

Fall 2009

# Putting Trees Back in the Hands of Malians: L'Association Malienne Pour La Conservation de la Faune et de L'Environnement and the Balance between Using and Protecting Local Forests

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## Recommended Citation

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# **Putting Trees Back in the Hands of Malians**

**L'Association Malienne Pour La Conservation de la Faune et de L'Environnement  
and the Balance between Using and Protecting Local Forests**

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**SIT Mali Fall 2009**

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## ***Introduction***

Products from trees provide the essential human necessities of food and shelter, as well as the means to cook and construct them with firewood and lumber. With the earth's ever increasing population and growing industries, these needs have also risen, and forests worldwide are feeling the strain of deforestation and over usage for both commercial and household consumption. Deforestation in Africa is occurring at a smaller scale than on other continents, but this does not mean it is any less damaging to local ecosystems (Bessassen, 2009, p. 76). In fact, African forests are particularly stressed because approximately 90% of the wood harvested from its trees is used for energy purposes and the harvesting has been found to occur in unsustainable manners (Bellassen, 2009, p. 76). Indeed, although Africa consumes the same amount of wood as Asia, when population is taken into account, Africa has by far the highest consumption of firewood per individual at 0.63 m<sup>3</sup> (see Table 1). Although deforestation may be happening at a faster rate in other regions of the globe, the heavy reliance on Africa's forest products has already caused permanent danger to its environment and is not showing good signs for the future.

### Consumption of Firewood in the Different Regions of the World

	Africa	North America	South America	Asia	Europe
Population (in millions)	868	429	365	3,838	723
Consumption of wood ( in millions m <sup>2</sup> )	546	85	192	546	115
Consumption of firewood per inhabitant (m <sup>3</sup> per individual	0.63	0.20	0.53	0.20	0.16

**Table 1. Bergonzini & Lanly, 2009. Africa has the highest consumption of firewood per inhabitant**

In the Sahel region of West Africa, the forests of Mali are showing no exception from this trend. Years of colonial exploitation for economic gains followed by strict state environmental policies established a system of forestry management disadvantageous for the rural poor population struggling to find resources for themselves. After droughts and wood shortages brought West Africa and its environmental degradation into international spotlight, political decentralization reforms have encouraged more local management of natural resources. While both Malian and internationally based non-governmental organizations have worked hard to turn the tables against deforestation by working with rural villages, the area's environment is still at risk.

#### **Study Area**

The programs of *L'Association Malienne Pour Le Conservation de la Faune et L'Environnement* (AMCFE) have been based for the main part in the three rural communes of Sanankoroba, Bougoula and Dialakoroba, located between 40 and 60 kilometers outside of Bamako, Mali's capital. The largest of these three is Sanankoroba, due mainly to its proximity to one of the few paved roads connecting Bamako to other cities. Sanankoroba has benefited from the presence of numerous other non-profit and non-governmental agencies, including a partnership with the town of St. Elizabeth, Canada and the establishment of an SOS village for orphans and underprivileged children. This area has suffered severe environmental degradation, in part caused by Bamako's heavy reliance on the area's forests for firewood and wooden

construction materials (AMCFE, 2009). Every day, trucks stacked several times their height with firewood leave Sanankoroba for Bamako's urban markets. Richer, urban-dwelling Malians frequently purchase land here for their own profit, restricting the control that locals have on the terrain around them. With Mali's loosely organized waste disposal system, it is also common for piles of Bamako's trash, consisting in a large part of plastic bags, to be dumped in visible piles in Sanankoroba's fields (A. Traoré, Nov. 26, 2009). According to Abdullaye Traoré, president of a village association in Sanankoroba and active community member, locals in this area have no control over their environment and cannot restore their natural resources without the help of outside organizations, including foreign groups.

## Methods

I tried to incorporate information from a variety of sources: both formal and informal interviews, first hand observation, reports of past AMCFE activities and outside scholarly articles. The main obstacle to completing a satisfactory level of research was scheduling conflicts with AMCFE limiting the time I could spend in Sanankoroba investigating their projects first-hand. I was not able to travel there until the third week in the month given for research, however this gave me more time to research historical background and read reports of AMCFE's past activities. These materials gave me a better idea of which current AMCFE projects I wanted to investigate and alerted me to more specific issues within the wider subject of environmental conservation.

Both in Bamako and the area around Sanankoroba, a large part of my information about AMCFE and local environmental issues came from informal conversations with Modibo Coulibaly, the association's program coordinator. Aside from conversations at AMCFE's Bamako office, we visited an elementary school in Biron, two tree farmers and families who use improved wood-burning cook-stoves, discussing the ups and downs of the projects and conducting both structured and less formal interviews. Due to language differences, Modibo Coulibaly served as a translator between myself and interviewees during our visits together, interpreting one of Mali's local languages, *Bamanan* into French. During independent interviews in Sanankoroba, I worked with a translator to talk to women selling firewood and a former member of the French and Malian armies who spoke mainly *Bamanan*.

## ***History of Forestry Management in Mali***

### **Pre-Colonial Environmental Practices**

Before colonization, state forest services, international NGOs and non-profit groups began attempts to manage forests and before industrialization, machines and population growth opened their mouths with a hunger for fuel, West Africans had their own methods of protecting their natural resources. To the Bambara people, one of the main ethnic groups of the studied area in southern Mali, the balance between three types of spaces in their surrounding environment was a key component of their belief system. Land categorized as "kongo" or "wula" was "open synergetic space inhabited by vital forces" while "foro" was land used for agriculture and considered more closed and definite. The areas within villages that were bordered by walls were called "dugu". The cultivated fields of "foro" were owned by families, while "kongo" or "wula" space was not owned by any individual but by the community as a whole (Seeing Green). The ownership of agricultural lands originated from ancestors who had made sacrifices to the appropriate spirits called "nyama" or "jinè" (Seeing Green) or from permission granted by village chiefs (Politique Africaine). By keeping more wild spaces in equilibrium with cultivated and inhabited land, communities ensured future existence of their surrounding natural environment.

Beyond the balance of open, closed and village spaces, Mali's trees were also protected by the concept of *forêt sacrés* ("sacred forests") and *bois sacrés* ("sacred wood"). Despite Mali's predominately Muslim religious affiliation, this tradition has its roots in the more traditional fetish religions of Western Africa. These individual trees and forested spaces were believed to be inhabited by malevolent or benevolent spirits depending on the location of the forest or the species of tree. These sacred trees and wooded areas were left untouched by villagers who believed that disturbing them would invoke the evil spirits to harm the person who had disturbed the space or offend the benevolent spirits that resided in the tree. Certain species of trees were thought to harbor protective spirits that would guard the families who left them to stand in their fields. Other incentives for protecting certain kinds of trees include specific uses of their products for eating or traditional medicine. Since these spaces were left untouched, they became protective habitats for animals such as large snakes, contributing to the idea that these were magical areas. Grave consequences await anyone who cuts a *bois sacré*,

including being possessed by a magical force, speaking in tongues, severe illness and even death. (M. Coulibaly and M. Maiga).

### **Colonial Exploitation**

The age of colonization changed both the physical environment of West Africa as well as its system of management. In March, 1898, the French military occupied Sikasso, one of the last standing independent kingdoms of what is now Mali, beginning the colonization of West Soudan that would last until September 1960. With the French came a system of centralized military authority with regional commanders awarded government positions after conquering a town, very different from the traditional village chiefs and royal kingdoms (Sept 14th , SIT class lecture). Recognizing the source of power in village chiefs, the French administration incorporated them as part of the colonial system, using them as tools to collect taxes, spread European ideas and collect men to labor for different projects (Becker, 2001, p. 504 & 519). In contrast to traditional views on categorization of terrain, the French Civil Code in Article 539 of 1937 stated, "All land that is vacant and unowned belongs to the state" (Becker, 2001, p. 510, Benjaminsen, 1997), in one step putting all the land that was communally owned in the hands of French officials. In a further leap away from Bambara views, land was categorized as either *forêt classés* ("classified forests"), indicating a potential for commercial use and exclusive utilization rights of the state or *forêt protégée* ("protected forests"), where individuals could gather forest products but only after obtaining a permit (Becker, 2001, p. 510). This classification system was just the beginning of the drastic changes French colonization would have on Mali's forests and the people dependent on their resources.

While, a small local population and centuries of self regulating usage of local plants prevented depletion of local resources, usage of forests by colonial authority centered on economic and industrial growth with no consideration of the indigenous population's needs or future environmental conditions. The colonial government, similar to others in the world at that time, prioritized monetary profit and strove to acquire as many resources as possible in the cheapest way available. The colonial aim to connect economic activity areas was realized with newly invented forms of transportation that were inevitable accompanied by steep incline in the demand for fuel power. Bamako was made the capital of West Soudan in 1907 and the construction of a railroad linking Bamako to the Senegal River transportation passage soon afterward only added to the commerce and transportation activity in the area (Becker, 2001, p.

507). In 1921, The General Inspector of Bridges and Railroads complained about the expensive use of coal, gasoline and fuel oil and suggested depending more on wood as a source of energy for the faster and hungrier transportation methods that had been introduced to the area. World War II brought upon shortages in fossil fuels and with the French devoting as many resources as possible to the Allied forces in Europe, railroads and riverboats in Mali were run exclusively on wood fuel from 1940 to 1955 (Becker, 2001, p. 508). Aside from cutting Mali's trees to power trains and boats, the French also harvested huge amounts of trees to extract rubber for the manufacture of tires and other products (Moussa Doumbia, Nov. 24, Becker, 2001). Similar to other empires' dependence on their territories for products, the French would continue to exploit Mali's forests for fuel for the transportation and industry they had introduced to the region until independence in 1960.

Beyond simply taking vast amounts of wood from Mali's forests, the French colonial authorities increased the amount available for their consumption by limiting West Africans' usage of their own forests. Due to the increasing reliance on wood fuel that came with colonization, Bamako and Kati, both centers of French authority in French West Soudan, were experiencing wood shortages by 1915. Individuals were officially prohibited from cutting wood within 50 meters of non-navigable waterways and roads and within 100 meters of major rivers (Becker, 2001, p. 508). Villages in proximity to Bamako, such as Sanankoroba, were placed in an especially difficult position because the city was the center of the colonial government and as a result had more transportation routes, the rivers and roads near which cutting wood was banned. In 1938, the chiefs of Bamako wrote a letter to the French authorities, requesting only that their people could have the right to obtain a sufficient amount of wood to satisfy their daily needs. (Becker, 2001).

These more specific bans on wood cutting came after French law had established state-owned forest reserves and dictated that local people could use the products from land outside these reserves only for non-commercial purposes. In addition, to gain access to even the non-state owned land, it was necessary to obtain the permission of the lieutenant governor of the area and buy a permit (Becker, 2001). The expense of these permits and the completely foreign definition of land ownership suddenly imposed on their land, as well as the need for villageers to find fuel for their own needs, led to the inevitable violation of the laws surrounding cutting wood. The consequence for such violation was heavy fining, which the colonial authorities soon

realized could be another source of revenue for the French state. Indeed, as shown in Table 2, the government gained a significant deal of money through the sale of permits and collection of fines, adding to the list of methods used by the colonial government to exploit the land and people of West Africa.

**Revenue (French Francs) Collected During the First Five Years of Forestry Law Enforcement**

**French Soudan 1927-1931**

<b>Year</b>	<b>1927</b>	<b>1928</b>	<b>1929</b>	<b>1930</b>	<b>1931</b>
<b>Francs</b>	<b>19,84</b>	<b>61,031</b>	<b>127,108</b>	<b>133,431</b>	<b>152,400</b>

Table 2, from Becker, L.C. (2001), shows the increase in revenue from violation fines and sales of permits

This exploitation of colonial territory also took the form of forced labor, making Africans leave their fields and families to complete projects designed to profit France. In the area surrounding large cities such as Bamako, this work entailed mainly chopping wood for fuel and harvesting trees used for the production of rubber tires. To recruit the labor needed for such projects, the regional commanders would send a message to village chiefs demanding a men to be ready on a specified date to report for service. Groups of males aged twenty to twenty-five years old worked month long shifts, after which they returned home and a different set of men replaced them. During the month long shifts, they would work from 6 a.m. to noon and then from 2 pm to 6 pm every day, in large groups or sometimes individually depending on the project. Refusal to cooperate with this system on the part of the village chief or the laborers resulted in severe physical punishment by the French colonial military, not infrequently leading to death. Similar punishment took place if an African resisted cutting down one of the *bois sacrés*, with the French being well aware that such spiritually significant places existed and the meaning that such trees and forests had in the beliefs of villagers (Moussa Doumbia, Nov. 24). These labor projects took place year round with no consideration for seasonal agricultural demands of the region, such as the intense field preparation and planting of the rainy season or the harvesting period of the dry season. This left family members of the forced laborers to work harder to compensate for the loss of the physical work of the young male adults in the household. (Moussa Doumbia, Nov. 24th).

## Forestry Management After Independence

In September, 1960, Mali gained independence from France and consequentially, control over its forest resources. However, this did not result in a return to pre-colonial conservation practices, as the state systems for forest management had already been set in place and would continue to dominate the power over natural resources. Certainly, the French stopped cutting wood to fuel their economic ambitions but the *Service des Eaux et Forêts* remained the strict enforcers of wood-cutting bans and environmental law (Moussa Doumbia, Nov. 24, 2009). The *Opération Aménagement et Production Forestière* (OAPF) was formed in 1972, and worked in the state-controlled forest reserves originally established by the French to supply urban areas with materials for charcoal, matchsticks, firewood and construction. The OAPF also used wage labor from Bamako to plant 6,000 hectares of teak, neem and eucalyptus to supplement the wood they cut from native trees (Becker, 2001, p. 11). Meanwhile, the Sahel region of Africa experienced horrible droughts in the 1970s, wrecking havoc on natural forests, but at the same time encouraging interest in the area's natural conservation.

*Le Service des Eaux et Forêts* (Water and Forest Service) was established by the French colonial government in 1935 and has been a continuous part of state forestry management since (Benjaminsen, 1997, p. 132). The agency has been characterized by periods of harsher and more lenient policies, with villagers remembering the years under the French colonization and the first Malian leader Keita the harshest (Becker, 2001, p. 511). *Eaux et Forêts* employees were first recruited from the military and police, resulting in their authoritative administration and strict punishment of rural villagers for violations of environmental law. In 1981, the agency's activities underwent revision to include more forestry management and provision of technical support, yet it still maintained a dominating image in the minds of villagers, more like policemen than the extension agents they are supposed to be (Benjamin, 1997, p. 132). While the state had been imposing fines and imprisonment on violators of wood-cutting bans for decades, fines established in 1986 were described as "extremely severe compared to income level in Mali", a generally impoverished country even by developing country standards (Benjaminsen, 1997, p. 132, Moussa Doumbia, Nov. 24, 2009).

## **Decentralization**

In March 1991, a coup d'état overthrew Moussa Traoré, Mali's president since 1968, and began a shift towards the decentralization of power throughout the country. Cries for more democratic processes were heard in all sectors of the government, including the administration of the *Eaux et Forêts* (Benjaminsen, 1997). Land tenure policies and the appointment of forest service officials were revised, now being locally elected instead of recruited from the military or police. This new atmosphere of shared power and less central authority also caught the attention of local and international aid organizations, attracting them to the idea of community-based land management (Benjaminsen, 1997, p. 122). After years of state issued reforestation and wood-cutting programs, people were eager to try novel ways of natural resource management stressing action at the local level (Becker, 2001). However, this enthusiasm was not shared by all Malians, "one forester interviewed in March 1996 said that if the government decides to leave the management of the land to the peasants, the trees will be finished off in short time. This view seems to [have] be[en] fairly well represented within the Forest Service" (Benjaminsen, 1997, p. 136). Also, the shift in ideals for management was not based entirely on genuine desire for democracy, as the government's revisions on environmental management corresponded remarkably with the principles of international donor and aid agencies in the same time period (Benjaminsen, 1997). Whether or not decentralization efforts were genuine or intelligent decisions, they marked a step in history changing how Malians view their power over their environment.

## ***AMCFE***

One of the non-governmental organizations that seeks to make local management of natural resources a reality is *L'Association Malienne pour la Conservation de la Faune et de L'Environnement* (AMCFE). Established in 1991 as a non-governmental organization (NGO), the group works mainly in the three communes of Sanankoroba, Bougoula and Dialakoroba, near Mali's capital city of Bamako, but collaborates with NGOs in other regions of Mali. The main funding of the projects discussed comes from a German organization called *Pain Pour Le Monde* (Bread for the World), with some reforestation projects in the past supported by the Jean Paul II Foundation for the Sahel. In carrying out their various projects, AMCFE stresses the action of

local people and groups and does not hesitate to collaborate with other NGOs to provide stronger technical support. In trying to conserve Mali's plants and wildlife, they seek to also help the people most reliant on these same natural resources, most frequently the rural poor and females. (AMCFE, 2009, AMCFE 2008).

The work between AMCFE and communities begins on the part of the local village associations, when they send a letter to the NGO, asking for their assistance in protecting their local environment. Often, villagers are aware that there are problems with the management and condition of local natural resources and hear about AMCFE's work through word of mouth, "*bouche à l'oreille*", from neighboring communities. The next step is the organization of a *convention locale*, ("local convention") between the village association, AMCFE workers, the mayor, the communal *sousprefet* (regional administrative official), local officials of the state environmental service called *Eaux et Forêts* (Water and Forests) and representatives of any other relevant groups who wish to participate. In these local meetings, the environmental problems of the community are identified and future actions of the local people to fix these issues are discussed (M. Coulibaly, 2009).

Commonly, these conversations center on which state environmental laws the village wants to keep in place, which ones they want to amend and maybe even if they want to add their own restrictions to forest product usage. One example of a local agreement is the decree of when villagers are allowed to light brush fires, commonly used to push animals towards an area for hunting. By banning brush fires during the dry season, the chance that they will grow out of control feeding on the dry underbrush is decreased, but still allows people to light fires during the rainy season to hunt. Another common component of these local conventions is negotiating the consequences for cutting wood in protected areas. As mentioned earlier, the *Eaux et Forêts* imposes harsh fines and imprisonment terms on violators of state forestry laws and much of the negotiations revolve around easing these punishments to make them more applicable to rural villagers, for example, lowering the fines to ensure that villagers could feasibly pay the sometimes vast sum. The next step after the oral negotiations is the drafting of a contract between all the involved parties to cement the details in place of how the village will better protect their natural resources. The contract is not official until the mayor, the *sousprefet*, the president of the village association and the local *Eaux et Forêts* official signs their assent. While original negotiations can go smoothly, the finalization of the details of the agreement can go on

for much longer, as the *Eaux et Forêts* department is frequently reluctant to lighten punishments for cutting banned wood. However, AMCFE patiently revises the contract to find a compromise between the needs of the villagers and the law of the state that can be plausibly carried out.

## **Education**

### ***Sensibilisation***

Widely used in Mali on the part of numerous programs, *sensibilisation* is essentially French for raising awareness about a topic through education and discussion. These presentations are typically led by an *animatrice* (“teacher”), an expert on the relevant topic trained to educate others. Since the beginning of its work, AMCFE has hosted many *sensibilisation* programs, spanning the topics of fighting erosion and protecting wildlife to childhood nutrition and safe use of pesticides. These presentations are held in the villages and advertised by the presidents of the village associations who encourage their members to attend (M. Coulibaly). In the most recently reported activities account of AMCFE, in the year between October 2007 and September 2008, nineteen educational programs were carried out, reaching far beyond the group's original goal for three programs for each of the three communes for the year. In the more specific domain of natural resource management, training sessions about fertilization, plant production and methods for erosion prevention were held at for each *organization communautaire du base* (OCB) (AMCFE, 2008). Generally, villagers are aware of the overall environmental degradation of their area but seek to learn more specifically what is causing the problems and how they can contribute to the solution or at least to the slowing of the problem (AMCFE 2003). Attendance is not usually an issue, but when an unacceptably low number of people participate in the *sensibilisation* sessions, the village association president gives AMCFE the names and locations of those who did not attend. With this information, the *animatrice* will visit the non-attendees personally and conduct semi-structured interviews to find out why they did not come and encourage them to attend the programs in the future (M. Coulibaly, 2009). Focused on informing the public and raising awareness, *sensibilisation* aims to sensitively change common attitudes and inspire average citizens to contribute towards protecting the local environment both for the sake of the plants and the people.

While educational presentations and discussions between the leaders of the program and villagers take up the majority of these *sensibilisation* sessions, AMCFE has begun to

communicate their messages to villagers through the technology of radio and video. In one session aimed at the reducing stress on local wood supplies, villagers are shown a short movie called "*L'arbre à Parler*" about a tree that begins to plead with villagers for protection after they have destroyed a forest by cutting down too many trees (AMCFE, 2003). The organization has also begun to send out radio emissions to raise awareness about environmental issues in a different format than the standard classroom teaching style. As part of its 2007-2008 campaign for *gestion durable des ressources naturelles* (GDRN) or "sustainable local resource management", AMCFE conducted five radio programs from a station in Sanankoroba (AMCFE, 2008). Both radio and television are popular among Malians, making them attractive options for connecting to the population about issues concerning sustainable usage of forest products and protection of wildlife.

### ***Jardin Botanique***

In an effort to combine *sensibilisation* with concrete protection of wildlife, AMCFE is helping establish a botanical garden and corresponding educational program at an elementary school in Biron, in the commune of Bougoula. The school was selected for its satisfaction of a set of criteria, including a large space within walking distance of the school that has a variety of plant species and a student population interested in protecting the environment. To start, the village of Biron donated one hectare (ha) of land and a local youth organization erected a fence of wood posts and metal wire, donated by AMCFE. A member of AMCFE's administrative council who is also a botanist surveyed the piece of land to count the numbers and species of trees. He has begun to erect small red wooden signs which state the French, Bambara and scientific name of the plant, as well as the ways it can be used. Future plans for the garden's physical aspects involve paths inside the garden to make it more accessible to visitors and a lock on the fence gate to keep out animals and unwanted visitors. Also, AMCFE and the school will create a *pare-feux*, ("fire wall"), by cutting away the underbrush bordering the garden to prevent the spread of wildfires from outside to the protected area in the garden. According to AMCFE and the director of the school in Biron, the labor for these projects will come from the school and community, who are willing supporters of the project (A. Coulibaly, M. Coulibaly, 2009).

In the educational realm of the botanical garden, the director, Abdou Coulibaly and employees of AMCFE have extensive plans. The school at Biron teaches grades 1-6 of

fundamental education including natural science classes that start in the 4<sup>th</sup> year. Proposed educational projects include creating large flashcards with the different names, uses and drawings of plants found in the garden to teach science classes. The flashcards could be used both in more traditional classroom presentations as well as for more recreational team competitions between students to engage them in a more active manner. There are also plans to teach the staff the scientific and French names of the trees that they already know the Bambara names and local uses. Another proposed educational activity is for the students, teachers and AMCFE members to work in small groups in the garden to answer questions about the vegetation, including not only identifying the species but also brainstorming techniques for protection (A. Coulibaly, M. Coulibaly, Nov. 23, 2009). By instilling environmental appreciation in students at a young age, the relatively new project of *jardin botaniques* teaches future village members to recognize the value of their local plants and the methods they can follow to protect them.

### **Focus on Females**

In its mission to conserve the environment for those who use it most, AMCFE focuses some of its projects specifically on rural women and their usage of forest products. While past forestry management policies by the state placed severe restrictions on wood usage and frequently blame local rural people as the cause of deforestation, these projects are designed to demonstrate how Malian woman can continue to use products of trees but in a more sustainable and profitable manner. In AMCFE's explanation of their goals, they state the desire to pay attention to "*des groupes socioprofessionnelles féminins économiquement pauvres, qui vivent essentiellement de l'exploitation des ressources naturelles*"<sup>1</sup> (AMCFE 2008). Rural women depend heavily on firewood both to fund their daily purchases and to fuel fires for cooking meals, and are aware of the consequences that this dependence brings. Indeed, environmental conservation efforts and womens roles in Malian society are so dependent on one another that any group focused on nature cannot afford to ignore the dynamics between the two.

The reality of cutting and using wood by rural women in Mali is harsh. Female firewood vendors in Sanankoroba reported traveling by foot to family lands three or four kilometers away, about a two hour walk, to search for trees that could be cut and sold in small bundles on the side of the road. The women, who go either in small groups or individually, carry the heavy loads of

wood back to their family compound on their heads, unless they are lucky enough to have a wagon and donkey. After transporting the wood back to town, it is either used as fuel for cooking or bundled and sold to other women, usually for 50 CFA per small bundle (about US \$0.12). The money earned from selling wood is used by the women to buy clothes and shoes for themselves and their children. Aside from clothing their families, Malian women are also responsible for buying the ingredients, typically vegetables, for the sauces that accompany the starchy bases of meals provided by the men. Truly, for some women, selling firewood is the only source of outside income, pressing them to continue cutting wood despite their acknowledgement that it is harmful for their environment. According to one female wood vendor in Sanankoroba, she would stop cutting wood if she could, but she does not see any options for earning money to support her family (F. Doumbia, M. Doumbia, E. Coulibaly, K. Traoré, Nov. 25, 2009).

### **Alternate Sources of Income**

Traditional practices of communally protecting trees valued for their products such as fruit or oils have been left behind as the need for income has pressed rural people into cutting a wider variety of wood to sell. The reliance on a wider variety of trees for firewood means that people are cutting trees that they used to acquire other products from in the past (Becker, 2001). As part of the effort to provide rural woman with a means to earn money while easing the pressure on local woods, AMCFE has begun training women how to take advantage of the products of living trees to demonstrate that they have more value standing and alive than dead and bundled for the firewood market. The gendered focus of these programs is due to the fact that women presently cut the majority of wood in the areas where AMCFE works and would benefit the most from a new source of income (M. Coulibaly, AMCFE, 2009). The first training sessions of this project took place in 2008 with instruction on how to process juice out of the fruit of several types of trees. The training demonstrates the process of juice making from the beginning, picking the fruit, to extracting the fruit juice, mixing with sugar for flavoring, and bottling for selling in the market. After a bit of experimentation, the best drinks were found to be made from *tamarind*, *zaban senegalese* and *ronier* fruits. These training programs also involve *karité* trees, whose nuts provide oil that can be used to make shea butter, a popular ingredient in cosmetic products. The barks and leaves of *karité* can be used for traditional medicine, still frequently used in Mali.

By learning how to utilize the products of trees to manufacture items for the market other than firewood, rural women can both help conserve the local environment and obtain a better source of income. The bottles of juice made from last year's programs with AMCFE cost 1,250 CFA each (about US \$2.87) (AMCFE, 2009), while the average bundle of wood sold in Sanankoroba is 50 CFA, making the sale of one bottle of fruit juice the equivalent of selling 25 small bundles of wood. Soap made from shea butter is sold in other small towns outside of Bamako for 500 CFA a piece, comparable to selling 10 small bundles of wood. Women in Sanankoroba reported selling between 20 and 40 bundles of wood on market days, indicating that by selling just a few bottles of juice a week or several shea butter products, they could easily earn the same if not more money than by selling firewood alone. Encouragingly, the moisturizing qualities of shea butter are popular in cosmetic markets outside of Mali, indicating potential for future business. Certainly, certain species of trees have greater potential as a sustainable source for ingredients of marketable products than when they are chopped dead in a reluctant but pressing search for income.

### ***Foyeres Améliorés***

One of AMCFE's most successful and continuous projects involving reducing the pressure on local forests while providing viable alternatives for women's needs is the promotion of *foyers améliorés* ("improved stoves") for women. The traditional cookstove of Mali and other Sahelian countries consists of three rocks arranged around a wood fire, with as many as ten pieces of wood inserted between the rocks. The open design of the stove leads to an overwhelming loss of the wood's potential energy, with only 5-10% of it being directed to the marmite pot supported by the stones (Tucker, 1986, p. 181). Decreasing the loss of heat and consequentially, the amount of wood needed to cook meals would mean both less labor demands on rural women as well as a slower consumption of firewood in Mali. In an article evaluating the feasibility of fuel efficient stoves in rural areas, Jonathan B. Tucker wrote, "even a 10-20% reduction in the consumption of firewood could save millions of trees and slow the pace of deforestation significantly, providing time for natural growth to catch up with the cutting rate" (1986, p. 181). While eliminating the need for wood fuel to cook would be ideal, more technological stoves such as solar cookers and ones powered by bio-gas are too expensive for the small budgets of Malian women and their families (Tucker, 1986, F. Doumbia, E. Coulibaly, K. Traoré, Nov. 24, 2009). Thus, efforts are concentrated on modifying stove designs made by hand from materials found locally.

The traditional Indian cookstove, or chula, inspired a design for a more fuel efficient apparatus in the 1950s by the Hyderabad Engineering Research Laboratory. During the 1970s, the Lorena cookstove model, constructed of sand and clay, was promoted in several Central American countries (Tucker, 1986, p. 181-2). The first designs of the Lorena cookstove were carved out of a large, solid chunk of sand and clay and were permanently installed in the location they were built. Years of projects working with cookstoves have resulted in numerous adjustments in designs and sizes throughout rural areas worldwide. AMCFE contributes its model of portable fuel efficient stoves to a potter in Burkina Faso named Frederic Yerbanga who developed a different style kiln in the 1970s. Yerbanga's goal was to find a design that kept an even temperature through out the oven, which he achieved by enclosing the fire with banco walls, which also maintained heat for longer, making it more efficient (AMCFE, 1997). The concept of an enclosed fire and banco walls which hold more heat is the basis for the improved stoves that AMCFE promotes through construction demonstrations and *sensibilisation* sessions.

The range of designs for *foyers améliorés* reflects the individuals' preferences for cooking and maintenance. For some, the traditional three stone stoves remains appealing because of its inexpensive and accessible materials, flexibility and low maintenance demands. Women simply need to find three similarly sized rocks and arrange them in a triangle wherever they wish to cook. The stones can be moved to adjust for different pot sizes and are made from one of nature's most durable materials. There exists a modified version of this traditional set-up, where the three rocks are fixed to the ground with cement, providing an extra layer around the rocks to hold in heat, compensating a little for all the heat that escapes out through the sides of the stove (Coulibaly, Nov. 23, 2009). An intermediate step between the modified three rock design and the portable banco model is a circular banco wall with an opening for firewood to be inserted. Frequently, one smaller semi-circle is built connected to a larger one, so that a sauce pot can be cooked at the same time as a grain dish (M. Coulibaly, K. Traoré, Nov. 23, 2009). The *foyers améliorés* that AMCFE is currently promoting are movable, freestanding ovens that are built to fit specific sizes of pots and only need three or four pieces of wood at a time, versus the ten pieces that a traditional model stove would require (Sylla, Nov. 20th, 2009).

Koudedia Sylla has been holding demonstrations and teaching the construction of improved wood stoves as an *animatrice* for AMCFE for ten years, long enough that the women of the villages she has worked in now teach each other how to build the stoves. The construction for

*foyers améliorés* lasts about eight days, with instruction by the *animatrice* in the beginning with the mixing of ingredients, and the end, with construction of the stove. The first step is the mixing of clay, mud and sand with donkey or cow droppings, water and some dried plant material into a material called *banco*. Then for each of the next six days, the resulting material must be remixed and left to sit. According to Sylla, this step is often neglected by the women, resulting in premature cracks in the oven walls. On the seventh day, the women work from the morning until the night building the stoves to fit their exact sizes of pots to ensure the best fit. The final step is cutting open a hole in the bottom wall of the stove where the firewood can be inserted. Sylla related that between ten and twenty women normally attend these training sessions, and the participants are frequently members of local women's groups whose president requested the training.

While *foyers améliorés*' have great potential for an increasing popularity, there are a few distinct problems identified by both the *animatrice* and users of the stoves, which originate mainly from users adjusting to a new piece of equipment and its necessary upkeep. The durability of a new *banco* stove depends a lot on the location of its storage and usage. When the *foyers améliorés* are kept outside, they are vulnerable to erosion by rain and abuse by the children and animals commonly present in rural Malian family compounds. Both falling on the ground and the effects of rain can result in small cracks throughout the *banco* walls, which then weaken the structure of the stove overall. Additionally, women who have been using ten piece of wood all their lives to feed cooking fires frequently try and stuff firewood into the stoves, suffocating the fire within by not providing enough space for air to enter (Sylla, Nov. 20th). Furthermore, the *foyers améliorés* only work well when used with the corresponding sized pot, which frustrated women accustomed to being able to freely exchange one size for the other while cooking. This was originally one of the strongest obstacles to the improved stoves' acceptance in rural Mali (Sylla, Nov. 20th and Becker, 1986). Fortunately, with enough innovation and determination, extension workers such as those with AMCFE have been able to convince many women that the inconveniences of the new stoves are outweighed by the benefits to the environment and improvements in the daily lives of women.

Overall, improved wood stoves have been positively received in the areas where they have been promoted by AMCFE, mainly due to the advantages that the more recent designs provide. The clay walls of the improved stoves retain heat for much longer than just rocks or metal stoves,

meaning that the fire can even be taken away and women can continue to use the heat radiating from the oven (Traoré, Nov. 23, 2009). A specific advantage of the heat retention is that after cooking dinner and removing the fire, a pot of water can be placed on the stove while the family sleeps and they can wake up to warm water for the morning (Sylla, Nov. 20, 2009). A small group of women found using traditional three stone stoves in Sanankoroba said that if they had the means or the money, they would definitely switch to using a more fuel efficient model (F. Doumbia, E. Coulibaly, K. Traoré, Nov. 23). All the materials needed to construct the *banco foyers améliorés* can be found in the local area for free, so it was assumed that they were thinking of more expensive metal-walled or gas-fueled models. While only a bit more heat efficient, the modified three stone design where the rocks are fixed to the ground with a layer of cement achieves a compromise between cultural preservation and external pressure to use more efficient technology. Resistance to changing such a culturally significant aspect such as cooking by outside intervention can frequently be a large obstacle to the acceptance of new stove designs (Tucker, 1986). The leading and most obvious advantage of the new cook stove designs is the smaller demand for labor on the part of women. Sumba Traoré of Safecorein in the commune of Bougoula related that after a year of using the semi-circular permanent model, she only needs to cut wood every three or four months, much less frequent than before she built her new stove (Nov. 23).<sup>2</sup>

## **Reforestation**

### *Pepinières*

In Safecorein, in the commune of Bougoula, down a dirt path away from town, a wooden gate separates the brown and dusty fields outside from the lush green of Bakary Coulibaly's fruit trees and pepper plants growing inside. Across commune boundaries, just off the paved road running through Sanankoroba are rows of small tree saplings popping out of plastic pots straining to grow strong through the dust and heat of Mali with the help of Abdullaye Traoré. These are two of the *pepinières*, or tree farms, sponsored by AMCFE to encourage reforestation of degraded areas. To help supply the trees used in tree-planting projects and promote individual planting of trees in the area, the organization gives technical support to local farmers chosen by the OCB. In 2008, eighteen new *pépinieristes*, "tree farmers", were selected between Sanankoroba, Bougoula and Dialakoroba, to begin receiving training and equipment from AMCFE (AMCFE, 2008). The main criteria for selection of the *pepiniéristes* was agricultural

experience, evidenced in examples such as Bakary Coulibaly's more than 20 year old tree farm. As a result of his own hard work, he was able to double the size of his farm from 0.25 ha to 0.5 ha and is planning for future extension. Abdullaye Traoré is an active member of *Paysanes pour Développement Rural* ("Village Citizens for Rural Development"), and has worked with a Malian seed company and AMCFE on other projects.

After being selected, the farmers received training in growing different species of trees as well as the seeds and plastic pots to start cultivating. (B. Coulibaly, A. Traore, M. Coulibaly, Nov. 23 and Nov. 26). The species of seeds distributed reflect the requests of the farmers for selling and the villagers for reforestation projects. In 2008, eucalyptus, teak, leucaena leuchphala, ziziphus mauritius and melina were given to farmers, and both Abdullaye Traore and Bakary Coulibaly said that eucalyptus and melina were the most popular for individual sales. Eucalyptus is typically favored by Malians for construction material and its rapid growth abilities, while melian provides large quantities of shade and good wood material for the manufacture of matchsticks (M. Coulibaly, Nov. 11). Producing species in demand by the local population means that they are more likely to be valued and therefore better protected.

While the small tree farms supported by AMCFE have begun producing plants with success<sup>3</sup>, there are still challenges facing the *pépiniéristes* and their work. Both Abdullaye Traore and Bakary Coulibaly cited water shortages and damage by insects as major problems in tending to their plants. During years when there has not been enough rain, Bakary Coulibaly climbs down into his wells to dig deeper for water, assuming that there will be more at the bottom. Aside from insects, toads are also a threat to young seedlings, squishing the tiny stems when they come to rest in the moist soil after Abdullaye Traore waters his farm. He also has had his metal fencing stolen by villagers in the past, leaving the plants vulnerable to animals grazing for food. (Nov. 23 and Nov. 26). Besides these issues easily identified by the tree farmers, there is also potential risk in the widespread planting and cultivation of eucalyptus trees. Eucalyptus has been promoted as a wonderful species for reforestation efforts because it grows rapidly and slows wind down, in turn preventing soil erosion and desertification. However, experiments conducted in Burkina Faso and Senegal found that the rapid growth characteristic of eucalyptus also affects the fertility of the soil by disturbing the equilibrium of bacteria in the ground (Flechet, 2008). Although there is no reason to immediately stop AMCFE's usage of eucalyptus plants in their projects, this is definitely an issue worth investigating more specifically in the different

vegetation zones in Mali. Also, while the *pépiniéristes* were selected for their experience in agriculture, there are still inconsistencies between their knowledge and the needs of the particular species of trees being grown (A. Traore, Djallo, Nov. 26 and Nov. 27).

Despite these obstacles, there are still many aspects to the tree farms that point to their successful benefit of the local community. By selling the trees in the local markets to individuals, the sponsored tree farmers earn extra income for their families, which can add to the budget for medicine, food and transportation. Abdullaye Traore reported selling about 2,000 or 3,000 plants per year, at prices between 50 and 150 CFA per plant, depending on the size. That means that at the least, by selling 2000 of the smallest sized plants, he could earn 100,000 CFA (US \$230), a hefty sum in rural Mali. By enabling farmers to grow a product that is in demand both in local markets and for reforestation projects and thus earn a personal profit, AMCFE is also benefitting the health of the families of their *pépiniéristes*. Furthermore, the selection of experienced farmers adds to the potential longevity of these tree farms because although they still might need some instruction on the cultivation of specific plants, they have a good base of knowledge about farming in Mali. By working through already established agricultural workers, AMCFE skips the seasons of learning through mistakes that a project starting with less experienced farmers would have to suffer through until they could establish the best cultivating techniques. This reliance on the experience of local farmers lends to the stability of the *pepinières* and increases the chance they will survive to provide the area with trees.

### **Reforestation Projects**

Support of village reforestation projects is one of AMCFE's most tangible actions, going beyond education and training programs to physically compensate for the loss of trees in the past. AMCFE does not host its own reforestation projects but instead provides technical support for village missions. Mayors, as part of their five year term, have a social, economic and cultural development programs (PDSEC), in which they have begun to incorporate reforestation sessions. The villages have the first and last say about the location and species of new trees, analyzing their town's needs to decide. For example, in Safecorein, eucalyptus was planted along the side of the road near the market and encircling the school, to provide shade and later easily accessible materials for construction. These reforestation projects usually begin in the morning and are done by noon and take place in August, when steady rains can nurture the transplants.

The trees for these reforestation projects come from three different sources, contributions by elected officials, the *pepinières* that AMCFE works with, and purchases from private companies. As part of the annual PDSEC program, the village government uses the tax money of local citizens to purchase trees such as the baobab saplings provided for the 2008 planting project in Kabé (AMCFE, 2008). AMCFE provides the rest of the trees needed for the project with purchases from local *pepinières* funded by Pain Pour Le Monde and in the past, the Jean Paul II Foundation for the Sahel. In 2008, the NGO bought 1,000 trees from the *pepiniériste* in Safecorein, Bakary Coulibaly. Usually the *pepinières* have sufficient supplies of trees for the large demands of AMCFE, but in the case they run out, the group turns to private companies in Bamako to fill the rest of the demand for trees for the project (Djallo, M. Coulibaly, 2009) While the authority figures of mayors and association presidents do plant one or two trees to motivate participants, the majority of the labor is provided by young men from the village. The chief of the village tells the president of the village association to recruit the area's young males, from about 10 years old to marriage age. If someone does not participate in the reforestation other than because of the excuse of being sick, they are fined either 5,000 CFA or a rooster. Since the trees are still small, the reforestation is not very strenuous work, but frequently the younger boys are kept busy fetching water both for the older workers and for watering the new transplants.

## ***Conclusion***

The projects conducted through AMCFE and its partners have great potential in changing the way Malians use and protect their natural resources. Through educating the public, offering alternate uses of tree products and physically compensating for the loss of trees through reforestation, the association's work can effectively ease the pressure of consumption on local forests. Additionally promising is the manner in which AMCFE's work is for the benefit of the people who are reliant in daily life on the environment that the projects are designed to protect. This divergence from past colonial and state-designed forestry management has a better chance for creating a sustainable pattern of wood usage. However, even if every individual in Sanankoroba, Bougoula and Dialakoroba adjusted their lifestyle to the most environmentally sustainable practices, the issues facing Mali's natural resources would not be resolved. All the people in a community play a role in its well being, and for this area, the community of resource users extends beyond the men and women living there to the larger urban population nearby.

Sustainable local usage and community protection of Mali's rural forests is definitely a worthy goal, but for more successful environmental conservation, the heavy urban consumption of rural wood needs to be examined and analyzed. For nearly a century, wood shortages have been blamed on local individuals' over-dependence on forests for firewood, yet urban markets and large-scale consumption has been the end point for many of Mali's trees. If any significant headway is to be made in the fight against deforestation and environmental degradation, conservation efforts at the local level need to continue and major changes in the way humans fuel their industries need to be made.

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## Notes

<sup>1</sup> "The female socio-professional groups who are economically poor, who live essentially by exploiting natural resources"

<sup>2</sup> Improved wood stoves may eventually provide Malians with another advantage in the form of job creation. In Sanankoroba, Mariama Doumbia said that a man had gone door to door selling his services to build the semi-circular permanent version of *foyers améliorés* for 250 CFA ( US \$0.58)

<sup>3</sup> The final count for the 2007-2008 season was 5,021 individual plants (AMCFE, 2008)