of Senegal and Mali, which descend in the dry season to exploit pastures and water [10]. The presence of these herds in these protected areas causes a serious degradation of the tree formations. So the gallery forests

disappearing, woodlands and wooded savannahs are reduced at the expense of a strong expansion of shrub and grassland [11, 10, 12, 13]. This degradation is caused mainly by bush fires and overexploitation of pastures in these protected areas. However, transhumance is also increasingly cited as an effective means of adapting to sustainable changes and management of natural resources [10]. Throughout the literature, the debate is ecologically opposed by those who claim that livestock is in direct competition with wildlife for access to forage resources [14], and those who qualify this regard, some authors suggesting that livestock and wildlife interact through a complex combination of competition / facilitation depending on the season and abundance of resources [15] and species considered [16]. Some authors suggest that pastoralism is responsible for the low densities of fauna currently encountered in West Africa [17]. Other authors question the very reality of environmental degradation due to pastoralism that would negatively affect wildlife [18].

The categories of protected areas according to the International Union for the Conservation of Nature (IUCN) are 6 and correspond globally and very schematically to a progressive evolution from territories which are to be kept as natural as possible (1 to 3) to areas where human intervention is increasingly visible (category 4, 5 and 6) [19]. Management of the relationship between livestock and wildlife also depends on protected area categories. Today, forests are increasingly co-managed with local people. But transhumant herders are not invited to participate in this co-management [20].

This literature review attempts to make a study of the use of the protected areas by the transhumant herders in West Africa through its history, the reasons for their presence and impact on natural resources and propose mechanisms for managing the transhumance of certain protected areas.

METHODOLOGY

The documentary review is the tool used in this scientific work. Several papers, including papers, theses, papers and technical reports dealing with transhumance in protected areas in the West African region were consulted. The data obtained have been synthesized in order to make the history of transhumance in protected areas, the mutual impacts transhumance-protected areas and the mechanisms of their management. The tool used is triangulation to verify information according to the different sources. A diachronic analysis was also made to highlight the management of transhumance in protected areas in Benin.

RESULTS AND DISCUSSIONS

History and causes of transhumance in protected areas of West Africa

Two main categories of history can be noted in the exploitation of protected areas by livestock in West Africa. The first concerns pastoral areas which were later transformed into protected areas by the colonial or post-colonial administration. Indeed, during pre-colonial periods, certain areas were exploited by hunters, herders and farmers under the control of chiefdoms or pre-colonial kingdoms. Benoit, M [21] noted some temporary human activities in Park W prior to its creation. He pointed out that migratory movements occurred in the Niger valley area before the creation of this reserve at the beginning of the 19th century [22]. Similarly, some migratory corridors from the Macina to the Sokoto were later transformed into a reserve [23]. This shows that some pastoral areas have long been exploited by cattle prior to their classification as protected areas. The second category of history concerns the West African protected areas which were considered "The wilderness" of a no man's land. Some protected areas have long remained unoccupied because they are unhealthy for humans (mosquitoes / onchocerciasis, mosquitoes / malaria) and livestock

(tsetse flies / trypanosomosis) [24]. During these periods, it is important to note that there was a feeding abundance for livestock in these West African regions.

But the situation of animal food abundance will gradually deteriorate with the increase in cattle numbers and the appearance of droughts in 1973 and 1984. Toutain, B *et al.* [24] also notes that the barriers to the penetration of areas protected by livestock have also been partially lifted by climate change, clearing, progress in the campaigns for the treatment of animal vectors and preventive measures for medical and veterinary control. For example, the Sahel herders did not cross the Benin border (Niger River and Tapoa River) until 1984. Efforts to control tsetse and trypanosomosis, as well as drier climatic conditions, would have significantly reduced or relegated livestock health zones further south [25]. Thus, after the 1984 drought in Niger, there was an extension of the pastoral area to the south of Park W, in Burkina Faso, Benin, Nigeria [26].

Boutrais, J [23] found that the end of the 20th century in West Africa was marked by a gradual extension of pastoral areas in the savannahs of the South, all Sudanese and Sudano-Guinean zones, from Senegal to North-Cameroon and the Central African Republic (Figure 1). Bernardet, P [27] also noted this pastoral expansion in Ivory Coast. Indeed, in 1985, Fulani herders still occupy only an area contiguous to the border of Burkina Faso with Ivory Coast but, a few years later, their range extends to almost all the north of the country, by completely enveloping the national park of Comoe [27]. The spread of pastoralism to the south is justified on the basis of ecological and political factors [23]. In some countries, colonial administrations forbade pastoralists to settle in the south for veterinary reasons and for fear of conflicts between populations. Other causes that are no less negligible can explain the presence of livestock herds in protected areas, namely the occupation of pastoral areas in the peripheral areas of the areas by the fields, the concern to avoid the damage of fields (farmer-herder conflict) and weak monitoring of protected areas [28,7].

In areas of political instability, protected areas are faced with an uncontrolled and illegal exploitation of natural resources. For example, in Togo in the 1990s, following the subsequent socio-political crisis to the advent of democracy, the monitoring system for the protection of protected areas has weakened. Thus, the populations have partially or totally invaded the protected areas by exploiting in an anarchic and illicit way the forest and wildlife resources [29, 30].

Protected areas become attractive to escape the scarcity of grazing areas, occupation transhumance corridors, the unsuitability of land legislation and the many social conflicts [31, 7]. Thus, the transhumant

movement in the savannas eventually invaded most of the protected areas in the Sudanian zone [23].

In several West African countries, outbreaks of transhumance have reached the peri-forest savannahs of the Guinean zone, as is the case in Benin [32] and Togo [33]. Most of the transhumance axes cross protected

areas (classified forests, wildlife reserve, national parks, sacred forests, sanctuaries) (Figure 1). Indeed, these spaces are zones of concentration of floristic and faunal biodiversity. They are characterized by the relative abundance of vegetation and watercourses. In the eyes of pastoralists, they represent good quality pasture area during the dry season [34].



Fig-1 : Transhumance itineraries showing movements of herds around and within protected areas of West Africa [23, 10, 34, 13, 35]

Mutual transhumance-protected area effects on flora

- Damage to the flora

Transhumance in protected areas is a form of disturbance of ecosystems such as bush fires [25]. The pasture and grazing of cattle herds can seriously degrade the floristic composition and floristic richness of natural rangelands, and therefore the biological diversity of protected areas [36, 37, 38, 39, 40, 41]. But it is important to note that the impact of livestock on biodiversity will depend on the type of environment (savanna, Sahel, etc.) and the intensity of grazing in this environment. Thus, in humid savanna a heavy load causes the scrubland and eliminates the good herbaceous forage species [42, 40, 43, 44], through the colonization of pastoral areas by undesired species (*Zornia glochidiata*) and or undesirable species *Sida cordifolia* and *Cassia tora* throughout the area [4, 45]. While in the Sahel, all vegetation, including ligneous, can decline [46]. The presence of animals can probably cause a mutilation of the seeds of rare ligneous forage species [40]. Considering the wild origin of domestic animals, the impacts of the presence of livestock in protected areas will appear unclear that, the question arises as to whether wild animals can not cause the same damage and even more to the biological diversity of these protected areas. For example, African elephants (*Loxodonta*) destroy thousands of trees each year in protected areas [47], but this does not sound like a degradation of the habitats of other animal species in view of the priority for elephant conservation for the

national and international community. Also, dikdiks (*Madoqua*) can have an impact on trees as important as elephants (*Loxodonta*), they can slow down or stop the regeneration of trees like Acacias [48]. In this context, the presence of livestock in protected areas poses no major problem, but rather the carrying capacity of the natural rangelands of these areas to support many cattle herds in transhumance in these protected areas. It is unanimously recognized that when overgrazing causes the degradation of the vegetation cover and consequently leads to the regression of forage resources [43, 49, 44, 50]. Domestic livestock can also cause the introduction of seeds of invasive plant species from open areas (fields, fallow land, human habitats) or from Sahelian countries via transhumance [40]. The structure of herbaceous vegetation can change by spreading species in response to repeated trampling of cattle herds. In the same way [13] added that the multiple itineraries of cattle herds in transhumance in protected areas also have serious consequences on forage resources. Repeated consumption over time of individuals of the most desirable species limits their growth and chance of survival and results in a decrease in the height and recovery of these species [51].

- Beneficial effects on the flora

Other research supports the beneficial effect of livestock in protected areas and attributes this to the beneficial effect of herbivory on ecosystems. Animal load in the natural rangelands of protected areas is a very fundamental decision-making element regarding

the possibility of opening protected areas to livestock. Indeed, several studies conducted in this direction in different environments have shown that when animal load is reasonable and well distributed over time, plant biodiversity increases [52, 53, 54]. This confirms the theory that species diversity is maximized at intermediate levels of disturbance [55]. Similarly, the African savannah is the result of a long history of co-evolution of vegetation, fires and ungulates [56]. The herbivores then generate a heterogeneity which favors the diversity of animal and plant species through their action on the vegetation. As a result, herbivory reduces the amount of herbaceous biomass and thus the frequency and violence of vegetation fires, which displaces the herb / ligneous balance for the benefit of the woody [56]. A protected area where large herbivores are very rare or absent as is the case in most classified forests, departs from a natural environment. This can lead to dysfunctions in the forest ecosystem. In this context, controlled or reasonable grazing of domestic animals in West African savannas appears to be an ecological engineering solution to alleviate the imbalance of wild herbivores [40].

Mutual transhumance-protected area impacts on wildlife

- Damage to wildlife

Many conservationists consider livestock as a threat to wildlife and its habitat. Wambwa, E [57] shows, for example, from his observations in Kenya, that there are exchanges of various pathologies between livestock and wildlife when they live together. Boutrais, J [23] reports that in W N Park, the buffalo population fell sharply in 1984 as a result of an epidemic of rinderpest introduced by transhumant zebu. Similarly, curators of protected areas indicate that livestock would compete with wildlife for food, at least with species with which it shares the same ecological niche [58]. This seems to be the case between cattle and certain herbivores, such as buffalo or wildebeest [59] who have a very close diet. The argument that livestock is a threat to wildlife is therefore not, in the absolute sense, false, but it is valid in both directions. Indeed, [60] have observed that wildlife has direct negative influences (predation, vectors or reservoirs of diseases, etc.) or indirect effects with restricting access to natural resources (water, fodder, salt cures, etc.) on domestic livestock. In addition, the herders incriminate wildlife, especially buffalo, in the occurrence of foot-and-mouth disease in their herd [58]. Although competition between fauna and domestic livestock is unquestionable, there are cases where there are none: cattle coexist well with koudous, grazers with which they have a very niche cover limit [59]. In addition, intermediate-rate herbivores, such as impala, consume the same herbaceous plants as cattle [59, 61]. But cattle are better competitors in this type of forage, and impala seem to modify their diet depending on the presence of cattle [61]. The authors add that the conclusions would be significantly different if we consider small

ruminants, especially goats, which consume a large part of wood in their diets. Nevertheless, from a strictly ecological point of view, nature cannot be mimed perfectly by introducing cattle as a substitute for an absent fauna. In the original ecosystems of the savanna, the many species of herbivores, by their diversity of size, of diet (thicknesses or grazers ...), of physiology (ability to digest various types of forage) and behavior (preference for particular environments, more or less territorial character, daily and seasonal mobility ...) occupy complementary ecological niches, so that their impact on the environment is distributed. It is naive to think that nature can be appropriately imitated by introducing livestock as a substitute for extinct herbivorous fauna, and caution is still needed [40] even if care is taken to use herds of several species of domestic ruminants [62].

- Beneficial effects on wildlife

Many scientific studies [21, 63, 40, 60, 23] show, however, that these ecosystems have long been part of the annual grazing range of the surrounding and even remote pastoral populations. The trends indicate that the pastoral use of protected areas is likely to increase because open space is increasingly scarce and of poor quality due to the agricultural grabbing of pastures and the overall anthropogenic pressure [60]. Based on some observations, existing arguments to support exclusionary policies [18], rather successful experiences of cohabitation are also reported. Bayer, W *et al.* [64], by fairly illustrative examples, emphasize complementarities. Thus, they show that the giraffe grazing on the upper floors (from 5 m), keeps the savannah ecosystems open, thus promoting shrubs, small trees and herbaceous plants usable by domestic livestock. They add that livestock, by grazing in wetlands, bring in nutrients consumed by waterfowl and fish. In the same way, [65] have observed a coexistence without interference between birds and cattle in the Djoudj National Park in Senegal. Boutrais, J [23] reports the results of a coexistence experiment between wildlife and domestic livestock conducted between 1970 and 1980 in an area in Kenya that resulted in an increase in the elephant population of this locality, whereas the surrounding areas saw their fall. Moreover, Bayer, W and Ciofolo, I [66] argue that the cost / benefit ratio of coexistence between wildlife and domestic animals is favorable. In the Sahelian Northeast of Mali, pastoral breeding contributes to the maintenance of the elephants of the Gourma, respecting the itineraries and the ease of access to the water points. Pastors recognize the importance of these elephant herds and exploit shared resources [20].

All this encourages a compromise between conservation actions and pastoral activities, the current challenges being to ensure the legitimate needs of pastoral populations without compromising the preservation of the heritage of protected areas in their diversity [58].

Management of transhumance in protected areas

- State management

The problem of the use of protected areas by livestock is all the more complex as in many countries the separation of decision-making centers (ministries) in charge of agriculture, protected areas and livestock, is not counterbalanced by coordination on the ground. Action synergy is rare [56].

Management of the relationship between livestock and wildlife depends on the protected area. In Djoudj, animals are prohibited according to the texts, but to the extent that the animal numbers of the riverside villages are low, they are allowed to frequent the park. No problem of cohabitation is reported for the moment unlike the Niokolo koba Park where the tension is permanent between riparian, transhumant herders and services of National Parks. Despite the total prohibition of penetration into the Park, 1/8 of the Park is frequented by livestock, which sometimes travels up to 16 km inland. Permanent conflicts exist between eco-guards and transhumant herders [25,10].

In Benin, according to their categories, protected areas are managed by three different institutions: the National Center of Wildlife Reserves (CENAGREF), which manages the National Parks and their Hunting Areas, the Office National du Bois (ONAB), which manages the classified forests of Agrimey, Lama and Djigbé and the Directorate General of Forests and Natural Resources (DGFRN), which implements the State's management policy at the level of other classified forests [67]. The herders who carry out transhumance within forests with a management plan pay a financial contribution per animal per year [68]. The fines are also paid by herders in the case of illegal logging [43]. Integration of ruminant livestock herders into forest management programs and territory management while taking account of climatic and anthropogenic factors in the use of natural rangelands is necessary [69, 13].

Faced with the often deadly open conflicts recorded by foreign transhumant peoples in Benin, the decision to suspend the practice of cross-border transhumance in February 1995 did not hinder the rush of international transhumant herds on Benin. On the contrary, this decision, which is not respected by this foreign transhumant, puts them in a status of illegality and, as a result, they are forced to evolve underground; hence fraudulent practices of all kinds making the national management of this complex activity.

- Collaborative management

The lack of forage resources in peripheries is often used to justify the use of protected areas. This can be done by farmers, who burn the crop residues sought by livestock or are increasingly exploiting lowlands developed for small-scale irrigation in the dry season. Thus, farmers,

agricultural services and other irrigation project initiators must be involved with full awareness of their responsibilities [56].

In case of difficulties, [56] suggest that the conservator of the protected area should take the initiative to manage this problem as much as possible. They must then consult the livestock services, the representatives of transhumant, those of the riparian villages and any other influential local actor that may be involved. To open up protected areas to herds, it is very important to understand all the elements of the problem and to prioritize them before deciding whether to open the protected area to livestock [70]. Kiéma *et al.* [56] add that opening the protected area to the herds can only appear as a limited tolerance in time and space, limited also in the rights of authorized users.

Thus, for the manager, the decision to take is an unavoidable responsibility, additional to his strict preservative role. It takes it to participate in regional development dynamics, to contribute to the local economy, to respond to social or humanitarian considerations, and also to prevent or mitigate the risks of tension and conflicts with herders. It allows it to control a pressure rather than undergo it.

In order to manage the problem of transhumance in Park W, the ECOPAS program has adopted an approach based on knowledge of the spatiotemporal dynamics of transhumance so as to understand its determinants and to be able to negotiate with the different stakeholders, at different levels of power (from breeders to senior officials); which was mainly aimed at managing the land issues raised by the agro-pastoral dynamics around the protected area [4]. This initiative had led to the establishment of a concerted management of cross-border transhumance in the region of the W regional park (Benin, Burkina Faso and Niger) in order to reduce the recurring conflicts between transhumant and foresters and farmers [71].

In the Gadabéji classified forest in Niger, the herders have a right to pasture in the first six months of the year during the dry season, thus contributing to the maintenance of the environment [20]. North of Dakoro, in Niger, the real regeneration of the trees was made thanks to the herds and their movements, including in classified forests.

With the advent of decentralization, communities at the grassroots level can participate in the management of protected areas in their territory. Thus, community projects may decide to develop livestock farming in the peripheral areas of protected areas by creating sufficient facilities to divert breeders from the interest of entering the reserves.

CONCLUSIONS

The study established a situation of transhumance and management of natural resources in protected areas in West Africa. The causes and impacts of the exploitation of these protected areas by transhumant herds have been reviewed in the literature. The state of play has highlighted the main causes of transhumance in protected areas, which makes it possible to better formulate proposals for adapting and improving transhumance in the light of the major issues and challenges facing it. These proposals relate to the conduct of studies that can predict the dynamics of transhumance in protected areas and propose a model for sustainable management of transhumance in these protected areas without compromising their biodiversity. The many examples cited in the management of transhumance in protected areas reveal once again the great diversity of situations and a universal solution cannot be found. Each case must develop its own modes of conduct.

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