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The Evolution of the Gum Arabic (*Acacia senegal*)  
Collection System in the Jolof, Northern Senegal  
c. 1890-1990

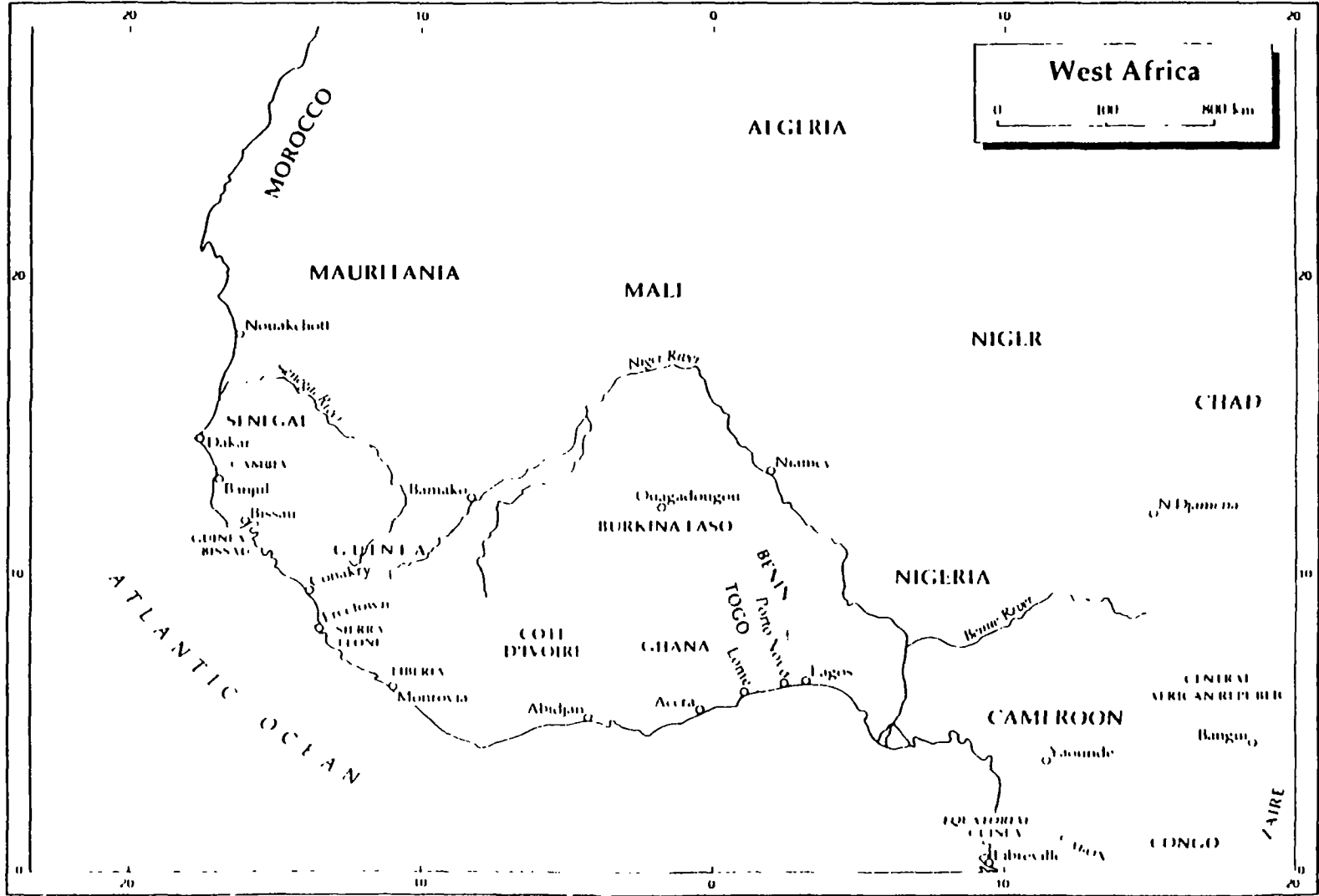
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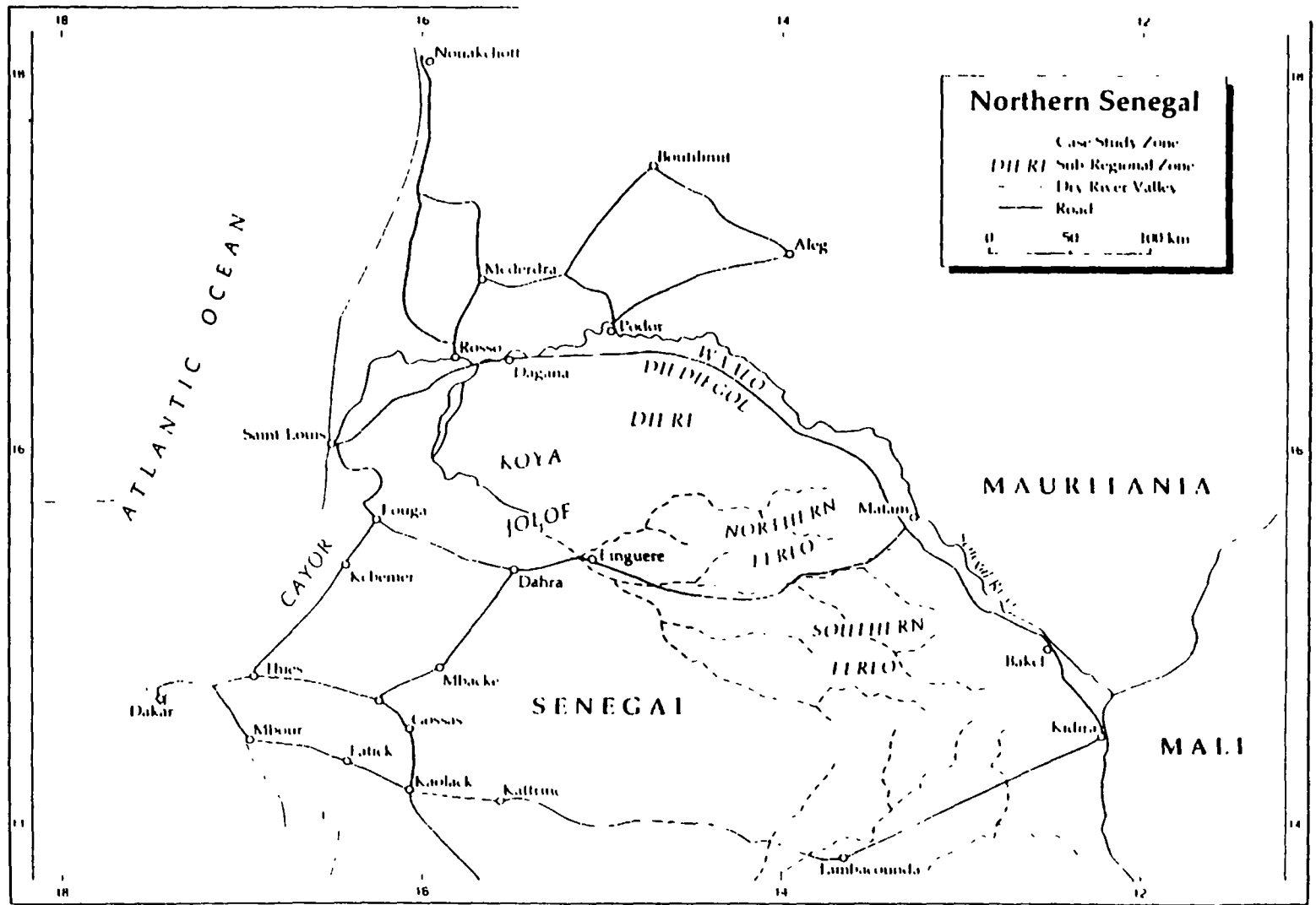
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I. INTRODUCTION

Natural resource management policies in Sahelian West African countries have evolved dramatically over the last few years. Rural development programs are beginning to promote decentralized management of common property resources (CPR) such as forests, grazing lands, and water points.<sup>1</sup> Both state development agencies and non-governmental development organizations (NGOs) are searching for ways to reconstruct some of the features of traditional Sahelian common property regimes. Many advocates of this approach suggest that resource management control, especially over forests, should be devolved from the state to rural civil society.<sup>2</sup> Proponents assume that if statutory control over natural resources is transferred from the central state administrative bodies to appropriate local-level institutions, resource management can be made more efficient, more sustainable, and more responsive to local needs. Despite the current appeal of this new approach, few successful examples exist in the Sahel of project-promoted reconstruction of common property management regimes. Few development practitioners have considered in detail the opportunities and constraints involved in promoting the emergence of new resource management

arrangements suitable to the great diversity of Sahelian geographical and cultural contexts.<sup>3</sup>

This paper describes from a historical perspective the evolution of a common property regime constructed around a single Sahelian West African tree species, the *Acacia senegal* or gum arabic tree. The constantly changing structural features of the *Acacia senegal* common property regime is summarized from its inception in the mid-seventeenth century in southern Mauritania to the present in the Department of Linguere in northern Senegal (See Map of Northern Senegal).<sup>4</sup> Throughout the discussion, attention is focused on the numerous constraints one resource user-group confronts in trying to protect, conserve, and regenerate the *Acacia senegal*, a forest resource which has been central to its livelihood strategy. The *Acacia senegal* produces gum arabic and a host of other by-products that are still collected in many parts of northern Senegal by black "Maures," descendants of captives who gathered gum as long as four hundred years ago for Arab-Berber merchants in southern Mauritania. This minority population continues to extract gum arabic in the Department of Linguere using sophisticated and ecologically sound collection practices. The Maures possess the technical knowledge to manage the *Acacia senegal* on a sustained-yield basis. Yet, as a minority group filling a particular livelihood niche within the broader social and economic milieu of the sedentary Wolof and pastoralist Fulbe populations, they lack secure tenure rights to the gum arabic tree. In the context of steadily declining

international prices for gum arabic, the costs of measures taken by the gum collectors to conserve and ameliorate the resource upon which their livelihood depends become higher relative to the benefits produced. These costs of gum collection could be brought down substantially if the Maures were to acquire greater control over the territory upon which the *Acacia senegal* is found and, in effect, reconstruct the common property regime which served the community so well in the past.

Today the once successful gum arabic collection system is threatened by changing ecological, economic, and social conditions. This case study identifies several of the central factors which threaten its future in the Department of Linguere, and suggests measures policy makers might take to facilitate the Maures' own strategies to protect, and indeed, revive, the gum arabic collection system.

## II. GUM ARABIC AND THE *Acacia senegal* TREE

The *Acacia senegal* is a small, scrubby tree found in a semi-arid belt from Senegal through northern Nigeria and eastward into the Sudan and south into parts of eastern and southern Africa.<sup>5</sup> The leguminous nitrogen-fixing tree is a pioneer species that thrives on sandy soils receiving between 150-850 mm of rainfall. Farmers in the Sudan, Chad, and eastern Niger have incorporated the species into bush-fallow rotations because of its role in restoring soil fertility.<sup>6</sup> For this reason, the hardy tree has been employed extensively in reforestation projects throughout the Sahel. During the hottest months of the dry season a sap-

like gum exudes naturally from fissures and wounds in the tree and hardens over the course of a few weeks into shiny amber colored globules. The physiological causes of exudation are not fully understood, though it appears that it is a response to various stress factors such as high temperatures, insect wounds, and cuts made into the bark.<sup>7</sup> Higher and more regular yields can be induced by tapping the tree at precise periods in the dry season.

#### **The International Market for Gum Arabic**

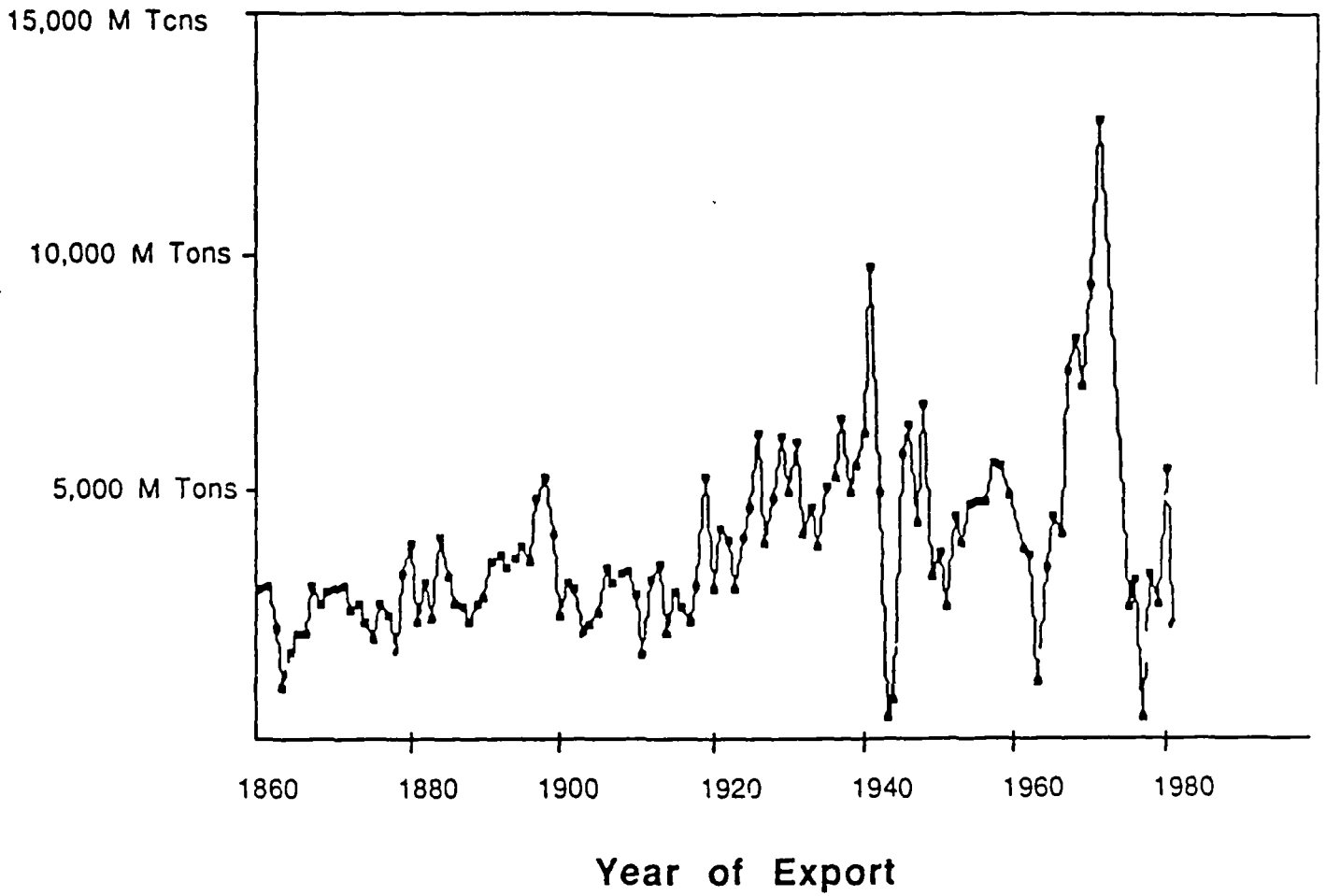
Rural populations have long used the *Acacia senegal* and its by-products for a wide variety of purposes ranging from fodder to food.<sup>8</sup> Small amounts of gum arabic are used locally to starch clothing and consumed as a famine food, but since the seventeenth century the largest share has been exported to northern Europe. Water soluble gums were used as long as four thousand years ago by the Egyptians. Eventually gums from several species of acacia found their way to Europe via Arabian ports. Gum arabic became an indispensable product in the European textile industry as a fixant in dyes from the mid-eighteenth to the mid-nineteenth centuries. Gum also entered into the production of paints, drugs, and certain foods.<sup>9</sup> Competition between the nascent industrial countries for access to the West African markets was so intense in the late eighteenth century that "Gum Wars" were fought off the coast of Mauritania between the navies of England, Holland and France.<sup>10</sup>

In the early seventeenth century European royal chartered



companies started to barter for gum arabic coming out of the Trarza and Brakna emirates of present-day southern Mauritania.<sup>11</sup> From the late seventeenth century until the 1870s, gum arabic was one of the most important exports of French trading interests stationed at isolated posts along the semi-arid coast of Mauritania and along the banks of the Senegal river. Exports increased from five to six hundred tons per year in the early 1600s to around two thousand tons per year by the 1830s. Gum arabic captured an even more significant share of the export economy after the Atlantic slave trade was halted in the early nineteenth century. Despite the emergence of the groundnut trade in Senegambia in the late 1800s, exports of gum arabic from the West African Sahelian countries of Mauritania, Senegal, and Mali rose steadily throughout the colonial and early independence period to peak at an all-time high of approximately 14,000 metric tons in 1971 (See Figure 1). Exports from Senegal fell dramatically after the drought of 1968-1974 and now fluctuate between 500-1000 metric tons per year, though official statistics are of questionable value ( See Figure 2). Seventy to eighty percent of the 50-60,000 metric tons of gum placed annually on the international market comes from the Sudan. For this reason, the marketing policies adopted by the Sudan and its principal North American and European trading partners strongly affect the dynamics of the Senegalese market and local production relations.

Figure 1  
Combined Exports from Senegal, Mauritania and Mali  
1860-1980



### III. THE EVOLUTION OF THE GUM ARABIC COLLECTION SYSTEM IN NORTHERN SENEGAL

In order to understand present day gum collecting systems, it is useful to trace their origins to pre-colonial Mauritania for many of the same gum collection techniques can still be observed today in the Department of Linguere. From the early 15th to the late 19th centuries, Muslim merchants (zawaya) of Arab-Berber descent sent captive laborers into the interior of the Trarza and Brakna emirates in Mauritania to collect gum. The emirates were particularly favorable locations for gum collection due to their proximity European trading routes established along the Senegal river and the Atlantic coast and the existence of relatively shallow water tables between sand dunes from which drinking water could be obtained from wells. Somewhat dense concentrations of *Acacia senegal* were found only about 40-100 km from the Senegal river in the "forests" of "Alfatek," "Lébier," and the "Sahel." These "forests" were by no means like those of temperate climates. The explorer René Caillié recounted in 1824 that the "acacia which furnishes gum grows singly in all the elevated parts of the desert, never on argillaceous or alluvial soil, but on dry sand ground; it is very rare on the banks of the Senegal river..."<sup>12</sup> The zawaya clerics engaged a captive labor to collect gum from the widely scattered trees.

Captive labor was obtained from present day Mali and northern Senegal. Imported European goods were exchanged by the

clerics for slaves who in turn collected the gum which was bartered for the consumer items at the seasonal market points along the Senegal river and the Atlantic coast. Considerable labor was, and still is, required to gather the gum during the most torrid times of the year, the periods just after the rainy season in October and November and the months of April and May just before the arrival of the new seasonal rains. The techniques of gum collection largely resemble today those observed by René Caillié in 1824.

The slaves fill their leather sacks with water every morning, and, furnished with a great forked stick, they traverse the fields in search of gum; as the gum bearing trees are all thorny, this stick is used to knock off from the higher branches the lumps of gum which would otherwise not be reached by hand...The superintending marabout receives a portion of the gum; the slaves work five days for the master, and the sixth for the superintendent, who thus comes in for the greater part of the produce.<sup>13</sup>

The growth of the international market for gum arabic not only stimulated the formation of a labor regime to extract gum arabic, but it also resulted in the creation of a complex, yet fluid property rights regime around the *Acacia senegal*.

#### **The *Acacia senegal* Common Property Regime**

The *Acacia senegal* common property regime consisted of a set of norms and conventions regulating the use of the resource by the various clerical *zawaya* clans. Vestiges of these resource use arrangements remain even today in the Department of Linguere, though they have been modified by historical circumstances. Within the vast territories of the Trarza and Brakna emirates (states dominated by a warrior class, the *hassaniya*), well

articulated use rights were held by individual clans. The clerics (*marabouts*) leading these clans considered that whoever exploited the *Acacia senegal* on a regular basis acquired usufructuary rights to the trees. The colonial researcher Paul Marty noted in the early 1920s that "a sort of legal prescription is established in the interests of the groups that have come for several years to collect gum in the same sector."<sup>14</sup> These rights of use, however, largely determined by the ownership of nearby water points.

The spatial boundaries of the gum collecting zones of individual *zawaya* clans were primarily determined by the location of shallow wells controlled by individual clans. Generally the *zawaya* of southern Mauritania calculated territorial claims by the radial distance livestock could walk to and from a water point in a day. Grazing territories for those owning larger animals such as camels tended to be larger than for those possessing, say, sheep and goats because of different walking speeds and water needs. Inside this radius the *zawaya* chiefs of clans could legitimately exclude other clans from digging wells.<sup>15</sup>

Ownership of wells generally determined preferential use rights to the surrounding gum arabic trees. However, there were innumerable institutional mechanisms enabling clan patriarchs to obtain access to trees in areas where they did not own wells. Through arranged marriages, a *zawaya* chief could inherit use rights to the pastures around a well and hence to the gum trees

growing in this territory. Permission to collect gum arabic might be granted by the chiefs to outsiders as a compensation for meritorious service during wars. Disputes were nevertheless constantly taking place over access rights to water points. At times such the disputes erupted into violent confrontations and these severely disrupted gum collection and thus sales at the European trading posts.

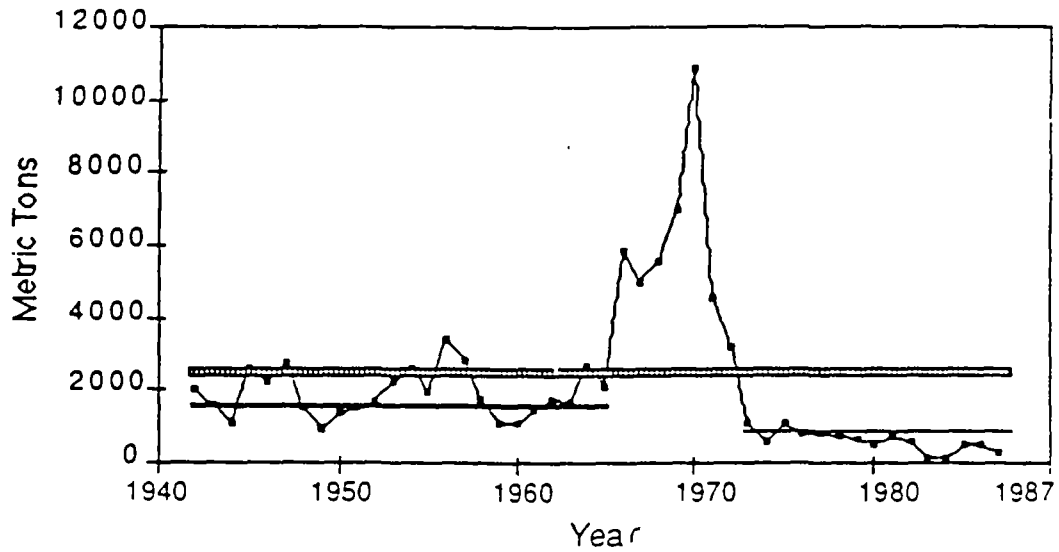
Individual *zawaya* use rights regimes were embedded in a larger collective property rights regime which were strongly affected by the dynamics of the larger regional economy. The spatial frontiers of the gum collecting zones of the *zawaya* constantly expanded and contracted relative to two key variables -- the price of millet which was used to feed the teams of gum collecting slaves and the international price of gum. As merchants noted during the nineteenth century, when the price of millet was low, the *zawaya* expanded gum collection for they could afford to feed the slave teams, but when it was high they quickly abandoned the activity.<sup>16</sup> Paul Marty noted in the early 1920s that the area exploited each year was,

dependent on the European market prices, and when these prices are too low, the Bidan prefer not to bother their slaves for such a small profit. When more favorable prices are available they can be seen working all of the gum forests on the right bank and even crossing the river to take in the neighboring cantons of the Fouta and the Ferlo. Writers in the last century and even at the end of the eighteenth century noted these bold harvesting practices.<sup>17</sup>

When terms of trade favored the gum collecting *zawaya*, unexploited *Acacia senegal* suddenly acquired considerable exchange value which in turn activated the formation of the

Figure 2

Gum Arabic Marketed in Senegal  
1940-1988



Source: République du Sénégal, Direction des Eaux, Forêts, e. Chasses, Rapports Annuels, 1942 - 1987.

individual use rights regimes noted above. When terms of trade were less advantageous, the individual articulation of rights would lapse as the trees returned to their previous status as a use-value element employed primarily as livestock forage.

During its heyday in the eighteenth and nineteenth centuries, the trade in gum arabic dominated the political and economic affairs of the French and English commercial outposts along the Sahelian coast. Much to the consternation of the French merchants in Saint-Louis du Sénégal, the Trarza emirs tightly controlled trade with the Jolof, a Wolof empire which is now largely encompassed by the Department of Linguere (See Map of Jolof). In order to restrict the supply of gum arabic to the market and hence increase its price, the emir set up camps of warriors to pillage any caravanners foolish enough to engage in commerce with the Jolof.

#### **The Gum Arabic Collection System of the Jolof**

The lure of the gum trees of the Jolof became one of the principal justifications for the military conquest of the interior of Senegal from the 1860s to the 1890s. The French were determined to open what is now the Department of Linguere to trade in gum arabic and other agricultural commodities.<sup>18</sup> Soon after the military pacification of the Jolof in 1890, the colonial administration built roads, a single-gauge railroad, and wells in an effort to draw the resident Wolof cultivators and Fulbe pastoralists into gum collection. Few were lured into the





collection of gum until the administration instituted a policy requiring payment of taxes in cash. European merchants also pushed villagers into gum collection by a system of debt peonage in which villagers were required to settle debts incurred at usurious interest rates with gum. By the 1910s, gum arabic had become one of the principal cash crops exchanged for overvalued imported items.

Much like southern Mauritania in the early fifteenth century, the expansion of the European driven market for gum arabic stimulated the emergence of new labor and property rights regimes in the Jolof. While the colonial power and the merchant interests created the market infrastructure, the Wolof political elite organized the collection of gum arabic. The *Acacia senegal* rapidly evolved from being a use-value species, long employed by the Fulbe and Wolof for livestock forage and timber, into an exchange-value species highly esteemed for the readily marketable gum.

During the strife torn decades of colonial conquest, gum collectors from the Trarza and Brakna fled into the Jolof. In this new frontier, this population of what are now known in Senegal as "Maures" replicated the traditional gum collection practices long employed in southern Mauritania. Even though the colonial administration had stripped the traditional Wolof leadership of much of their military authority, the last paramount chief (*bourba*) still controlled the allocation of many

resources. The decisions of the *bourba* Bouna Ndiaye not only held sway among his own ethnic group, but also over the resident Fulbe pastoralist populations and newcomers such as the Maures.<sup>19</sup>

The densest concentrations of *Acacia senegal* located nearest to the market villages of Yang-Yang and Mbeuleukhé were reserved by the *bourba* for the Wolof nobility (See map of Jolof). Teams of black Maures were engaged by the Wolof patrons to harvest and transport the gum arabic. Wolof cultivators collected gum in a second zone found primarily around the villages of the Ferlo river valley. Heads of lineages or clans received rights of gum collection from the *bourba* and then sub-divided the area up among relatives and dependents. In the far northeastern reaches of the Jolof (about 70 km east of Yang-Yang near Labgar) a third region was allocated by the *bourba* to the Maures. The Maures could not have obtained access to the dense concentrations of *Acacia senegal* in the eastern Jolof without the intercession of Muslim *zawaya* clerics who were advisors and religious counsellors to the court of the *bourba*. The low status Maures did not command sufficient authority as former slaves to negotiate on their own terms rights of access. In return for the right to harvest gum arabic, the clerics required the payment of religious tithes amounting to 1/10th or more of the gum harvest from collectors.

Sahelian tenurial systems are often characterized by overlapping and seasonally determined rights to natural resources. The expansion of the market for gum arabic stimulated the creation of a new layer of rights to the *Acacia senegal* in

the northern reaches of the Jolof. The Maures replicated the common property regime of the gum arabic tree practiced extensively in southern Mauritania. At the start of the dry season in early October, the Maure gum collectors left their villages in the western Jolof to camp out in the eastern territories for the duration of the collection season. This seasonal migration did not interfere with the pastoralist activities of the Fulbe who customarily occupied the area during the rainy season and used the *Acacia senegal* for firewood, poles, and occasionally as forage for sheep and goats. The Fulbe and their livestock had already vacated the zone by the time the Maures arrived since their shallow rainy season pools (*mares*) used for watering livestock had dried up and the pastoralists had migrated either north to the Senegal river or south to the Sin and Saloum river basins. Within this seasonally determined "empty" space freed of use by the Fulbe, the Maures found their occupational niche.

The first Maure gum collectors to arrive in this new frontier divided the territory into sections exploited by teams of *sourga* laborers. The original occupants held the position of "patrons," and enjoyed many of the same prerogatives as the chief *zawaya* clan heads of southern Mauritania. Indeed, these patrons were relatively well off for they tended to possess sufficient means to engage labor for the duration of the gum collecting season. The *sourga* labor arrangement is a form of share-cropping prevalent throughout much of the Sahel. Usually the head of the

work unit provides food to dependent relatives, slaves, or migrant laborers in return for work provided during a specified period of time.<sup>20</sup> The gum collecting *sourga* turned over roughly 3/4 of the harvest to the patron or collected from his trees five out of seven days. Much better terms were obtained by those *sourga* who were able to provide their own food. In these cases roughly 1/3 of the harvest and one day per week of labor were provided to the patron. The *sourga* who returned with the same patron year after year gradually obtained permanent use-rights to specified territories. The patrons tended to cede collection rights as gifts, though trees were also loaned out on a seasonal basis. Eventually, the gum collecting regions of most of northern Senegal were allocated by the first patrons to relatives and faithful *sourga*. To this day the descendants of these first gum collectors recognize the territorial boundaries of their forefathers.

The scarce factor of production in the gum arabic collection system was not the *Acacia senegal* itself but rather the supply of labor required for gum collection, transport of water and gum by camel caravans to the distant gum collection zones, and the preparation of food. While women and children rarely collected gum, they were essential to the smooth functioning of the system. Women were responsible for processing millet into a fast-food known as *sahkal* (pounded and steamed millet cous-cous), drying meat, and sewing leather sacks used for the transport of water and gum. Women and children filled these water sacks for the

camel caravans which returned periodically to base camps for provisions. In return for this assistance, the collectors set aside the largest balls of gum for their wives and women relatives. The women in turn bartered this gum for milk from the Fulbe and merchandise from the itinerant traders who traversed the countryside.

#### **Resource Management Practices of the Maures**

Gum collectors tapped the *Acacia senegal* and used fire to induce higher yields and spread out labor expenditures.<sup>21</sup> Both of these techniques were severely sanctioned by the colonial forestry service yet a closer investigation of the practices shows a strong commitment by the Maures to resource conservation. The gum collectors had every reason to make judicious resource use decisions since they depended on continuous exploitation of the same trees each season. Tapping consists of removing strips of bark with a long handled ax and then waiting several weeks for the gum to exude from the wound. The Maures used fire to create two gum collecting seasons -- one during the hottest weeks of the early dry season and another in the sweltering months before the arrival of the new rains. Fires were set in the early dry season when grasses were still somewhat green, especially in lowland depressions. Those trees that were singed by the fires were tapped in the first season, those unburnt found in the lowland depressions during the second. Timely fires spread out the peak labor demands over a longer period.

The Maures employed a number of management practices to

conserve the *Acacia senegal* from the effects of tapping and bush fires -- techniques which are still used today by experienced collectors. Proper tapping consisted of scrapping off only the superficial layers of the bark without reaching the white wood. No branch was ever tapped in the same spot in consecutive years. Fires probably contributed to the regeneration of the pioneer species, something which the colonial scientists were eventually forced to admit. After several seasons of continuous exploitation, the *Acacia senegal* were placed in "reserve" so that they could recover from the physiological stresses associated with tapping and fire. This practice is still in use in some parts of the gum collecting zones of northern and eastern Senegal. Many of these techniques, reflecting centuries of experience, could be usefully employed in contemporary reforestation and natural forest management programs.

Outside of the gum arabic trade, the Jolof generated few other exports of commercial value. Peanut production turned out to be a marginal activity due to the low and erratic rainfall of the region. To the great frustration of the administration, the Fulbe refused to sell their livestock. Estimating the exports of gum arabic is difficult, but it appears to have been about 500-700 metric tons per year. Unfavorable climatic conditions, such as drought, reduced yields in some years; locusts sometimes consumed the harvest; unseasonably late rains dissolved the water soluble gum in others. The lack of water during the long dry season kept the Jolof at the periphery of the colonial economy.

## The Introduction of Boreholes in Northern Senegal

In the late 1930s French hydrologists fortuitously discovered the Maechestrician aquifer, a massive and seemingly inexhaustible source of fresh water underlying a large part of northern Senegal. From the perspective of the administration, the new water technology promised the long-sought solution to the integration of the pastoralist Fulbe into the colonial economy. The lethargic economic backwaters of northern Senegal experienced a sudden and profound perturbation following the installation in the mid-1950s of a network of deep mechanized boreholes. For the Maure gum collectors, the new water technology heralded an end to their seasonal separation from the Fulbe herders and the start of severe competition over the Jolof's natural resources.

Ever since the conquest of the Jolof, the administration had attempted to integrate the pastoralists into the colonial economy as producers of meat for the rapidly growing urban markets of the peanut basin and Dakar. The Fulbe had successfully resisted most of the attempts by the administration to commercialize the sector. The authorities initially foresaw the construction of a series of boreholes as a technological instrument to facilitate the transport of livestock by hoof to urban centers. As one administrator recalled,

we recognized straight away that the deep boreholes were the dream technology which would permit all the animal trails in the sylvo-pastoral zone of the Sahel to be bordered by modern, well-equipped drinking troughs. One can imagine the borehole as destined to satisfy the water needs of these transhumance herds in much the same way that train station cafeterias or drink stands meet the needs of rail travelers.<sup>22</sup>



The boreholes also promised to resolve another burgeoning conflict. Colonial development policies in the higher rainfed areas of the colony had long favored the expansion of the peanut cultivation zones into the sparsely populated areas of eastern Senegal. Pastoralists traditionally grazed this area until disciples of the Islamic Mouride sect moved into the zone to cultivate peanuts.<sup>23</sup> Violent disputes arose between the Fulbe pastoralists and the peanut cultivators centered over competing uses of the same space.<sup>24</sup> Suddenly the administration found itself in the delicate position of arbiter in resource conflicts. By constructing boreholes in what the administration considered the unoccupied "desert" of the northern Jolof, the authorities hoped that the region would be opened up to year-round pastoralist exploitation. At the same time, land use pressures could be significantly reduced further south by restricting the pastoralist's transhumance movements.

Following World War II, the administration installed an extensive network of 200-300 meter deep boreholes and diesel powered pumps at 25-30 kilometers intervals, roughly the distance livestock could walk in one day. Within a couple of years after the construction of the boreholes, the Fulbe had radically altered their migratory and settlement patterns. Small Fulbe camps sprouted up during the dry season within the 15-25 kilometer radius of the boreholes.<sup>25</sup> The seasonal separation and complementary relationship between the pastoralists and the gum collectors rapidly disintegrated as the Fulbe started to

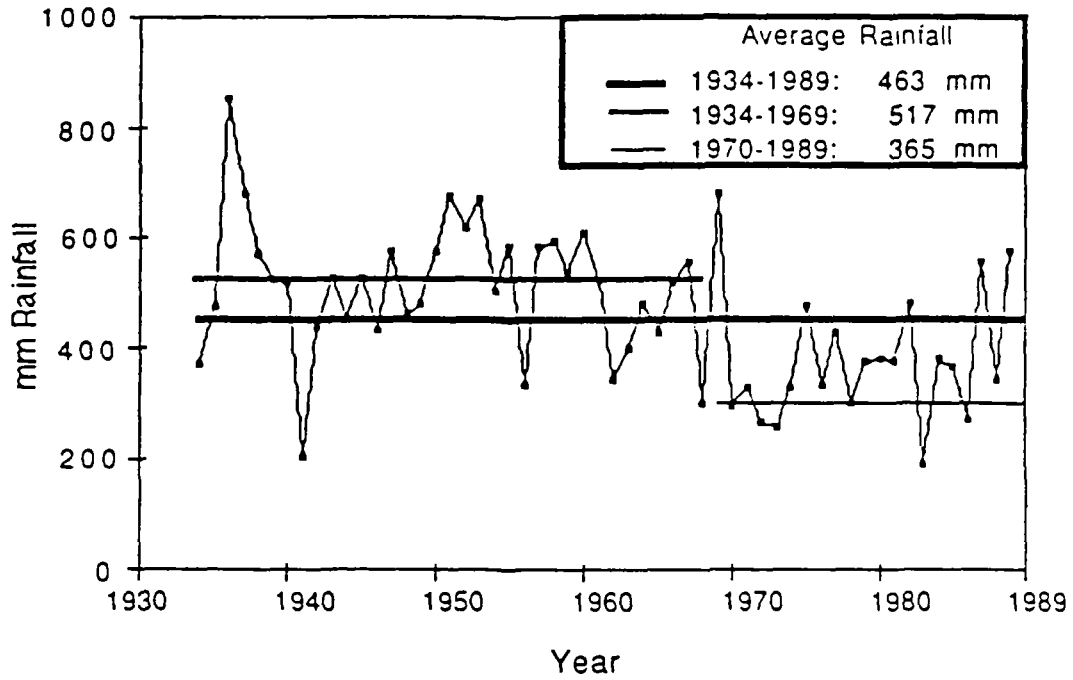
remain year-round within the northern grasslands. The end of the *Acacia senegal* common property regime was in sight. Soon after the construction of the boreholes young Fulbe herders began furtively to pick gum off the trees that had been tapped by the Maures. While this was not initially a serious impediment, it foreshadowed the more severe conflicts that would arise when drought increased competition over the *Acacia senegal* and other increasingly scarce vegetative resources.

#### The Transformation of the Maure Gum Arabic Collection System during the Great Sahelian Drought

Exports of gum arabic from Senegal averaged roughly 1300 metric tons per year from 1962-1970, not substantially different from the late colonial era. The drought years of 1968-1974 profoundly altered this relatively stable situation. Average annual precipitation levels not only plummeted but became highly erratic (See Figure 3). Throughout northern Senegal the severe drought caused a major die-off of the *Acacia senegal*. Studies conducted by the International Biological Program at Fété-Olé and elsewhere in northern Senegal<sup>26</sup> showed that between 1969 and 1972, roughly 70% of the *Acacia senegal* perished.<sup>27</sup> The commercial impact of the die-off was spectacularly reflected in government statistics. From 1940-1988, roughly 2000 metric tons of gum arabic were marketed annually in Senegal. Between 1974 and 1988 the average dropped to a mere 565 metric tons.

By the late dry season of 1974, four dry years had taken a severe toll on the pastoralists. In northern Senegal as much as

**Figure 3**  
**Cumulative Annual Rainfall**  
**Linguere, 1934-1989**



Source: Republic of Senegal, National Meteorological Service Statistics, 1934-1989.

40-60% of the livestock capital, which had risen dramatically between 1950 and 1975, perished from lack of forage.<sup>28</sup>

Throughout the northern grasslands the Fulbe responded to the crisis by diversifying their income generation strategies: some sent household members to Dakar or the peanut basin in search of wage employment; others moved into petty trade, increased sales of their remaining livestock, or sold wood collected from dying forests. A large number moved into the collection of gum arabic, encouraged by exceptionally favorable market prices for gum arabic which skyrocketed at just the moment when the Fulbe faced their greatest threats to survival. The international price of gum arabic rose from \$650 per metric ton in early 1973 to \$5000 per metric ton in May, 1974 as a result of supply shortfalls in the Sudan gum zone - also hit hard by the drought. The local price rose less dramatically, though still over 280% in one season (See Figure 4). The Fulbe shouldered their distaste for what had long been considered a culturally unacceptable activity and reluctantly entered into this highly lucrative income generating activity. To the Maures, this was nothing short of an outright expropriation of historically determined use rights.

#### **Break down of the *Acacia senegal* Common Property Regime**

The introduction of boreholes to the Jolof in the mid-1950s disrupted profoundly the common property regime constructed by the Maures at the turn of the century around the *Acacia senegal*. The breakdown of the seasonal spatial separation between the Fulbe and Maures translated into overlapping and competing uses

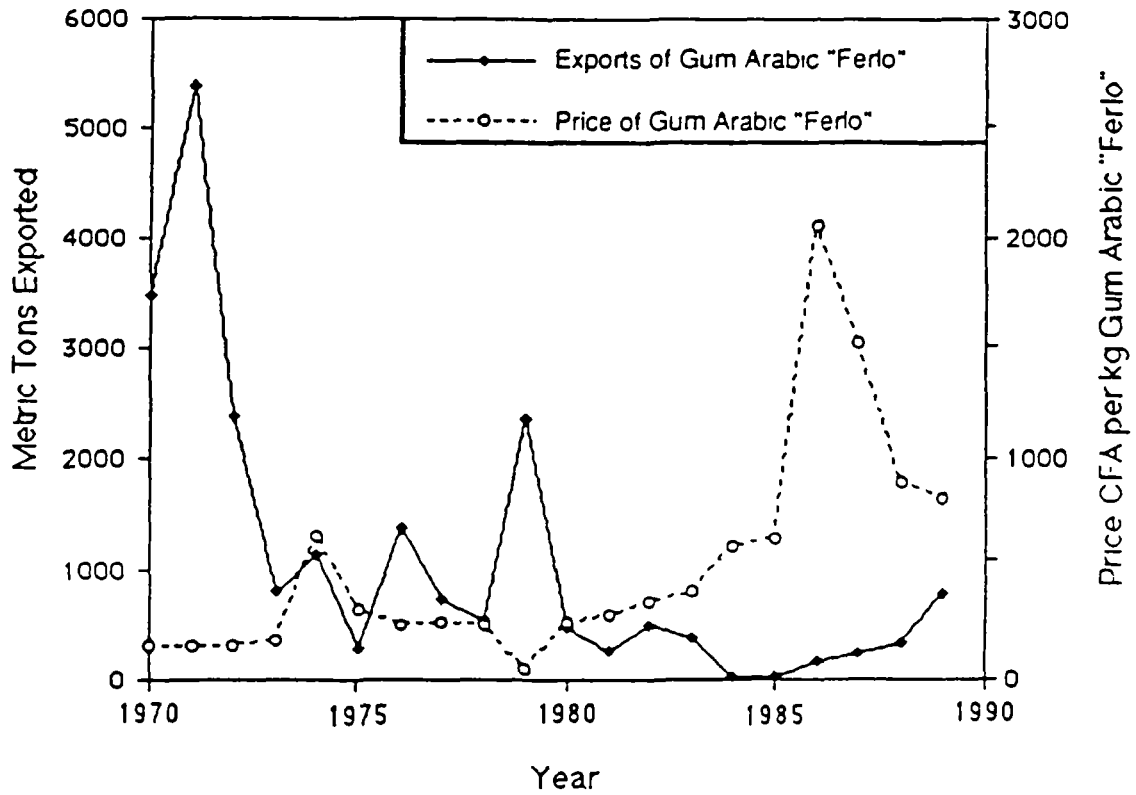
of the same geographical space. When the pastoralists entered massively into gum collecting, the norms and rules regulating the use of the gum arabic trees in the Jolof were redefined. The Maures attempted to enforce rights of exclusion against the newcomers, though this turned into protracted and bitter struggle between the Maures and Fulbe for control over the diminishing populations of *Acacia senegal*. Beatings and knifings were violent expressions of the depth of animosity that suddenly erupted between the two formerly compatible ethnic groups.

By the time of the drought, the traditional institutions that might have been able to mediate the disputes had been largely abolished. The few remnants of customary institutional mechanisms for mediating conflict between the Maures and the Fulbe - village-level councils of elders from both ethnic groups - were incapable of resolving the tenure disputes over the gum trees. The Maures feared that by granting concessions to the Fulbe, they risked permanently losing access to the best concentrations of gum trees. The Fulbe, for their part, were faced with the intractable stresses of short-term struggles for survival. The conflict reached an impasse; no customary authority could solve this deep-seated tenure crisis.

The failure of traditional dispute resolution mechanisms reflected the break down of traditional governance institutions, namely the Wolof *bourba* and his coterie of sub-regional chiefs (*kangam*) and the Fulbe *ardo*. The French colonial administration imposed on the local populations *chefs de cantons* and later,

Figure 4

Comparison of Free-on-Board Price vs.  
Quantity of Exports of  
Gum Arabic "Ferlo" 1970-1988



Source: République du Sénégal, Ministère des Finances et des Affaires Economiques, Commerce Extérieur Spéciale, Statistiques Douaniers, 1970-1988.

during the post-colonial period, the state gave to *préfets* and *sous-préfets* considerable administrative powers. These centralized and hierarchical institutions took over many of the dispute resolution functions once handled by traditional and local institutions. Western juridical concepts began to guide decision making rather than the wisdom of traditional authorities. Yet in the case of the violent disputes around the gum arabic trees, the judicial and administrative bodies could not call upon legal precedents to resolve in an equitable fashion the contending viewpoints.

Exogenous shocks such as droughts, changes in regional economies, or the introduction of new technologies in a particular social context often redefine the institutional foundations of common property regimes. In the *Acacia senegal* common property regime, the combination of factors linked to the drought and the installation of boreholes in the northern Jolof led to the expansion of the powers of the state in local level resource management systems. The Senegalese administrative authorities and technical services became for the first time the principal arbitrators in the tenure disputes around the contested gum arabic trees. Rather than side with the interests of the Maures, the administration decreed that since the gum trees were a resource held in the public domain, all citizens had equal rights of access. The state forestry service granted the Fulbe permits to collect gum from *Acacia senegal* found within the immediate vicinity of their scattered encampments. This doctrine,

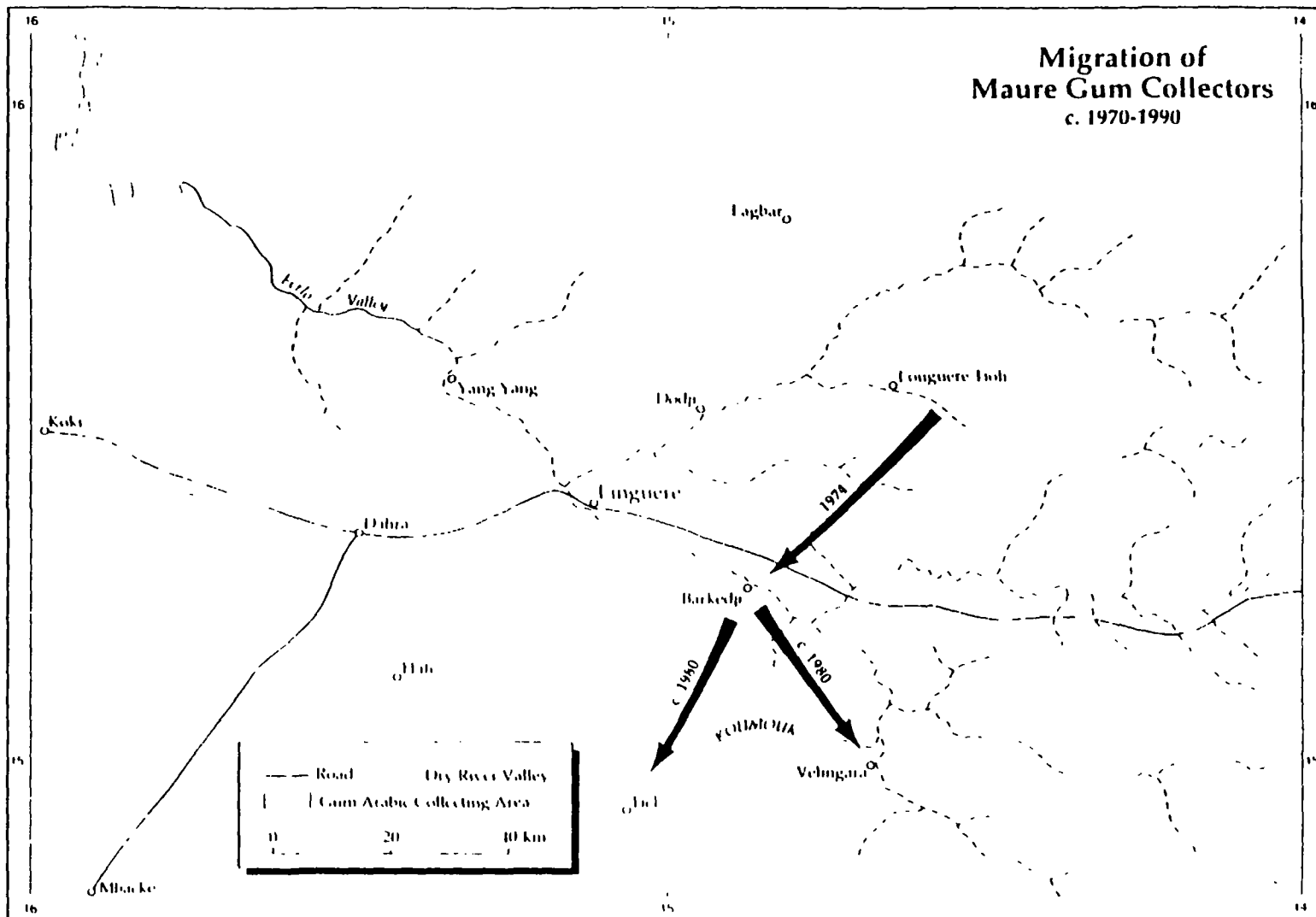
reflected in the following justification for a tapping permit, is still very much in force today.

Mr. Amadou, who has lived in the said locality for nearly 34 years is entitled to exercise his use-rights in accordance with the legal articles cited as follows... Because of the conflicts and quarrels that arise from this exudation business in the Fulbe milieu, we have limited gum collecting forays to an area of approximately one square kilometer in order to avoid any eventual clashes with neighbors in the zone. Marks are to be placed on the tree to delineate the perimeter in question.<sup>24</sup>

Since the Fulbe were widely dispersed in seasonal encampments throughout the gum belt of northern Senegal, the policy decision gave the pastoralists government-sanctioned rights to collect gum throughout most of the zone. This meant that the Maures were in effect prohibited by the forestry service from collecting gum arabic in many of the prime gum collecting zones. No opposition was mounted to this policy decision for the Maures no longer maintained a dependent relationship with Muslim zawaya clerics who, in the past, might have protested and negotiated on their behalf. Confronted by the continued threat of violence and the reality of being a minority population possessing little political influence, the Maures had no choice but to migrate to the more peripheral and inhospitable regions in the southeastern part of the Department of Linguere, near the villages of Thiel and Velingara (See map Migration of Maure Gum Collectors). Here they were protected from competition from the Fulbe since the region was not used by pastoralists during the dry season due to a chronic lack of wells and boreholes.

Once again the Maures pioneered gum collecting among the





extensive, but relatively underexploited stands of *Acacia senegal*. The Maures reproduced the characteristic gum arabic tree common property regimes of the past. The first arrivals divided the new territory among themselves and replicated the technical and organizational features of their ancient livelihood system. At the beginning of each gum season, the Maures walked 15 to 40 kilometers into the bush from the towns of Thiel, Barkedji and Velingara to set up small seasonal camps under the shadows of huge baobab trees. The spatial boundaries between the various patrons were delineated by identification marks cut into the gum trees, though the limits changed from year to year depending upon the availability of *sourga* and household labor.

While the Maures experienced few difficulties in acquiring use-rights to the *Acacia senegal* from the Fulbe living in the vicinity of the borehole villages, it has nevertheless been hard for the Maures to exclude even seasonally non-Maures from using these prime gum collecting zones. Theft has been a critical problem, especially within the dense thickets (200-300 *Acacia senegal* per hectare) found scattered throughout the zone.<sup>25</sup> As in the past, thievery becomes particularly rampant when gum prices are high or after consecutively poor harvests of field crops. Improved roads and the widespread use of horse carts now facilitates rapid movement of thieves throughout the bush. During the last "gum boom" of 1984-1986 (gum prices once again rose after the 1983-1984 drought, this time to over 1500 CFA/kg), the Maures lost control of the dense thickets near Velingara and

struggled to maintain rights of access elsewhere.

In contrast to the pre-borehole gum collection system of northern Senegal, the new gum belt of the southeastern part of the department is used year round by several different resource users. Charcoal producers illegally gather wood for charcoal; pastoralists graze cattle, sheep and goats; and other villagers collect various forest products, such as "gum mbepp" (Sterculia setigera) and the fruit of baobabs (Adansonia digitata).<sup>26</sup> Since each user group profits by stealing the exuding gum whenever it can, gum collecting has become an increasingly marginal activity for the Maures. This is especially serious at a time when international prices have fallen precipitously from 1500 CFA/kg in 1986 to about 350 CFA/kg by mid-1991 and collectors have to spend weeks at a time in the bush merely to protect exuding stands from thieves.

The Maures themselves note with insistence that the future of the gum collection economy is precarious. Interviews with collectors demonstrated a sophisticated understanding of the causes behind the deteriorating market conditions and the factors constraining collection at the local level. If the Maures are to continue to earn a substantial part of their household income from gum collecting, then costs of gathering must be brought down substantially through the reduction in the amount of labor expended in controlling theft. A solution, as suggested by the gum collectors, is to try to reconstruct the seasonal spatial separation of gum collectors and pastoralists characteristic of

the pre-borehole era. Only this can reduce in a cost effective manner the high costs of protecting gum harvests from theft. Yet legal contradictions between the colonially inspired Forest Code and the corpus of national land laws impedes the emergence of a new common property regime adopted to the post-borehole realities of the Jolof.

#### IV. THE ROLE OF THE STATE IN THE MANAGEMENT OF THE GUM ARABIC ECONOMY IN NORTHERN SENEGAL

The state is presently the dominant institution affecting the way commonly used natural resources are exploited in Senegal. It is in the position to help articulate new joint use-rights agreements to contested resources like the *Acacia senegal* tree. Yet, the locus of resource related decision-making must be devolved from the state back to local user-groups, a process which may lead to more sustainable management of forest resources. Until now, the state has been a notoriously poor manager of natural resources.<sup>27</sup> In the case of the gum arabic economy, the French colonial government transferred management powers from the Maures to the forestry service through the enforcement of the Forest Code. In the debate on decentralization and devolution in the Sahel, the question now turns to whether the state can restore to local users the management prerogatives lost during the colonial period - techniques which may be more sophisticated and ecologically sound than those promoted by state foresters.

**The State and the Conservation and Regeneration of the  
*Acacia senegal***

From as early as the turn of the twentieth century, the administration took a series of measures to protect the colony's *Acacia senegal* resources. The "Décret Relatif au régime forestier du Sénégal et ses dépendances" of July 20, 1900 provided the statutory framework for state intervention in the gum arabic collection system.<sup>28</sup> One of the key articles justified state intervention - "the harvest of tanning and tinting barks, gums, resins, rubber, and latex will be done in a fashion so as not to destroy vegetative production." According to this first legislative edict, any practice deemed detrimental to the forestry domain could be banned "if the practices or the abuse of the rights enumerated above compromise the wealth of the forestry domain."<sup>29</sup> This legislative precedent justified a host of more specialized regulations. As early as 1908 edicts against abusive tapping were passed by the *commandants du cercle* in the Aleg and Brakna of southern Mauritania. In Senegal the governor signed several decrees designed to halt abusive tapping.<sup>30</sup> These restrictions against excessive tapping and coppicing were incorporated into the Forest Code of 1935 and subsequent revisions later in the colonial and independence period. Many standard gum collection practices to this day remain illegal. For instance, gum collectors often lop off thorny branches which hinder the approach of the tapper to the tree. This is a practice that is punishable by stiff fines and/or a one month to two year prison term. Since the *Acacia senegal* is considered a

"protected" species, it is subject to numerous interdictions against any "felling, pulling up, or mutilation" of the species unless authorization is granted by the forest service. This provision justifies the requirement of an annual permit to collect gum. Even though the permit is free, the transaction costs of obtaining the annual authorization is high for the collector must often travel great distances to locate the forestry agent responsible for writing out the permit. Failure to obtain a permit results in a fine.

As early as the late 1920s it had become evident to the colonial administration that the codes and edicts would not stop what merchants and technical advisors considered abusive collection practices. The laws simply could not be enforced due to a chronic shortage of personnel. The administration adopted a radically new policy approach. State forest reserves (*forêts classée*) of economically valuable tree species were created throughout the colony in the 1940s and 1950s. Governor General Brévié spelled out his dream: "I envisaged as an effective way to prevent major deforestation of the country, to create a vast forest reserve domain, removed of the incontinence of forested lands vacant and unowned, that would be well constituted with rights, definitively delineated in size and specially protected."<sup>31</sup> The administration justified the expropriation on the grounds that most forested lands in Senegal were "vacant and unowned" since the territories were not officially registered and titled according to colonial land laws. The rights of gum

collectors to the trees were simply ignored.

Between 1941 and 1960, roughly 60% of what is now the Department of Linguere was converted into forest reserves. The forestry service continues to this day to enforce restrictions governing the exploitation of the *Reserve Sylvo-Pastorale de Six Forages* and several other large *forêts classée*. Commercial peanut production, for example, cannot be practiced in these reserves though this interdiction is flaunted with impunity. Severe restrictions against forest fires are also enforced.

Many of the prime gum collecting areas happened to be located in the protected forests of the Department of Linguere. Even though the forestry service agents were instructed to train the Maures in appropriate forest management practices, it soon became clear that temperate zone silvicultural practices such as coppicing, direct seeding, or less severe tapping could not be applied to the *Acacia senegal*. Recognizing the limits of their knowledge, the forestry service founded a research station in Linguere in the early 1950s with the mandate to develop new management practices. Yet neither the Linguere research station nor a Gum Arabic Research Center at Mbiddi constructed in the early 1970s were able to devise management techniques better than those employed by skilled gum collectors. After years of limited results, the scientific community is gradually coming around to respect the indigenous knowledge of the gum collectors.

The forestry service continues to enforce the edicts of the Forest Code that have not substantially evolved since the mid-

1930s. In the interim the enforcement powers of the state have substantially increased. In 1935 the forest service consisted of some 28 personnel for the entire colony of Senegal, by 1958 it had increased to 475 staff; by 1989 roughly 635 forestry agents patrolled the territory.<sup>32</sup> The long arm of the forestry service reaches deep into the daily life of gum collectors. The Forest Code is often enforced arbitrarily as a technique to generate revenues from fines for the poorly paid and ill-equipped forest agents. Since the code is written in dense French legalistic jargon, few among the non-literate populace know whether the law is being applied correctly or not.

#### **Contradictions between the Forest Code and Senegalese Land Law**

The Forest Code is an anachronism of the colonial period that contradicts the intent of the corpus of Senegalese land law, an innovative set of legislative measures which in theory grants considerable resource management control to decentralized rural institutions. In the mid-1960s and early 1970s Senegal enacted a series of legislative measures permitting user-based governance of natural resources. The 1964 *Loi relative au domaine national* is founded on the precept that most land is held in the national domain, but that the state grants use-rights to those who exploit (*mettre en valeur*) the land conforming to national and local development criteria. The 1972 *Loi relative aux communautés rurales* vests in 318 locally elected rural councils the responsibility of allocating land to individuals and groups residing in the administrative district (*communauté rurale*) "as a



function of the capacity of the beneficiaries to assure, either directly or with the aide of their family, the development of their lands conforming to a program established by the council."<sup>33</sup> The land may be retroceded back to the state if it is not developed according to definitions of *mise en valeur* determined by the community council itself.<sup>34</sup> All land transactions must pass through the rural council, such as inheritances of fields. Most land cannot legally be sold, rented, or loaned yet legal provisions do exist to lease lands.

The *Loi relative au domaine national* and the *Loi relative aux communautés rurales* give many prerogatives to the rural community councils including rights to allocate land, plan for local development, employ as much as 75% of the rural tax directly for local development projects, and resolve land disputes.<sup>35</sup> Several provisions in the original legislation granted the rural community councils the right to express resource use preferences. The decree 64-573 indicates, for example, that the "community council deliberates all rights of usage in the interior of its territory" and that the "rural council expresses its wishes on all regulatory measures that it judges useful to apply within its territory in order to obtain a judicious exploitation of resources and an effective protection of agrarian resources of all kinds..."<sup>36</sup> Despite these potentially wide ranging powers, the council does not have the right to legislate regulations pertaining to commercial exploitation of forest resources. Exploitation of trees producing

commercial products, such as the gum from the *Acacia senegal*, falls under the jurisdiction of the Forest Code.

The community council leadership is legally granted the powers to establish land use plans and determine local rules and regulations governing many forms of resource exploitation. The Loi no. 80-14 of June 3, 1980 reinforces the powers of the community council to devise suitable local resource management rules by stating that "the rural council deliberates everything that is within the jurisdiction granted by the laws and notably... the fight against fires and forest fires; the regime and the modalities of access to water points of all types; the creation and the installation of livestock paths within the interior of the territory of the rural community; planning for the exploitation of all forest gathering products and wood cutting."<sup>37</sup> This later provision regarding forest resources does introduce much legal ambiguity. It is not clear from this text whether the community council has the authority to regulate the exploitation of forest resources.

In practice the community council leadership could conceivably create a protected forest reserve within its administrative jurisdiction or require land users to plant and protect a proscribed number of trees in every cleared field as a condition to allocating land to an individual farmer. Perhaps wood cutting or gum collecting permits could be granted to specified user-groups as part of a strategy to control exploitation of the forests found within the territory of the

*communauté rurale*. The community councils of Thiel and Velingara could mandate that the forest resources be managed in a fashion which incorporates the interests of the Maures. Unfortunately, no precedents exist to inform rural community councils of the broad scope and potentiality of the law. The participatory allure of this decentralized management structure hides harsh realities. Even though the community council possesses considerable authority, the administration (the *sous-préfets* and *préfets* of the Ministry of Interior) may in fact veto any decision taken by the rural community council: "the deliberations of the community council cannot be executed until they are approved by the appropriate tutelage."<sup>38</sup> While this provision is intended to provide "checks and balances," the provision has been abused on many occasions.<sup>39</sup> Several cases have been reported in northern Senegal where community councils controlled by Fulbe have attempted to create their own pasture reserves, but these have been vetoed by the *préfets*.

The council is assisted in its administrative tasks by a multidisciplinary cadre of technical agents from different mainline ministries (Centres d'Expansion Rurale Polyvalents-CERP). The CERP could be a key actor in working with the community councils to negotiate new use rights agreements. Even though the external catalytic role of the CERP is well recognized by rural development agencies, the umbrella agency has been marginalized since its inception in the early 1960s.<sup>40</sup> Endowed with very limited financial resources, transport, or technical

support, the CERP staff have succeeded in preparing only a small number of management plans with the community council. The national land laws promote participatory rural governance, yet the community councils have not acquired the institutional capacity to articulate and enforce local resource use plans. So why the great discrepancy between the intent of progressive and innovative legislation and the reality at the grassroots?

The Senegalese government has resisted devolving true governance powers to community councils because the state development bureaucracy would lose the prestige and prerogatives it has so long enjoyed. Most development aid in Senegal is channeled through centralized ministries which design and implement projects without significant consultation with the community councils. The development machine generates significant financial benefits for the bureaucracy, creating jobs and providing per diems, vehicles for project managers, international travel, and academic scholarships to the west. The majority of financial resources are captured by the ministries in Dakar and little flows down to the regional and sub-regional level. Agents of the CERP for example, see a meager portion of the millions of dollars of aid funds flowing into Senegal.

The donors themselves are at fault for failing to insist on implementing programs and projects to improve the institutional capacity of the rural community council. Multi-lateral and bi-lateral donors have in the past preferred to finance and work through large parastatal development organizations in northern

Senegal rather than through the local-level administrative bodies. With few exceptions, the donors have ignored the potentiality for increasing community participation and local level empowerment embodied in the statutory mechanisms of Senegal's land legislation.

The concentration of resources at the national level has undermined the institutional capacity building process at the base which is so germane to territorial management of natural resources. For the Maures of the Department of Linguere, the consequences have been disastrous. Donor projects have preferred to finance large-scale gum arabic plantations overseen by the forestry service rather than working with the host of unseen user groups involved in exploiting not only gum arabic but many other forest resources.

#### V. CO-MANAGEMENT ARRANGEMENTS AND THE FUTURE OF THE GUM ARABIC ECONOMY IN THE DEPARTMENT OF LINGUERE

The prognosis for the future of the ancient gum arabic economy in northern Senegal would appear to be bleak on many accounts. Botanical studies indicate that the *Acacia senegal* of the northern half of the Department of Linguere have not fully regenerated in the wake of the droughts.<sup>41</sup> International market demand is declining rapidly as synthetic, biotechnology produced substitutes such as xanthum gum invade the international market.<sup>42</sup> Yet the economy is far from dead as three to five hundred tons of gum continue to be marketed through official channels in the Department of Linguere.

For the Maures and the poorest pastoralists living in the southeastern zone of the Department of Linguere, the collection of gum arabic continues to generate much needed income. Gum collecting has remained an important part of the myriad of risk aversion strategies employed by rural households struggling to recoup from crop failures, sudden death of livestock or other such disasters. For these people alone, policies and programs to protect and revitalize the gum arabic economy would have positive social benefits. Perhaps the best way to conserve and regenerate Sahelian forest resources is to assure that minority populations who depend on collection of tree crops continue to exploit intensively the resources upon which their livelihoods depend. As this case study has shown, those who depend on the *Acacia senegal* tend to conserve the tree provided they have sufficient incentives, among these, firm rights of access to the resource.

#### **Options for User-Based Environmental Action to Protect and Revitalize the Gum Arabic Economy**

Neither the state nor the gum arabic collectors are capable of embarking alone on a path to protect and regenerate the gum arabic collection system. The history of the gum economy in northern Senegal provides many valuable hints on what a new "co-management" relation might look like. In the pre-borehole era in northern Senegal, the gum collection system functioned well due to the seasonal separation between the Fulbe pastoralists and the Maure gum collectors. The essential features of this system may be worth reviving since they would reduce the high costs of protecting the harvest from theft. Future policy interventions

might center around two objectives: the reconstruction of an arrangement which allows temporary exclusion of livestock and their herders from gum collecting areas at key moments during the early dry season, and the creation of suitable resource management institutions.

The community council possesses the legal authority to plan for the sustainable use of the natural resources falling within its domain. The council can create the forum from which site specific strategies and programs are enunciated and negotiated with the many different users of the environment. For instance, the leadership could convoke the principal users of the gum collecting territory to decide on measures to reduce the theft of gum. The council could issue regulations excluding, for example, the passage of livestock through particularly dense concentrations of *Acacia senegal* during the first weeks of the gum collecting season. Since roughly 75% of the exudation occurs during the early months of the dry season, seasonal restrictions would facilitate unhampered collection by the Maures. Once the harvest was brought in, the zone would be opened up to unrestricted grazing. Such an arrangement could provide considerable benefits not only for the Maures, but also for the pastoralists since it would create a late dry season pasture reserve. The council could allow the Maure and Fulbe users of the territory to practice suitable resource management techniques. Both user groups might decide jointly to set fire to the bush from time to time. As both scientific studies and rural

populations note, fires set at appropriate times and frequencies help not only to regenerate vegetation but they often eliminate pests harmful to livestock production. Other schemes would undoubtedly emerge from a process of concerted dialogue organized by the community councils.

Problems may arise if local institutions are not strong enough to enforce locally devised rules and regulations; the state may need to provide backstop enforcement. "Free-riders" tend to shirk responsibilities to the broader community and break the conventions set down in the rule-making institutions. For those caught stealing gum or illegally cutting trees for firewood or charcoal making, a system of fines could be instituted, payable to the rural council. The gendarmerie or the forestry service might enforce local sanctions against gum theft when notified of transgressions by the community council. Revenues from fines and even user permits deposited in the council treasury could then be used for community initiated projects.

The development of new resource management arrangements hinges on the legal recognition of the Maures' rights to gum collecting in well delineated territories. In the early twentieth century, the *bourba* Jolof allocated use-rights; today the state must do the same. This is not to suggest that the state must embark on a full-scale land registration program. Maure rights to gum collection could be recognized by ceremonial acts, similar to those that occurred in the past. For instance, when the low cast Koundoul lineage obtained rights to gum



collection near Linguere in the 1920s or 1930s, a public ceremony consisting of feasts and speeches was held under the auspices of the *bourba* under the shade of a well-known tamarind tree. Today the community council leadership, chiefs, government representatives and representatives of the Maures might hold a similar ceremony.

Neither the government nor the leadership of the community council is likely to act unless forced to do so by political pressures. The Maures lack the political power and legal tools to promote their interests among these institutions. As newcomers to the southeastern part of the Department of Linguere, they are a largely "invisible" and economically marginal population living within the broader Fulbe and Wolof cultural and political milieu. Such groups must build the collective power required to reassert control over resources critical to household survival. While the legal corpus permits collective responses by resource user groups, test cases must be attempted, something that is not within the means of a minority group unfamiliar with the law. It is at this juncture that external actors may usefully become catalytic agents.

Government development agencies, non-governmental organizations, forestry projects, and committed individuals have a key role to play in working with such clearly articulated user groups to devise new resource management arrangements. The external actors could work with the Maures to form a legally recognized associations, such as "Groupements d'Intérêt

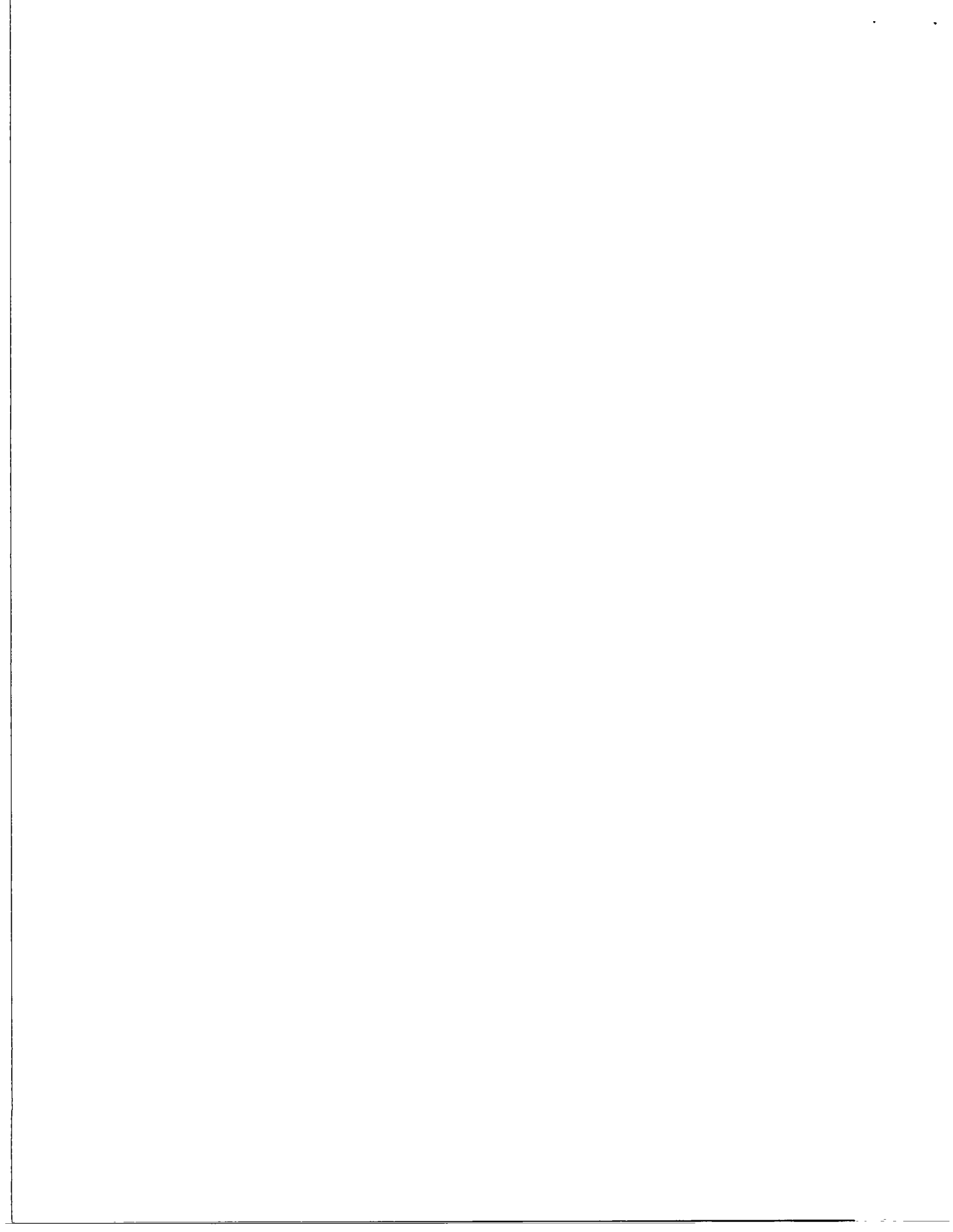
Economiques," (GIE) which could receive from the community council property rights to the *Acacia senegal*. GIEs are legally constituted groups of two or more individuals involved in commercial activities and entitled to receive bank credit.<sup>43</sup> If the revised version of the forest code were to pass legislative and bureaucratic hurdles in the near future, the new code would give these associations rights to manage forest formations on the condition that they employ conservation practices determined by the forestry service.<sup>44</sup> The allocation of a natural resource to such an institution is not unheard of in Senegal. The state has begun to turn management responsibilities for boreholes over to GIEs operated by the pastoralists themselves. The World Bank financed PEDES0 project has worked with the Fulbe to develop "pastoralist units" granted with the authority to manage water points and pastures.<sup>45</sup> The process of formally recognizing the collective property rights of a user group to a specific natural resource may create the institutional power so necessary to the formation of new territorial management arrangements.

#### **The Future of the *Acacia senegal* Common Property Regime**

The history of the *Acacia senegal* tree crop commodity in southern Mauritania and northern Senegal is instructive in suggesting what may happen if state institutions fail to allow some type of new common property regime to emerge around the species. So long as an international market remains for gum arabic, violent disputes will most likely break out among competing rural interest groups each time the value of the gum

arabic commodity suddenly increases. These disputes mark critical junctures in the evolution of the common property regime. New sets of rules determining rights of access to the resource often materialize during these crisis ridden and conflictual times. There are winners and losers among the competing rural interest groups.

The historical record suggests that any number of exogenous factors may increase, in the eyes of the rural populations, the value of the tree crop commodity. During the severe droughts of 1968-1974 and 1983-1984 the collection and marketing of even small amounts of gum became for the most resource poor rural populations a critically important element of risk aversion strategies. At such largely unpredictable moments, the increase in the perceived value of gum incites a struggle by various competing interest groups to redefine rights of access to the *Acacia senegal*. Other exogenous factors such as a dramatic increase in the local price of gum arabic may also send shocks through the resource regime. Customary user-groups such as the Maures have attempted since the early 1970s to exclude non-members from intruding into the gum collecting territory. The struggle to maintain rights of exclusion often degenerates into violent altercations because, in the contemporary institutional context of northern Senegal, no rural institution is yet strong enough to mediate adequately the disputes over access rights to the tree. In the future, crop failures and sudden growth in the price for gum arabic will most likely be marked in the Department



to find ways to encourage the replication of these local level initiatives, and to make them the cornerstone of the new micro-territorial approaches to rural development now emerging in the Sahel.

The development community in the Sahel has recently begun to promote the concept of local level management of natural resources. Development projects have created the context for experimenting with new and innovative local-level rule making arrangements. In most Sahelian countries, the forestry service is turning some management control of protected state forest reserves over to local communities. In these pilot projects the state defines the rules of the game by constructing the spatial boundaries of the management unit and defining the broad framework for local participation. In a sense, these projects provide the "protection" required by local groups to develop more participatory resource management arrangements. When one considers the options for promoting participatory management of natural forest formations found outside of state forest reserves, the problematic becomes much more complex.

The case of the gum arabic tree crop economy provides a sobering picture of the factors which impinge upon the development of new "co-management" arrangements among commonly used forest resources. The struggle of the Maures to protect and revive their livelihood systems shows that rural Sahelian populations do possess the capacity to manage resources provided that they acquire firm rights of access to the particular species

and that they have an economic interest in doing so. However, numerous institutional and economic variables hinder the emergence of collective actions to protect and restore forest resources such as the *Acacia senegal*. The history of the gum arabic collection system in the Department of Linguere reveals many of the economic, political, and technological factors which impinge upon the Maures' efforts to maintain traditional systems of resource management and to adapt these systems to changing socio-economic and ecological conditions.

The gum collection system of the pre-borehole era was a product of its era. It operated in relative isolation with little interference from other livelihood systems. The introduction of the boreholes in the mid-1950s undermined one of the essential features of the system, a common property regime that spatially separated the livelihood activities of Fulbe pastoralists and Maure gum collectors. The breakdown of the traditional common property arrangement is threatening the future of the gum collection economy for the Maures. If gum gathering is to survive in the future, new resource management arrangements must be negotiated between competing user groups. In Senegal, there are many opportunities for constructing new common property regimes because of the existence of a state sanctioned institutional framework. Yet numerous political and economic factors impinge upon the emergence of new resource use agreements.

Minority groups in the Sahel dependent upon tree crop

collection face great obstacles to protecting and managing the space in which their gathering activities take place.

Development programs usually ignore the niche collector peoples play in the utilization of natural resources. The Maures are not using a resource that is perceived by the outside world to have great ecological or economic benefits, despite the use of small amounts of gum arabic in a wide variety of products in the industrial world. As substitutes invade the international market for gum arabic, the loss of the tree crop product and the accompanying livelihood system will scarcely be noted. Yet efforts to maintain the gum arabic economy would not only provide a continuing source of revenue for small and sparsely scattered populations, but the continued existence of such diverse micro-economies may be the most appropriate and sustainable use of semi-arid regions of the Sahel.

This reconstruction of common property regimes requires a very different planning orientation than the top-down "master plan" approach which has dominated past efforts to develop these Sahelian regions, however. Protecting and nurturing a complex array of "niche" activities (as opposed to government schemes to promote ranching or mono-crop plantations of gum arabic trees on such grasslands) requires an intimate knowledge of diverse physical and social micro-environments. As such it depends on the systematic participation of local communities -- including minority populations -- in planning and rule making for local resource management. As this chapter has shown, this can only

happen if the state makes room for "co-management" arrangements to flourish. From there, concerned development actors can work to strengthen the capacity of local interest groups and institutions to create and enforce management plans that are at once ecologically sound and responsive to local communities' diverse concerns.



## End Notes

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16. Daniel Delaunay, De la captivité à l'exile: Histoire et démographie des migrations paysannes dans la moyenne vallée du fleuve Sénégal. (Paris: ORSTOM, 1984), p.37.

17. Marty, 345.

18. Leland Conley Barrows, "The Merchants and General Faidherbe: Aspects of French Expansion in Senegal in the 1850s," Revue française d'histoire d'Outre-Mer 16 (1974): 236-283; Margaret O. McLane, "Commercial Rivalries and French Policy on the Senegal River, 1831-1858," African Economic History no. 15 (1986): 29-68; Eunice A. Charles, Precolonial Senegal: The Jolof Kingdom 1800-1890, Boston University, African Studies Center, 1977, pp. 104-132.

19. Patrice Mingou, Le Jolof de 1870 à 1875, Thèse de Maîtrise en Histoire, Université de Dakar, 1976; Omar Ba, "Les Peuls du Diolof au XIXe siècle," Bulletin de l'I.F.A.N. Série B 37 no. 1 (1975): 117-136; Philippe Grenier, "Les Peuls du Ferlo," Les Cahiers d'Outre-Mer 13 no. 49 (1960): 28-58; Christian Santoire, Raison pastorale et politique de développement: Les Peuls Sénégalais face aux aménagements, (Paris: ORSTOM), pp. 20-44.

20. For a more complete historical discussion of the "sourga" labor system, see James F. Searing, "Aristocrats, Slaves and Peasants: Power and Dependency in the Wolof States, 1700-

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21. Studies at the Gum Arabic Research Station at Linguere showed that only 52-80% of the trees yielded gum in any one season and that average annual yields ranged from a low of 57 grams per tree to a high of 190 grams per tree.

22. Territoire du Sénégal, Service des Eaux et Forêts, Inspection Forestière du Fleuve, Eléments de Politique Sylvopastorale au Sahel Sénégalais, Rapport Grosmaire, Saint-Louis, 1956, Fascicule 15, p. 41.

23. Cheikh Tidiane Sy, La Confrérie Sénégalaise des Mourides, (Dakar: Présence Africaine, 1969).

24. For a history of these disputes, see Jean Copans, Les Marabouts de l'Arachide: La Confrérie et les paysans du Sénégal, (Paris: l'Harmattan, 1988), pp. 79-86; Paul Pélisser, Les Paysans du Sénégal (Saint-Yrieix: Imprimerie Fabrègue, 1966), pp. 358-362.

25. Henri Barral, Le Ferlo des Forages: Gestion ancienne et actuelle de l'espace pastoral, (Dakar: ORSTOM), 1982; Cheikh Ba, Les Peuls du Sénégal: Etude géographique, (Dakar: Les Nouvelles Editions Africaines, 1986), pp. 143-176.

26. For an in-depth empirical study of the affect of the drought on the ecology of northern Senegal, see the series of articles in: La Terre et la Vie, v. 26 no. 1-3 (1972) and v. 28, no. 1, (1974).

27. Henri Poupon, "Influence de la secheresse de l'année 1972-1973 sur la végétation d'une savanne sahélienne du Ferlo septentrional, Sénégal," In La Désertification au Sud du Sahara, (Dakar: Les Nouvelles Editions Africaines, 1976), p. 97; Henri Poupon, "Evolution d'un peuplement d'Acacia senegal (L.Wild.) dans une savane sahélienne au Sénégal de 1972-1976), Cahiers ORSTOM Série biologie 12 no 4 (1977): 289.

28. Christian Santoir, "Peul et aménagements hydro-agricoles dans la vallée du fleuve Sénégal." In Pastoralists of the West African Savanna, Edited by Hahdi Adamu and A.H.M. Kirk-Greene, (London: International African Institute, 1986), p. 195.

24. "Autorisation Gratuite d'Exudation sur essences protégées," of December 13, 1980 by the Chef de Brigade Forestier of Dahra, M. El Hadji Malick Dieye.

25. Jonas Erik Lawesson, Mark Schoonmaker Freudenberger, Knud Tybirk, "The Ecology and Economy of the Gum Arabic Tree (*Acacia senegal*) in Northern Senegal." Manuscript. Botanical Institute, University of Arhus, Denmark.

26. This is another water soluble gum employed domestically as a cooking ingredient but also exported and used in many dietary products. S.R.J. Robbins, A Review of Recent Trends in Selected Markets for Water-Soluble Gums, Overseas Development Natural Resources Institute, Bulletin no. 2, 1987, pp. 61-66.

27. Rebecca McLane, "Second Trimesterly Report, Village Reforestation Project," University of Wisconsin Land Tenure Center, October, 1990; James T. Thomson, "Peasant Perceptions of Problems and Possibilities for Local-Level Management of Trees in Niger and Upper Volta," African Studies Association, October 15-18, 1980.

28. Gouverneur Général de l'Afrique de l'Ouest Occidentale Française Colonie du Sénégal, Service de l'Agriculture et des Forêts, Réglementation Forestière, (Saint-Louis: Imprimerie du Gouvernement, 1916), p. 4.

29. *ibid.*

30. Décret no. 26, S.E. du 9 janvier, 1933 "Réglementant l'exploitation des gommages dans la Colonie du Sénégal," and Arrêté no. 1768 S.E. "Réglementant l'exploitation des gommiers dans la Colonie du Sénégal," 31 juillet 1934.

31. Le Gouverneur Général de l'Afrique Occidentale Française à Messieurs les Lieutenants-Gouverneurs des Colonies du Groupe, no. 26 S.E. "Circulaire sur la politique forestière," Journal Officiel du Sénégal, (16 février 1933), p. 143.

32. République du Sénégal, Direction des Eaux, Forêts et Chasses, Rapports Annuels, 1935-1980.

33. Article 3 of Décret no. 72-1288 du 27 octobre, 1972 "Rélatif aux conditions d'affectation et de désaffectation des terres du domaine national comprises dans les communautés rurales."

34. Considerable enforcement provisions exist, for the 1972 legislation states that, "le arrêté fixe, si besoin est pour chaque communauté rurale, les conditions de mise en valeur minimale prévues à l'article 9." Article 9 states that if after one year the president of the community council determines that land allocated to an individual or a group is not properly developed according to a local management plan, then the land can be retroceded back to the public domain.

35. République du Sénégal, Ministère de l'Intérieur, Secretariat Exécutif aux Actions des Centres d'Expansion Rurale. Guide de la Planification du Développement dans les Communautés Rurales, octobre 1988, pp. 7-9; Marie-Claire Bouat and Jean-Louis Fouilland, Les Finances publiques des communes et des communautés rurales au Sénégal, (Dakar: Editions Clairafrique, 1983), pp. 58-64; République du Sénégal, Ministère de l'Intérieur, Guide Pratique du Conseiller Rural, Novembre, 1984.

36. Décret 64-573, Article 7, Chapter III.

37. Loi no. 80-14 du 3 juin 1980 abrogeant et remplaçant certains articles de la loi no. 72-25 du 18 avril relative aux communautés rurales, Article 24.

38. *ibid.*

39. Dominique Darbon, L'Administration et le Paysan en Casamance (Paris: Editions A. Pedone, 1988), pp. 76-81; Gerti Hessling, "La Reforme foncière au Sénégal: Consensus entre paysans et pouvoirs publics?" in State and Local Community in Africa, Edited by Wim van Bingsbergen, Filip Reyntjens, and Gerti Hesseling. (Bruxelles: Centre d'Etudes Africaines, 1985), pp. 113-137.

40. Thierno Aliou Ba, "Les centres d'expansion rurale du Sénégal entre la dynamique paysanne et les structures d'Etat. Médiation ou frein pour un développement autogestionnaire" Mondes en Développement 13 2, (1985): 621-631.

41. Jonas Erik Lawesson, "Sahelian Woody Vegetation in Senegal," Vegetatio, in press.

42. Robbins, 18-33.

43. Loi no. 84-37 du 11 mai 1984 sur les Groupements d'Intérêt Economique.

44. Article L 78 of the legislative section of the proposed forest code states that "Les collectivités locales que sont les communautés rurales ou toute autre collectivité publique peuvent conformément à l'article L 8 du présent Code, être possesseurs de forêts naturelles ou artificielles." Article L 8 states that "les forêts appartenant aux collectivités locales selon les modalités du présent Code, les plantations forestières réalisées par ces collectivités, les sols à vocation forestière aménagés par celles-ci constituent le domaine forestier des collectivités."

45. Jamie Thomson, Alfred Waldstein, Sheldon Gellar, Jerry Miner, "Options for Promoting User-Based Governance of Sahelian Renewable Natural Resources," pp. 29-34.

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