11 Cattle and Trees in the West African Savanna

THOMAS J. BASSETT AND JEAN BOUTRAIS

Introduction

The typical pastoral landscape is totally unlike the dense forest: in the former there is only grass, while in the latter trees are so numerous that they prevent grass from growing in the understory. In general, forest vegetation is unsuitable for livestock raising, especially cattle rearing. Nonetheless, trees and livestock raising are intimately related in West Africa. For example, in the Sahel region, shrubs are browsed not only by small ruminants but also by cattle. When trees attain too great a height, herders turn into wood cutters by climbing trees and cutting leafy branches to give to their animals waiting below. The contribution of trees to cattle diets is especially important during the dry season when animals are momentarily deprived of herbaceous pastures. Ancient agro-pastoral civilisations of West Africa depended on high quality pasture grasses that were supplemented by tree forage. The symbol of this alliance between cattle and trees is the *Acacia albida*, a central feature of regional agrarian civilisations (Pellissier, 1966).

It is this relationship between cattle and trees which forms the focus of this chapter. The main arguments are organised into three parts, excluding this introduction and a concluding section. First, received ideas about the links between livestock raising and land and vegetation degradation are reviewed. Second, these are then contrasted with local perceptions of environmental change in Cameroon and Côte d'Ivoire. Finally, scientific support for these indigenous perceptions of environmental change is reviewed. The concluding section highlights two main themes: first, the contradiction between received wisdom, on the one hand, and local and scientific views, on the other, regarding the environmental impact of savanna pastoralism; and, second, increasing evidence which suggests that, over the long term, herd and range management practices encourage an expansion in tree cover.

Over the past few decades, cattle numbers have increased greatly in the

Sahel. Numerous authorities assert that they have increased too much. The overstocking of Sahelian pastures manifests itself in land degradation, whose outcome many believe to be desertification. In fact, grasses seem to resist grazing pressure better than trees. Excessive grazing pressure aggravated by the effects of drought threatens to eliminate trees over extensive areas (Peyre de Fabregues, 1990). In the Sahel, livestock raising is allied to the tree but it is a dangerous alliance, especially for the latter.

In the wetter savannas, pastoralism is a relatively recent activity which has developed as a consequence of myriad livestock raising constraints in the Sahel. Over the past few decades, large numbers of Sahelian pastoralists, in particular the Fulbe, have taken their herds south in search of new pastures. In the ecological context of the wetter savannas, what relationships exist between livestock raising (especially of bovine cattle) and trees? Are these likely to inform debates about contemporary savanna forestry relations?

Livestock raising in these savannas is often a complementary activity to agriculture, so much so that it is difficult to isolate the ecological effects of one in relation to the other. However, some pastoralists have settled in a few regions for more than 50 years, for example on the Adamawa plateau in Cameroon. Such regions have been veritable laboratories for examining the relationship between livestock raising and trees. Elsewhere, for example in Côte d'Ivoire, pastoralism is more recent, but the influx of cattle is such that it has already provoked noticeable environmental changes.

It is important to study the interaction between livestock raising and trees in wetter savanna areas, for it is likely that animal husbandry will continue to develop in this zone. Moreover, by virtue of its agricultural potential, this zone will continue to be attractive to immigrant farmers. Competition between divergent interests over access to and management of natural resources will thus likely intensify in the coming years (see also Schreckenberg, and Amanor, this volume).

Received Ideas on Livestock Raising and Land Degradation

One of the first challenges encountered in examining the relationship between cattle and trees is the need to confront the received idea that livestock are an important agent of land degradation. Livestock raising is singled out for blame, both for reducing grass cover and for destroying forests. Pastoralist use of fire as a range management tool is believed to be the single most important factor behind this purported environmental degradation. For example, the broad

savanna belt located between the tropical rain forest and the Sahel was widely believed to be the degraded remnants of ancient forests (Aubréville, 1949). During the 1950s and 1960s, ecologists working in Central Africa repeatedly emphasised the role of land degrading factors to explain the existence of these great savannas.

In Cameroon, Jacques-Felix (1950) considered fire to be the most important factor accounting for the abrupt transition between the tropical forest and the southern savannas. Reflecting his view of the essential dynamic of this vegetation change, he called the entire savanna region the 'fire zone'. He argued that the humid savannas of the Guinea zone are of post-forest origin. Dry deciduous forests, he noted, only appear in the Sudanian zone where fire resistant tree species were found. Jacques-Felix correctly observed that livestock raisers rarely cut down trees but he accused them of being firebugs (*des incendiaires*).

It is important to note, however, that livestock raisers have only recently entered the tall grass zones of the Guinea savanna. Historically, the major agents of vegetation change in this zone have been farmers and hunters who set fires to clear land and hunt game. Moreover, these savannas are sparsely populated. But Jacques-Felix (1950) noted that fire considerably magnified the impact of humans on vegetation, and that the importance of fire was inversely proportional to population density. Later, other ecologists (for example, Letouzey, 1985) offered more prudent and nuanced explanations on the origin of savannas.

It is true that wherever they are found, livestock raisers are partisans of bush fires because they preserve desirable pasture grasses at the expense of woody species. Even the Fouta-Djallon and Adamawa plateaus do not support natural savannas; they are technically 'grasslands' or grazed pastures. According to Jacques-Felix (1950), they are products of a fragmented forest, 'showing the influence of humans and their herds'.

One wonders if the case of destructive livestock raising on forest vegetation has not been exaggerated. Unlike in Latin America where large tracts of tropical rainforests have recently been destroyed and replaced by pastures for speculative livestock raising, African pastoralists do not cut down forests to create grazing areas. On the contrary, they have been content to take advantage of existing savannas, and to enhance the value of these by transforming them into grassland. In doing this, they have probably modified the nature of bush fires to realise their pastoral objectives (e.g. grass regrowth at the beginning of the dry season). But bush fires themselves predate the relatively recent arrival of herders in savanna areas.

Trees are valued for their forage potential during the dry season when the herbaceous plant cover is unable to meet the needs of grazing animals. The fact that forage tree species are less numerous in the wetter savannas than in the Sahel leads to species like *Pterocapus erinaceus* and *Afzelia africana* being more frequently exploited than others in the northern Sudanian zone.[1] The common practice of cutting high branches and even treetops to bring forage within the reach of cattle can lead to the rarefaction of certain species. However, this selective cutting of trees has only a marginal effect on the composition of savanna woodlands.

In general, herbaceous forage is more abundant in the southern savanna than in the Sahel which means that herders only rarely use tree leaves as forage in the former. Livestock raisers who have resided in these savannas for quite some time confirm that they rarely exploit trees for their forage potential. Certainly, during the dry season, animals browse bushes that are within reach. The practices of cutting and pruning tree branches are especially followed by Sahelian livestock raisers who have recently migrated to wetter savanna areas, where they continue to exploit above ground forage resources.

In contrast to farmers, livestock raisers are not 'consumers' of forest. They follow rather than precede pioneer agriculturalists who clear forest areas for farming. Despite this widespread practice, livestock raising is an activity that is reputed to degrade the environment and to bring about desertification in the savanna region.

Yet, for savanna areas, these views of the negative role of livestock raising are contradicted by the actual practices and perceptions of herders. Indeed, interviews conducted with pastoralists and peasant farmers in central Cameroon and northern Côte d'Ivoire suggest that savanna landscapes are becoming *more* wooded as a result of cattle grazing and the declining intensity of savanna fires. In the following section views of land users in both countries on the nature and process of this reforestation are presented.

Local Perceptions of Environmental Change in Central Cameroon and Northern Côte d'Ivoire

Cameroon

Livestock raisers are quick to note any changes in the composition of pasture grasses. Their observations regarding the growth of trees are less common because such changes are slower and herders themselves change locations so

frequently that they are often unable to compare tree growth in the same place over a long period of time. Nevertheless, herders on the eastern edge of the Adamawa plateau offered similar testimonies on the evolution of the surrounding vegetation. The research focused more on livestock raising techniques and social problems than on the evolution of pastures. It was the herders themselves who stressed the changes in pasture vegetation in the process of explaining the problems they face in raising livestock. Studies were undertaken with herders in both Cameroon and neighbouring Central African Republic, but were more exhaustive in the former (Figure 11.1). It seems, however, that bush encroachment is more spectacular and more extensive in the Central African Republic than in Cameroon.

The edge of the Adamawa plateau is bordered by cliffs formed by either tectonic uplift or by headward erosion of upper stream valleys. Geomorphologists distinguish two plateau levels: the Bocaranga surface at 1,200 metres and the Meiganga-Bouar at 1,000 metres. At the beginning of the present century, these two areas were depopulated; the Gbaya had settled in the large peripheral valleys where soils were more fertile. When the first Fulbe (Mbororo) livestock raisers arrived on the plateau beginning in the 1920s and especially the 1930s, they discovered extensive grasslands. For reasons related to herd health (particularly diseases transmitted by tsetse flies and tics), they settled on the higher Bocaranga surface.

Elders described the pasture lands they encountered upon their arrival. 'As far as the eye could see, there was grass.'[2] For livestock raisers, the abundance of grass represents an important criterion for a good grazing area. Its relative abundance is not easily forgotten. 'From here (Horé Pendé), one could see as far as Mbotoga ... there was nothing but grass'.[3] These two places are located at the same elevation about 18 km apart as the crow flies (Figure 11.1). The visibility of distant places serves as a benchmark against which one can measure subsequent changes. Such memories evoke a prairie landscape devoid of trees with an open horizon. Indeed, informants specified that '... there were no trees; it was completely open.'[4] The term 'open' is an imperfect translation of the Fulbe verb *laaBi* which means 'to be clear, clean'. For the Adamawa Fulbe, a rangeland without trees is clean, neat, and pure. On the contrary, savannas with scattered shrubs are considered to be 'dirty', imperfect, and therefore less valuable.

However, some people said that they had found some shrubs on the plateau. They cited especially *Lophira lanceolata* and *Terminalia spp.*, and occasionally *Syzygium guineense* and *Entada abyssinica* .[5] But these shrubs were few and far between. Trees were only found in gallery forests (*laynde*) along river

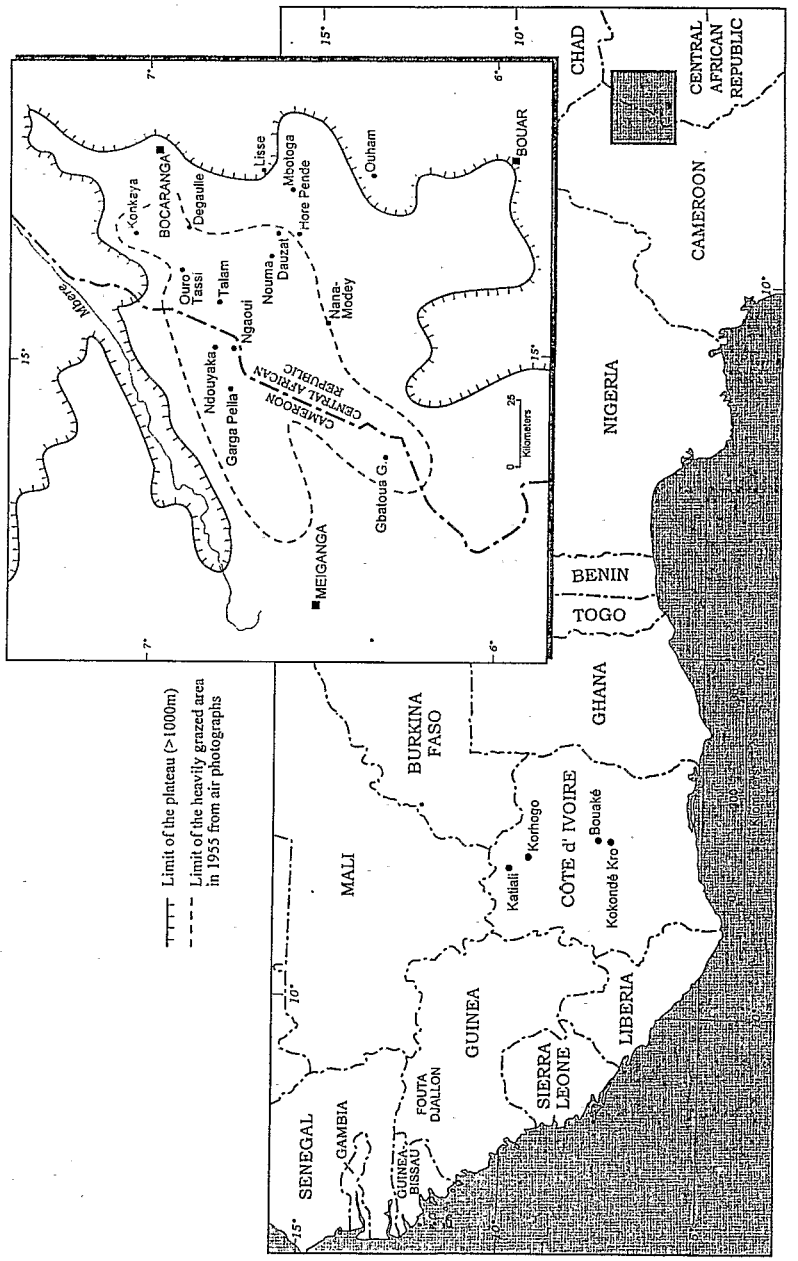

Figure 11.1 Location of Adamawa Plateau, Cameroon and Katiali Village, Côte d'Ivoire

valleys. It is likely that shrub savannas were more common on Meiganga-Bouar, while grass savannas predominated on Bocaranga on the upper plateau.

To describe the grassy and depopulated expanses that they encountered on the plateau, the Mbororo employ the expression *ladde perongal* – 'the deserted bush'.[6] *Perongal* has the same root as *ferwa*, 'to be empty, deserted', and signifies the absence of inhabitants, in this case farmers; but it also suggests the existence of extensive open pastures. From the pastoralist's perspective, this is a very positive characteristic of a natural environment.

The description *caBBal*, equally employed by the Fulbe to designate these areas, carries the same meaning of extensive grasslands but at a higher elevation than the plains or sectors found at lower elevations. The term is especially employed for the higher plateaus located at the periphery of the Bocaranga surface, for example those which dominate the Mbéré gap to the north.[7] The *caBBal* is considered an excellent environment for livestock raising because these treeless montane grasslands are conducive to good animal health.

Fulbe pastoralists never tire of praising the treeless pastures they encountered on this part of the Adamawa plateau. Despite the difficulties they experienced in obtaining food supplies, they became very prosperous as their cattle numbers grew.[8] Official cattle census data, although incomplete, show increasing herd sizes on both sides of the border during the period 1940–50. Herders sought out other pastures, but animal losses due to trypanosimiasis and peri-pneumonia forced them to return to their highland ranges. The growing concentration of animals on these pastures eventually led to range degradation. Aerial photos dating from 1954 in the Central African Republic show that nearly all of the Bocaranga surface area had been particularly intensively grazed at this time. Similarly, on the Cameroonian side, grazing had been so intense that livestock officials closed off large areas to livestock raising for a three-year period.

Today, Fulbe pastoralists recognise that these plateau pastures have changed completely. 'The place (Talam) is old and used up, the soil has become denuded.'[9] 'The pasture is dead; there are no more grasses, the earth is barren.'[10] The Fulbe term *karal* designates, in the Adamawa area, a compacted clay soil that does not support herbaceous vegetation. For the Fulbe, it is a range condition that has very little pastoral value. This evolution is common for overgrazed pastures throughout the Sudano-Sahelian zone. 'We return each year to the same place to pass the rainy season but there are too many cows, there is no more grass.'[11]

A specific impact of overgrazing on Adamawa pasture is the widespread invasion of trees. 'Shrubs have appeared everywhere.'[12] 'Now there are

thickets everywhere; grass no longer grows.'[13] The word *thickets*, a dense and compact woody vegetation formation, is a good translation of the Fulbe words *baafe* (Mbororo) or *guube* (Fulbe). The Fulbe of the Adamawa equally say *ladde sukki*: 'the bush has become dense and enclosed'.[14] Tree invasion blocks the landscape's horizon. Trees have become so dense that they prevent grass from growing and lead to an impoverishment of pastures. 'Today the bush is closed like a forest.'[15]

Herders note that today's invasive species are not the same shrubs that they encountered upon their arrival. These are new species that they assume have come from lower elevation gallery forests. They especially cite *Harungana madagascariensis* (*burugal* or *kandihi*) and *Croton macrostachyus* (*galawahi*). While the first has a shrub-like habit, the second attains the height of a tree with abundant foliage.

Herders localise the invasion of these two species to the uppermost surface of the plateau (Bocaranga). There are two possible interpretations of this phenomenon. Either the new species are well adapted to the higher elevation (which is undoubtedly the case for *Croton macrostachyus*, a montane species of mid-elevations (see Aubréville, 1950)), or, the relatively long duration of livestock raising in the region is the principal factor explaining their spread. The latter is probably the case for *Harungana*, which is noted for its hardiness and colonising nature, and which is ubiquitous at the margins of tropical forests (Aubréville, 1950). Herders know that this shrub proliferates when the bush is no longer fired. They say that '... the entire bush no longer burns; if there were bush fires, the trees would burn'.[16]

Herders believe that cattle are the principal cause of this vegetation change. 'The cow is like fire, after a while, it kills grasses. Cows trample the earth and, if they are numerous, grass no longer grows, only trees do.'[17] 'Cows have killed the bush.'[18]

The invasion of Adamawa pastures by trees has had dramatic repercussions for livestock raising. The new woody species offer little forage and choke out the grass cover under their dense foliage. 'Grass no longer grows. Cows are not eating enough during the rainy season.'[19] 'During the dry season, the cows are hungry. They move down to the valleys and enter the gallery forests where they eat toxic plants.'[20] Confronted with this form of 'green' degradation of their pastures, herders are emigrating. One herder who moved to a neighbouring valley explained: 'I looked for a place to raise livestock where the pasture is not dead.'[21]

Ladde waati: 'the bush is dead'.[22] In the Sahel, this is a Fulbe expression meaning that there is no more pasture left after a great drought. But it is also

the Fulbe way of expressing the complete invasion of savannas by trees. For the Fulbe, this vegetation change is irreversible.

Is this dramatic evolution of the grazed savanna specific and unique to the Adamawa plateau? For quite some time, it was believed to be so. Today, however, more and more herds are grazing in the wetter savanna zone throughout West Africa. This is the case, for example, in northern Côte d'Ivoire. So, how do the land users there perceive the impact of livestock raising on vegetation? And how do their perceptions differ from those of the Fulbe in central Cameroon?

Côte d'Ivoire

Local perceptions of environmental change were recorded in the village of Katiali based on interviews with peasant farmers and pastoralists in July–August 1995 (Figure 11.1). The population of Katiali numbers close to 2,000 persons comprised mainly of Senufo and Jula farmers. Fulbe agro-pastoralists arrived in the 1970s and constitute the third ethnic group residing in the village. Situated in the transition zone between the Sudanian and Guinea savannas, the vegetation of the Katiali region is characterised by a mosaic of tree and shrub savannas. The herbaceous plant cover is dominated by grasses (80 per cent) of which more than half (52 per cent) are perennial species (GTZ, 1994).

When asked if they perceived any differences in the bush today in contrast to when they were younger, more than two-thirds of the 38 farmers interviewed responded affirmatively. The most significant change, they noted, was that the savanna had become more wooded. The majority of respondents (69 per cent) explained this change as resulting primarily from the arrival of Fulbe herds in the region. When asked about the impact of Fulbe livestock raising on the bush, more than half of the informants replied that there are more trees today in the bush than there were before the Fulbe arrived in the mid-1970s. Another quarter of the respondents answered that there was less grass with which to thatch roofs due to the presence of so many cattle. Indeed, the most common thatch grasses are highly palatable to cattle.[23] The combination of grazing pressure and burning has led to higher prices for thatch in local markets.[24]

A somewhat smaller sample comprised of 32 farmers was asked if the nature of bush fires had changed or remained the same since their youth. The majority of respondents (70 per cent) indicated that fires had changed significantly, notably that they are earlier, smaller, and less intense than in the past. Although they attributed these changes to a number of factors (more

area under cropland, shorter rainy seasons, an abundance of trees), the principal reason given was Fulbe livestock raising. Before the Fulbe arrived, fires were set by hunters in the middle of the dry season (January and February) at the very earliest. As a result, savanna grasses were both dry and abundant and burned with such an intensity that only fire resistant tree species survived. After Fulbe herders entered the region, fire regimes changed most importantly in terms of their timing. Fires are now set by herders much earlier in the dry season (October) when pasture quality is poor due to the lignification of grasses. By burning pastures early in the dry season, herders take advantage of residual soil moisture which allows for the sprouting of fresh and highly nutritious grasses. A major consequence of these earlier and less intense burns is that fire sensitive plants are able to survive and ultimately thrive under these new conditions.

To summarise, the majority of respondents believe that significant environmental change is taking place in the Katiali region, most notably that the savanna is becoming more wooded. They link the expansion of trees and shrubs to the arrival of Fulbe pastoralists and specifically to the impact of their herds on savanna vegetation. Individuals attribute these changes to grazing pressure, changing fire regimes, and cattle dung which provides a favourable micro-environment for tree growth (e.g. enhanced soil fertility, seed dispersal). Peasant farmers view more trees in the landscape in a positive light since they are seen as producing richer soils. Soil enrichment results from elevated levels of organic matter and the flush of nutrients like potassium when the trees are burned prior to cultivation.

The perception of peasant farmers is strongly supported by Fulbe herders of the Katiali region who have also witnessed a process of bush and tree encroachment over the past 15 years. Group interviews with Fulbe herd owners produced a picture of declining pasture due to both the expansion of cropland as well as trees.[25] The pastoralist's perception is that cattle are a major agent behind this reforestation since they disperse the seeds of trees in their manure. They point to the density of trees and bushes in former corrals as indicative of this process. Sita Sangaré noted that he could see the village of Katiali from his encampment 15 years ago but is unable to do so today because trees block his view. He and other herders remarked that some of the most palatable grass species like *Andropogon guyanus, Rottboellia exalta* and *Pennisetum pedicellatum* are declining. The Fulbe consensus is that despite these vegetation changes, grazing conditions are still good in the Katiali region. Herd mobility ensures that cattle still graze highly palatable plant species, even though this involves a seasonal transhumance trek of some 100–200 km to the south during

the dry season. The Fulbe believe that the most serious obstacles to livestock raising are the expansion of cropland and the growing number of cattle in the region.

The livestock population in the region has grown dramatically since the 1970s, due both to increases in the number of peasant-owned cattle, and the immigration of Fulbe pastoralists and their herds. Fulbe-owned cattle more than doubled from 3,310 in 1982 to 7,033 cattle in 1992. Peasant-owned cattle rose from 578 to 1,417 over the same period. Oxen increased dramatically from four to 419 over the period 1975–93.

The expansion of cropland is closely linked to the widespread adoption of ox-plows, which have allowed farmers to augment the area under cultivation from an average of 4.8 ha to 8.2 ha per household. This increase in cultivated area has transformed the regional landscape. A study conducted just north of Katiali by the German Technical Cooperation Agency (GTZ) shows that the area under cultivation grew from less than 1 per cent of the total area in 1955 to 33 per cent in 1991. A similar land cover study conducted for 65 km^2 of the Katiali area showed a 13 per cent increase in the area in cropland, from 23 per cent in 1956 to 36 per cent in 1989 (GTZ, 1994).

The short-term impact of farming on the savanna woodland is a dramatic reduction in tree cover. Land clearing also triggers a process of bush encroachment by disrupting the fire-regulated balance between grassy and woody species. The intensity and frequency of subsequent burning and herbivory will largely determine the emergent mix of woody to herbaceous species. Studies of vegetation change in other savanna regions of Côte d'Ivoire show that areas that were formerly cultivated become more densely forested than non-cultivated areas after long (20–40 years) fallow periods (Mitja and Puig, 1993).

Scientific Support for Indigenous Perspectives

In contrast to conventional images of peasants and pastoralists as destroyers of forest and woodland environments, there is a significant body of research showing that woody vegetation is expanding rather than contracting in savanna areas. In the case of Côte d'Ivoire, researchers have shown how agricultural practices lead to an expansion of forest islands in the savanna-forest contact zones (Blanc-Pamard and Peltre, 1984; Gautier, 1990; Spichiger and Blanc-Pamard, 1973).[26] In central Cameroon, there is a consensus that sustained grazing pressure eventually results in bush and tree encroachment. In this section we examine the scientific literature to see the extent to which local perceptions of vegetation change are corroborated by field and experiment station studies.

Côte d'Ivoire

The evolution of savanna vegetation in northern Côte d'Ivoire is the subject of a number of recent studies – all of which conclude that grazing pressure is conducive to eventual forest growth (through a stage of bush encroachment) due to the inability of fire to check the advance of invading ligneous species (Bruzon, 1994; César, 1994; Filleron, 1994; Hoffman, 1985). The consensus view is that the Ivorian savanna is a 'fire-climax formation'. When fire is suppressed, the savanna is eventually replaced by a dry deciduous forest. The great paradox is that pastoralists themselves are largely responsible, both for the retreat of pastures and the forest's advance. Fulbe use of fire as a range management tool is a particularly important factor behind the forest's advance.

The practice of setting early-dry season fires to encourage pasture regrowth is widely recognised as a range management tool favoured by pastoralists. Bruzon (1994: 159) quotes a Fulbe pastoralist in Côte d'Ivoire who declared: '... if there is no fire, there is no regrowth ... and if there is no fire, there is no livestock raising'. Farmers, on the other hand, view early-dry season fires as threatening their standing crops (e.g. cotton, millet, sorghum and swamp rice) which are not harvested until the months of December and January. A danger of early fires for pastoralists is that if they are set before perennial grasses have built up sufficient food reserves in their root systems to make it through the dry season, it is likely that they will be replaced by less palatable annual grasses.

Late-dry season fires are commonly set by agriculturalists to clear new land or by hunters so that they can more easily stalk game. Pastoralists, on the other hand, do not consider late-dry season fires to be that valuable since soil moisture is inadequate at that time to allow for pasture regrowth. Pastoralists are not unaware of these advantages and disadvantages of using different types of fire. Some groups, like the agro-pastoral Lobi of northeastern Côte d'Ivoire, have developed a fire management system based on soil humidity, slope and wind conditions to reap the benefits of pasture regrowth while avoiding the hazards of poorly timed fires. Hoffman's (1985) discussion of the Lobi's spatial and temporal sequencing of bush fires indicates a highly sophisticated use of fire as a natural resource management tool.

The impact of fire on the evolution of savanna vegetation has been the subject of a number of field studies in Côte d'Ivoire. A long-term experiment undertaken in Kokondékro just south of Bouaké shows that one of the most

important variables in fire-vegetation dynamics is the timing of fires. When fire is totally suppressed, the Guinea savanna evolves towards a dense forest. A regime of low-intensity, early-dry season fires (October–November) leads to either a tree savanna (*savane arborée*) or a savanna woodland (*savane boisée*).[27] Hotter, late-dry season fires (March) are the most destructive and only allow fire tolerant species to survive. The open bush savanna (*savane arbustive claire*) is most characteristic of this fire regime.

Grazing pressure will alter these evolutionary tendencies by reducing the amount of flammable biomass. As a result, fires will be less aggressive and fire sensitive trees will be able to survive. Livestock raising can thus rightly be considered to be an anti-fire factor conducive to bush encroachment (Scholes and Walker, 1993). In addition to changing the intensity of fires, overgrazing can disrupt the process of soil regeneration on fallow land. César (1994) and LeRoy (1993) show that the evolution of vegetation in long fallows is disrupted by cattle grazing in northern Côte d'Ivoire. The natural evolution of fallow land in the sub-Sudanian savanna is characterised by the replacement of annual grasses by the highly palatable *Andropogon guyanus* within three to five years after a field is abandoned. After 15–20 years, *Andropogon* is in turn gradually replaced by perennial grasses and fire tolerant tree species. By the thirtieth year, the once fallow field is likely to have evolved into a wooded savanna or open dry forest growing on soil which is sufficiently fertile for cultivation.

The overgrazing of *Andropogon* blocks this natural sequence. LeRoy (1993) noted that fields that had been in fallow for more than 15 years still exhibited early fallow vegetation such as annual grasses as a result of overgrazing. Bush encroachment and a reduction in grass cover, the telltale signs of overgrazing, characterised these old fallow lands.[28]

In northern Côte d'Ivoire, Fulbe livestock raising is a relatively recent activity. Consequently, there are very few studies on livestock-induced vegetation changes for this region. However, Fulbe livestock raising is much older in Cameroon and the Central African Republic. Fortunately, too, there exist studies for these areas which show the long-term impact of grazing on savanna vegetation.

The Adamawa Plateau

One of the first scientists to demonstrate the woody invasion of grazed savanna pastures was Bille (1964). During the 1960s he participated in a mapping project of pastures in a grazing region of northwest Central African Republic where Fulbe (Bororo) pastoralists had settled since the 1920s. The high rainfall,

1500 mm of rainfall falling over a seven to eight month period, produces an enormous amount of vegetation whose quality declines precipitously with the onset of the dry season. Consequently, pastoralists burn the dried grass so their animals can graze the highly palatable regrowth. As a result of both grazing and fire, significant changes have taken place in terms of the composition and density of savanna grasses. Bille (1964) showed in particular how less palatable grasses replaced those that were formerly grazed. What is especially notable about the savanna of this part of the Adamawa plateau is the dynamic process of the invasion of woody species.

As soon as the herbaceous cover becomes less continuous, bushes begin to grow. Bille (1964) found *Harungana madagascariensis* to be one of the most invasive seedlings. It spreads rapidly once fires become less intense due to the reduction in herbaceous plant cover. This shrub, which is normally found at the edge of gallery forests, tends to invade rangelands. Its umbrellalike morphology effectively shades out surrounding plants. From the perspective of livestock raisers, this loss of herbaceous plants through the spread of *Harungana* represents range degradation. However, Bille (1964) believed this process to be a transitional phase, one that is characteristic of a 10–20 year period. By providing more shade and humid soil conditions, *Harungana* creates conditions that are favourable for the growth of forest trees. These trees eventually grow taller, outcompete *Harungana* by depriving it of light, and herald a second stage in the reforestation of savannas.

Another pioneer tree species (*Arthrosamanea eriorachis*) that grows in thinner soils would pose an even greater threat to rangelands because it produces more stable forests than *Harungana*. Such forests could last as long as a half a century (Bille, 1964).

According to Bille, trees represent the most serious threat to livestock raising in the region. Since his objective was to improve pasture lands, he proposed a series of measures to suppress tree growth such as mechanical removal, burning, and chemical methods. But no one solution struck him as being both effective and economical.

Although Bille implicitly attributed bush encroachment to the high stocking rates of pastoralists, this view is not completely shared by Peyre de Fabregues (1975) who is of the opinion that fire plays a much more important role. According to this author, whether or not there are high stocking rates, early and less intense fires permit bush and tree seedlings to overtake grasslands.

Given these divergent scientific views, we are fortunate to have at our disposal the results of studies conducted over a 15-year period (1958–73) at the Wakwa (Cameroon) livestock experiment station. This station, which is

also located on the Adamawa plateau, is situated on soils of granitic and volcanic origin. Such experiments carried out over such a long period are relatively rare. The results were first presented by Rippstein and Boudet (1977) and later by Rippstein (1985) in his doctoral dissertation.

Early fires which are lit at the beginning of the dry season (December) are unable to contain the spread of woody species which can cover from 60–80 per cent of the rangelands. Mid-dry season fires (January–February) limit this spread to 30–50 per cent. Fires set towards the end of the dry season are the only ones capable of significantly reducing the proportion and density of trees. In contrast, the combination of high stocking rates and the absence of fire offers the most favourable growing conditions for woody plants, which end up dominating pasture lands and forming savanna woodlands and forests. Independent of the timing of fire, the dynamic of tree growth is more pronounced on granitic soils than on volcanic soils.

These findings are important. They show that, depending on their timing, bush fires can either favour or deter the invasion of savannas by trees. But these are long-term trends. At any given moment, the livestock raiser does not consider these long-term trends but rather seeks to fulfil the more immediate objective of stimulating pasture regrowth. This highly prized pasture is produced under specific soil moisture conditions in the early dry season. It is precisely such early fires, however, that are conducive to the invasion of woody species. In summary, management practices favour short term objectives at the expense of long-term interests.

To the west of the Adamawa, near the Nigerian border, the geographer Hurault (1975) similarly observed a process of forest advance in savanna rangelands but one which he attributed to a different cause. He showed in particular that bush encroachment is more pronounced at specific locations within a given drainage basin. To the west of the Adamawa, the plateau surface consists of convex shaped interfluves separated by narrow valleys where ancient gallery forests have commonly been cleared. Contrary to what one might expect, the expansion of woody species does not begin in valleys and move progressively upslope. Rather it begins at the summit of interfluves and moves downslope. Hurault (1975) attributes this inversion of the 'natural' model to the concentration of animals at the upper parts of the interfluve. It is there where herbaceous plants disappear first, that the exposed soil allows bushes to take root and ultimately proliferate.

Hurault (1975) estimates that the reforestation of upper interfluves is due to a livestock raising system that he characterises as highly 'anarchic'. For him, this so-called anarchy stems from the absence of collectively organised

grazing regulations. Grazing areas are utilised in such a way that not all of the available pasture is exploited, especially along slopes. It is true that cattle do not like to graze hillsides and prefer more level areas. However, this grazing behaviour can be explained by a number of factors and not just simply the 'anarchy' of livestock raisers. For example, by forcing animals to graze hillsides livestock raisers would accentuate the risk of erosion. Nonetheless, we agree with Hurault that the reforestation of the interfluves is directly linked to livestock raising.

Tree and bush encroachment has become so common in the Adamawa region that botanists have recognised these vegetation formations as a distinct plant community that they have labelled 'pastoral thickets'. A vegetation map of Cameroon shows the distribution of this vegetation formation (Letouzey, 1985).

Over the last few decades, both cartographers and experiment station researchers confirm the perceptions of local informants on environmental change. The pioneer species and the rate of reforestation may differ from one country to the next but the process is identical: intense and sustained grazing of the savanna ultimately favours tree growth. However, this vegetation dynamic appears to be more typical of the more humid southern Sudanian savannas. These savannas are more likely to undergo bush and tree encroachment under heavy grazing than the more northern savannas.[29]

In summary, bovine livestock raising provokes a transformation of pastures by shrub invasion, tree encroachment and then reforestation. The pioneer shrubs and the speed with which the vegetation evolves certainly differs from one region to the next. This change in vegetative cover is largely negative for livestock raising because it reduces the amount of grasses which constitutes the principal source of cattle forage. A potentially more serious consequence of bush and tree encroachment is the spread of tsetse flies, the principal vector of bovine trypanosomiasis. This widely distributed African cattle disease, for which there is still no vaccine, can result in serious losses of zebu cattle. Tsetse flies thrive in wooded and shaded habitats where temperatures are moderate. Even the so-called 'savanna' flies cannot survive in grass savannas but need some wooded cover. During the dry season, flies commonly seek refuge in gallery forests where ecological conditions are favourable for their survival.

Since the 1960s, the Adamawa plateau of Cameroon and the Central African Republic has been subject to an invasion of tsetse flies which has had catastrophic consequences for livestock raising. The causes of this large scale ecological phenomenon are still poorly understood, but one hypothesis proposes a relationship between shrub invasion and the advance of tsetse flies on plateau pastures (Boutrais, 1974). Although a seductive explanation,

this link between the two phenomena is perhaps not so simple. For example, those areas supporting a dense cover of *Harungana madagascariensis* were neither the first nor the most strongly infested with tsetse flies. It is also clear that while dense Sudanian forests found in the foothills of the plateau are today highly infested with glossines, they were probably free of tsetse in the middle of the century. These dry forests are very old and are not the product of a process of tree and bush encroachment induced by livestock raising. Advances and retreats of glossine areas thus originates in a combination of ecological and climatic factors, and not simply from shrub invasion of grazed savannas.

Conclusion

Livestock raisers are often accused, along with the farmer and wood cutter, of being primary agents of desertification in the Sudano-Sahelian zone. As an increasing number of pastoralists migrate towards the southern savanna region, it is widely assumed that their pastoral activities reduce forest cover through overgrazing and uncontrolled burning. This chapter seeks to present an alternative image of the environmental impact of savanna pastoralists by arguing that their herd and range management practices result, in the long term, in the expansion of tree cover. This contradiction between received ideas and local and scientific views is largely due to the transfer of flawed models of land degradation in semi-arid areas to wetter savannas (see also Fairhead and Leach, this volume). The evidence from northern Côte d'Ivoire and the Adamawa plateau of central Cameroon suggests that grazing pressure and changing fire regimes are largely responsible for the invasion of woody species. The dynamic process of bush and tree encroachment appears to be more advanced on the Adamawa plateau than in Côte d'Ivoire where Fulbe pastoralists are relative newcomers.

The vegetation dynamics presented here are well known to specialists of savanna ecology (Bourlière, 1983; Scholes and Walker, 1993). However, government policy makers do not appear to be familiar with this literature. Take the case of Côte d'Ivoire where a National Environmental Action Plan was being drafted in the summer of 1995 at the behest of the World Bank. In the discussion paper for the north, the authors sketch out what they believe to be the region's major environmental problems. With reference to vegetation, they reach the conclusion that '... the vegetative cover is on the decline as a result of such practices as shifting cultivation, bush fires, anarchic forest use, and overgrazing'. The authors go on to state that because of the nature of this

vegetative decline, '... the diminution of the vegetative cover is accompanied by a replacement of the tree savanna by a grass savanna' (Republique de Côte d'Ivoire, 1994).

This image of a treeless savanna conforms to popular representations of the Sahara ominously spreading southward towards those regions that were formerly more humid and wooded. The grass savanna is closer to this outcome than the savanna woodland or shrub savanna. From the perspective of environmental policy, this official landscape history has important consequences. If authorities believe that farmers and herders are currently deforesting the land, they will try to regulate their activities. In fact, the authors of the same report recommend that bush fires be forbidden, that tree planting campaigns be undertaken, and that land reforms be instituted on the problematic assumption that land titling will incite peasants and pastoralists to conserve their environment and presumably put an end to the purported anarchic land use practices. Such thinking is not foreign to Ivorian rural development policy. Indeed, three programmes currently under way in northern Côte d'Ivoire are motivated by just such a vision of environmental change and conservation (Bassett, 1995).[30]

The role of livestock raising in the expansion of woody plants of most savannas underscores the inappropriateness of forestry policies, notably those that seek total protection of reserves and parks from local land users. The notion that forests are degraded if not totally destroyed by livestock raising is so widespread that access to forest reserves is nearly always forbidden to livestock raisers. Only Nigeria has instituted 'Grazing Reserves' from which farmers are restricted. These are reserved spaces for livestock raisers and, at the same time, areas where tree cutting is interdicted (Waters-Bayer and Taylor-Powell, 1986). However, the creation of these sylvo-pastoral reserves was not the outcome of the application of ecological theory to the effects of livestock raising in savannas. Instead, it was the dramatic reduction of grazing areas in the north of the country which forced authorities to offer some spatial compensation to livestock raisers. In the savannas of Burkina Faso, forest reserves were created in the form of linear bands that effectively divide rangelands. The boundaries of these reserves are drawn in such a way that herders have difficulty moving from one grazing area to another. Herders complain of a severe policing of these forest zones which often results in fines and the seizure of cattle. On the contrary, in Cameroon, the defence of livestock raising interests was sufficiently powerful to force the government to cancel two forestry reserve projects in Adamawa. These projects included the protection of wild animals which compete with cattle for grazing resources.

Livestock raisers were not opposed to the protection of forest vegetation but to the anticipated restrictions on cattle access to protected areas.

Defence of the forest against livestock raising on one side, defence of savanna pastures against the establishment of reserves on the other: the two forms of land use would seem mutually exclusive. However, livestock raisers and farmers, along with scientists, are in agreement that livestock raising and the expansion of trees are intimately related in most savannas highlighting the interrelated nature of environmental change and rural livelihood strategies (see also Thomas, and Amanor, this volume). One of the objectives of this chapter is to urge policy makers to gain a clearer understanding of the processes of savanna landscape change so that their recommendations and actions are grounded in actual versus imagined environmental changes.

Notes

1 In the southern Sudanian/northern Guinea savanna transition zone of northern Côte d'Ivoire, common browse species include *Pterocarpus erinaceus*, *Ficus gnaphalocarpa*, *Ficus capensis*, and the young leaves of *Pericopsis laxiflora* and *Isoberlina doka*.
2 Alh. Djalo, Nouma (Central African Rebublic), 24 August 1984.
3 Ardo Issa, Horé Pendé (Central African Rebublic), 23 August 1984.
4 Ardo Hamadou, Djobé (Central African Rebublic) 24 November 1984. He was referring to the Konkaya sector north of Bocaranga.
5 Alh. Djalo, Nouma (Central African Rebublic), 24 August 1984. Dj. Mohamadou Goni, Gbatoua (Cameroon), 14 May 1977.
6 Ardo Issa, Horé Pendé (Central African Rebublic), 23 August 1984.
7 Ardo Hamadou, Djobé (Central African Rebublic) 24 November 1984. He spoke in reference to the Konkaya sector north of Bocaranga.
8 Ardo Adamou, Ouro Tassi (Central African Rebublic), 24 November 1984.
9 Ardo Bouré, Bimbé (Central African Rebublic), 27 July 1984. This was in reference to Talam, his place of birth.
10 Ardo Issa, Yonkoné (Central African Rebublic), 27 July 1984. He was referring to the pastures of Nana- Modey.
11 Ardo Haman Damissa, Ndouyaka (Cameroon), 24 October 1976.
12 Ardo Babia, Garga Pella (Cameroon), 10 November 1976.
13 Addou Caenou, Gbatoua Godolé (Cameroon), 8 June 1978.
14 Ardo Adamou, Ouro Tassi (Central African Rebublic), 26 August 1984.
15 Dj. Adamou, Dauzat (Central African Rebublic), 23 August 1984.
16 Ibid.
17 Ardo Séfou, Bakéra (Central African Rebublic), 23 October 1984. He was referring to Ouro Tassi near Bocaranga.
18 Alh. Niaroum, Bakota (Central African Rebublic), 21 October 1984. He spoke in reference to Konkaya.
19 Addou Gaenou, Gbatoua Godolé (Cameroon), 8 June 1978.

20 Ardo Goubdo, Lissé, (Central African Rebublic), 12 September 1984.
21 Ardo Malloum, Ouham (Central African Rebublic), 21 August 1984.
22 Ibid.
23 The most common grasses used for roof construction are *Andropogon guyanus*, *Andropogon schirensis* and *Schizachyrium sanguineum*.
24 In fact; the price has remained stable but the size of the bundle sold has decreased in size. Interview with Sozana Silué, Donisongui Silué and Zanapé Silué, 18 January 1997.
25 Only those Fulbe who had lived in the Katiali region since the early 1980s were interviewed. Principal informants were Drissa Sangaré (9 July 1995); Sita Sangaré (13 August 1995); and Hassan Sangaré (14 August 1995).
26 Research conducted in Guinea by Fairhead and Leach (1994; 1996) and in the Congo by Guillot (1980) shows a similar process of human induced reforestation at the savanna-forest contact.
27 The tree savanna is characterised by trees between 8–15 metres in height that enclose between 20–50 per cent of the upper storey. A dense cover of grass encloses 90–95 per cent of the lower storey. The tree cover becomes more dense and irregular in the savanna woodland where trees between 5–18 metres cover 40–70 per cent of the upper storey. The open bush savanna is characterised by sparsely separated and low shrubs (1–2 metres) where grasses dominate (Riou, 1995).
28 Bush savanna can also result from a combination of overcultivation and overgrazing. Riou (1995) cites one example in central Burkina Faso where animals overgrazed a young fallow field that was then put into cultivation. Rather than returning to its earlier state as a dry open forest, the savanna degraded into bush savanna.
29 An extraordinarily invasive species of savanna areas of non-pastoral origins is *Chromolaena odorata*. To herders of the southern savanna, *Chromolaena* has become the greatest menace to rangelands (Gautier, 1994). It is a plant that reproduces itself quickly, forming impenetrable thickets. Although the invasion of *Chromolaena* is recent and poorly understood, it is probable that it will favor the growth of trees and forest formations in the long term.The invasion of pastures by *Chromolaen* thus risks accelerating the reforestation of the savanna. But this phenomenon is not specifically pastoral in nature. It began in the forest zone in the coffee and cocoa plantations of Côte d'Ivoire, Ghana, Cameroon, and the Central African Republic where this introduced plant began to proliferate. When *Chromolaena* reaches savannas that are regularly grazed, it covers all areas exposed by cattle: around encampments, along cattle trails, and where cattle habitually rest. For herders, *Chromolaena* is a calamity much greater than *Harungana*. But it is an ecological 'accident', not a 'normal' and endogenous evolution of pastures subjected to grazing.
30 The three projects are: The National Environmental Action Plan for Côte d'Ivoire (Le Plan National d'Action pour l'Environnement en Côte d'Ivoire), The Rural Landholdings Project (Le Plan Foncier Rural) and The National Rural Land Use Management Program (Le Programme National de Gestion de l'Espace Rural).

References

Aubréville, A. (1949), *Climats, Forêts, et Desertification de l'Afrique Tropicle*, Société d'Editions Géographiques et Coloniales, Paris.

Aubréville, A. (1950), *Flore Forestière Soudano-Guinéenne; AOF-Cameroun-AEF*, Soc. d'édit. géogr., marit. et col., Paris.

Bassett, T. (1995), 'L'Introduction de la Propriété de La Terre: la Cartographie et la Banque Mondiale en Côte d'Ivoire', in C. Blanc-Pamard and L. Cambrézy (eds), *Terre, Terroir, Territoire. Les Tensions Foncières*, Editions de l'ORSTOM, Paris, pp. 395–420.

Bille, J.C. (1964), *Pâturages du Secteur Occidental d'Elevage de la R.C.A.*, IEMVT, Maisons-Alfort, Carte en Coul, Paris.

Blanc-Pamard, C. and Peltre, P. (1984), 'Dynamique des Paysages Préforestières et Pratiques Culturales en Afrique de l'Ouest (Côte d'Ivoire centrale)', in C. Blanc-Pamard et al. (eds), *Le Developpment Rural en Question: Paysages, Espaces Ruraux, Systèmes Agraries*, (ed.) ORSTOM, Collections Memoires No. 106, Paris.

Bourlière, F. (ed.) (1983), *Tropical Savannas*, Ecosystems of the World, No. 13, Elsevier, Amsterdam.

Boutrais, J. (1974), 'Les Conditions Naturelles de L'Elevage sur le Plateau de l'Adamaoua (Cameroun)', *Cah. ORSTOM, Sér. Sc. hum.*, vol. XI, pp. 145–98.

Bruzon, V. (1994), 'Les Pratiques du Feu en Afrique Subhumide. Example des Milieux Savanicoles de la Centrafrique et de la Côte d'Ivoire', in C. Blanc-Pamard and J. Boutrais (eds), *A la Croisée des Parcours*, (ed.) ORSTOM, Paris, pp. 147–62.

César, J. (1994), 'Gestion et Aménagement de l'Espace Pastoral', in C. Blanc-Pamard and J. Boutrais (eds), *A la Croisée des Parcours*, (ed.) ORSTOM, Paris, pp. 111–45.

Fairhead, J. and Leach, M. (1994), 'Contested Forests: Modern Conservation and Historical Land Use in Guinea's Ziama Reserve', *African Affairs, vol.* 93, pp. 481–512.

Fairhead, J. and M. Leach (1996), 'Enriching the Landscape: Social History and the Management of Transition Ecology in the Forest-Savana Mosaic of the Republic of Guinea', *Africa*, vol. 66, pp. 14–36.

Filleron, J. (1994), 'Phoenix, Mythe ou Réalité? Du Bon Usage du Discours Ecologique dans les Politiques d'Intervention en Milieu Rural', *Cahiers de Géographie Tropicale*, No. 1, pp. 39–53.

Gautier, L. (1990), 'Contact Forêt-Savane en Côte d'Ivoire Centrale: Evolution du Recouvrement Ligneux des Savanes de la Réserve de Lamto (Sud du V-Baoulé)', *Candollea*, No. 45, pp. 628–9.

Gautier, L. (1994), 'L'Emprise des Brousses à *Chromolaena odorata* sur le fond V-Baoulé', *Journal d'Agriculture Tropicale et de Botanique Appliquee*, vol. 36, pp. 36–48.

Gesellschaft fur Technische Zusammenarbeit (GTZ) (1994), *Implications Ecologiques de la Lutte Anti-Tsetse en Côte d'Ivoire Nord et Centre*, No. de projet 87.2539.2, Rapport Final, GTZ, Sarrebruck.

Guillot, B. (1980), 'La création et la Destruction des Bosquets Koukoua, Symboles d'une Civilisation et de son Déclin', *Cah. ORSTOM, Sér. Sci. Hum.*, Vol. XVII, pp. 177–89.

Hoffman, O. (1985), *Pratiques Pastorales et Dynamique du Couvert Végétale en Pays Lobi (Nord Est de la Côte d'Ivoire)*, (ed.) ORSTOM, Collection Travaux et Documents, No. 189, Paris.

Hurault, J. (1975), *Surpâturage et Transformation du Milieu Physique: Formations Végétales, Hydrologie de Surface, Géomorphologie, l'exemple des Hauts Plateaux de l'Adamaoua (Cameroun)*, Institut Geographique National, Paris.

Jacques-Felix, H. (1950), 'Géographie des Dénudations et Dégradations du Sol au Cameroun; Conditions Physiques et Humaines', *Bulletin Scientitifique*, No. 3, Nogent-sur-Marne.

Le Roy, X. (1993), 'Pratique de la Jachère dans les Terroirs Sénoufo du Nord de la Côte d'Ivoire', in C. Floret and G. Serpanté (eds), *La Jachère en Afrique de l'Ouest*, ORSTOM, Collections Colloques et Séminires, Paris, pp. 157–69.

Letouzey, R. (1985), *Notice de la Carte Phytogéographique du Cameroun au 1/500 000*, 5 fascimile, Toulouse.

Mitja, D. and Puig, H. (1993), 'Essartage, Culture Itinerante, et Reconstitution de la Végétation dans les Jachères en Savane Humide de Côte d'Ivoire', in C. Floret and G. Serpanté (eds), *La Jachère en Afrique de l'Ouest*, ORSTOM, Collections Colloques et Séminaires, Paris, pp. 377H. 92.

Pelissier, O. (1966), *Les Paysans du Sénégal: les Civilisations Agraries du Cayor à la Casamance*, Fabrègue, Saint-Yrieix.

Peyre de Fabregues, B. (1975), *Dégradation des Pâturages Naturels dans l'Ouest Centrafricain*, IEMVT, Maisons-Alfort, Paris.

Peyre de Fabregues, B. (1990), 'Sécheresse et Disparition des Arbres Fourragers au Sahel', *Sécheresse*, vol. 2, pp. 105H. 8.

Republique de Côte d'Ivoire, Min. de l'Environnement et du Tourisme, Plan National d'Action Pour l'Envrionnement (PNAE-CI), Cellule de Coordination (1994), *Tome I, Livre Blanc de l'Environnement de Côte d'Ivoire*, Abidjan.

Rioù, G. (1995), *Savanes, l'Herbe, l'Arbre et l'Homme en Terres Tropicales*, Masson, Armand Colin, Paris.

Rippstein G. (1985), 'Etude sur la Végétation de l'Adamaoua; Evolution, Conservation, Régénération et Amélioration d'un Ecosystème Pâturé au Cameroun', *Et. et synth.*, IEMVT, No. 14.

Rippstein G. and Boudet, G. (1977), 'Expérimentations sur Parcours de Savanes Tropicales Humides', in *Recherches sur l'Elevage Bovin en Zone Tropicale Humide*, Colloque de Bouaké, t. 1, 'Les écosystèmes', pp. 227H. 43.

Scholes, R.J. and Walker, B.H. (1993), *An African Savanna: Synthesis of the Nylsvley Study*, Cambridge University Press, Cambridge.

Spichiger R. and Blanc-Pamard, C. (1973), 'Recherches sur le Contact Forêt-Savane en Côte d'Ivoire: Etude du Recrû Forestier sur des Parcelles Cultivées en Lisière d'un Ilot Forestier dans le Sud du Pays Baoulé', *Candollea*, No. 28, pp. 21H. 37.

Waters-Bayer, A. and Taylor-Powell, E. (1986), 'Settlement and Land Use by Fulani Pastoralists in Case Study Areas', in ILCA, *Livestock Systems Research in Nigera's Sub-Humid Zone*, ILCA, Addis Ababa, pp. 213H. 26.

Contesting Forestry in West Africa

Edited by

REGINALD CLINE-COLE
University of Birmingham, UK

CLARE MADGE
Leicester University, UK

Ashgate

Aldershot • Burlington USA • Singapore • Sydney

Published by
Ashgate Publishing Limited
Gower House
Croft Road
Aldershot
Hampshire GU11 3HR
England

Ashgate Publishing Company
131 Main Street
Burlington, VT 05401-5600 USA

Ashgate website: http://www.ashgate.com

British Library Cataloguing in Publication Data
Contesting forestry in West Africa. - (The making of modern Africa)
1. Forests and forestry - Africa, West
I. Cline-Cole, Reginald II. Madge, Clare
333.7'5'0966

Library of Congress Control Number: 00-135273

ISBN 0 7546 1253 8

Printed and bound in Great Britain, by Antony Rowe Ltd., Chippenham

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University of Birmingham, UK

CLARE MADGE
Leicester University, UK

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