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Non-timber forest products in rural Mali: a study of villager use

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Abstract. Malian Forest Service activities and policies have evolved since the beginning of colonialism under the assumption that forests and their products are the property of the government. Today the importance of involving local people in forest management is recognized. The purpose of this research was to determine the range of non-timber forest products local people use either for direct consumption or for income generation and to identify the trees/shrubs that yield these products in natural forests, fallow lands and crop fields. A gender analysis of the data was also conducted. The data were collected from face-to-face structured interviews using open-ended questions of 92 randomly sampled households in six Malian villages. One-half of the interviews were conducted with women and the other half were with men. The study identified 55 different non-timber forest products produced by 108 plant species. Almost all (99%) of the products identified are used for personal consumption, whereas 68% of the products are also used to generate income. Products such as firewood, leaves for sauces, shea nuts for oil/butter, seeds for condiments and nuts/seeds for soap are the most frequently mentioned products collected by women. Different categories of products like utensils/house materials, animal feed and construction materials (thatch, poles, mats) are the products most frequently collected by men. Ninety percent of the products collected are found in the natural forests; 63% are collected from trees on fallow lands and 51% from scattered trees in crop fields. Forest Service support of villagers using non-timber forest products would create an economic relationship between the forest and the local people. This is essential for the protection of the forest because people will safeguard their interests.

Introduction

Since the drought of 1970 in Sub-Saharan Africa, the Malian Forest Service has carried out tree planting projects (industrial plantations) with the primary goals of overcoming fuelwood and timber shortages and lessening the effects of desertification. The projects have emphasized fast-growing trees of exotic species (e.g., *Azadirachta indica, Gmelina arborea, Eucalyptus camadulensis, Tectona grandis*, and *Cassia siamea*). The goals of these plantations were not fully achieved for three main reasons: (1) the plantations were costly to establish and concentrated on government lands; (2) they were established on lands previously occupied by good stands of native plants producing non-timber forest products; and (3) their products were not directed to the local

populations' needs; instead they were sold in external regional markets. For many rural people the non-timber forest products, defined as the forest and/or tree products collected by rural people for direct consumption or personal income generation, are important to their social and economic systems of survival. The forestry programs developed in the years following the drought were primarily concerned with halting desertification and addressing the shortage of fuelwood [Jackson et al., 1983]. However, farmers give more priority to the availability of a wide range of non-wood products traditionally collected from the forests, such as edible fruit, fodder and browse for animals, fibers and bark, and medicinal plants [Jackson et al., 1983]. Forest management which focuses on those products and recognizes their value to local people, could involve villagers in forestry activities.

The primary goal of our study was to provide managers of natural tropical forests information about how villagers use forests to gather non-timber forest products. Villagers have a stake in ensuring the productive development of forest resources to meet their own needs. Information on local residents' uses of non-timber forest products is essential to formulate successful programs for villagers' participation in the management of classified forest.

Forest management, based on people's participation and embodying the concepts of 'social forestry', is necessary in rural Mali. A social forestry project implies that the group of beneficiaries is defined, that their needs are known, that the products produced under the project meet these needs, and that these beneficiaries do, in fact, participate in design, implementation and evaluation [Noronha and Spears, 1985]. FAO [1978] used the term social forestry interchangeably with 'farm and community forestry' and 'forestry for local community development'. The term social forestry is also used to refer to a broad range of tree- or forest-related activities that rural landowners and community groups undertake to provide products for their own use and to generate local income [Gregersen et al., 1989]. Activities include farmers growing wood to sell or use for firewood; communities or individuals earning income from the gathering, processing, and sale of minor forest products such as fruits, nuts, mushrooms, herbs, basketry materials, honey and wines; and governments or other groups planting trees on public lands to meet local village needs. Finally, Cernea [1989] summarizes the current concept of social forestry as programs designated to: (a) motivate large numbers of people to plant trees; (b) promote the kind of tree-growing that will best supply fuelwood, small timber, grasses, and income to the small producers themselves; and (c) provide increased benefits to the poorer strata.

Definition of non-timber forest products (NTFP)

In the literature non-timber forest products (NTFP), are also called non-wood products or secondary forest products. The term 'non-timber forest product' encompasses all biological materials other than timber which are extracted

from natural forests for human use. These include foods, medicines, spices, essential oils, resins, gums, latexes, tannin, dyes, ornamental plants, wildlife (pro-ducts and live animals), fuelwood and raw materials, notably rattan, bamboo, smallwood and fibers for household utensils. The alternative label of non-wood products unsatisfactorily excludes important material resources derived from the forest and trees by rural people such as fuelwood, building poles, and smallwood for handicrafts and tools [De Beer, 1989].

Many products from trees are extracted by local people using simple technologies (axes, hoes, carts pulled by donkeys or oxen, headloads, etc.). The people living in or near the forests often use these products even though such products are usually, and wrongly, called *secondary* forest products by forest managers [FAO, 1982].

It has been reported that non-timber forest products (NTFP) may be as important as cultivated crops for rural people [FAO, 1982; Miller, 1984]. During famine years and critical periods of the year, these products constitute the source of basic foods for peasants. Their importance may be even greater because of their variety and their availability during different periods of the year. In addition to food supply, the NTFP play other roles in rural people's activities. Often, when natural forests are converted to plantations, the NTFP become scarce, and this may negatively impact rural people's lifestyle as reflected in the following quote:

> What needs to be understood by people dealing with African forestry but not living in Africa, or not close to African traditions and values, is that for the well-being and daily lives of millions of people, these products (non-timber forest products) are comparable in importance to the use of wood for structural purposes. Africans, of course, know this, but it is so self-evident that they may not make a point of it. [FAO, 1982]

For the purposes of this study the term 'non-timber forest products' is defined to include forest and/or tree products collected by rural people and used by them either for direct consumption or personal income generation. These products are gathered from natural forests, trees on fallow lands and from scattered trees in crop fields. The emphasis is on the scale of production and the benefit for rural people. Animal products, such as bush meat, skins, etc., are not included in this study.

Research objectives

Two research objectives guided this study. The first was to identify the range of non-timber forest products used by rural people, including how these products are obtained and used and which gender collects each non-timber forest product in the household. The second was to determine which plant species produce the NTFP identified.

Study area

The study was conducted in a rural area in the transition between the Sudanic and Sahelian climatic zones of Mali, West Africa. This area is comprised of shrub-and-tree savannas and grass-and-shrub savannas. The average annual rainfall is about 900 mm and the mean annual temperature is 30 °C. Three main seasons exist in the year: a rainy season from June to October; a cool, dry season from November to February; and a hot, dry season from March to May.

The traditional production system is a bush fallow system based on a subsistence economy with products harvested from croplands, fallow lands and natural forests. This agrosilvipastoral system integrates crops, trees, shrubs and livestock. NTFP from non-plantation forests (including fallow lands and naturally-wooded lands) are sources of many useful goods and products for local people, including many products which complement cultivated foods. The economy in the study area is based on agriculture and animal husbandry.

Methods

The case study research design was carried out between February and May 1991 in six villages near the national forest reserve, 'Forêt Classée des Monts Mandingues', which is 15,000 ha in size, located 25 km south of Bamako, the capital city of Mali. The primary method of data collection was face-to-face structured interviews of household members using open-ended questions. Men and women in 92 randomly selected households in six villages around the forest were interviewed. One-half of the household interviews were conducted with women 15 years or older and the other half were with men more than 15 years old. Women's interviews were done in households different from where men's interviews were held [Gakou, 1992]. Additional data collection methods used to triangulate findings included observations of NTFP sold in the village markets, interviews with people selling specialty NTFP in villages, observations of NTFP identified in subjects' homes during the interview process and a literature search (primary to verify tree species' names).

Limitations

Because the purpose of the interviews was to determine the range of non-timber forest products and species being used by rural people, we used an open-ended question asking participants to name the NTFP collected in their household. If a participant failed to mention a product, such as firewood, e.g., they were not asked specifically about firewood. Thus, our goal was to identify products used by men and women in a household, not the proportion of households using a particular product. We report the total number of times

a specific product was voluntarily mentioned by the interviewees. Relative importance of products can only be implied based on frequency of a product being mentioned. Participants were not asked to prioritize any list of products, because not all subjects reported the same products; thus prioritization of a list was not feasible or valid.

Key findings

A total of 769 data records which represent each time a specific product was mentioned during the household interviews was obtained. The number of products mentioned per household ranged from 3–15 with an average of 8. Four major findings of the study are presented.

NTFP are important to villagers for direct consumption and income generation

Table 1 summarizes the individual non-timber forest products that were identified during the study according to 7 categories of products:

- Utensils/Working Tools/House Materials
- Firewood
- Food
- Fodder
- Construction materials
- Medicines
- Other products

The specific products identified are listed under each group of NTFP.

Fifty-five different NTFP coming from 108 different plant species were identified. Almost all the products (99%) collected are used in the household as a source of energy, utensils, tools, construction materials, food, fodder and medicines. In the study area where drought often lessens agriculture productivity, NTFP are extremely important as food supplements. Food accounts for 54% of the total NTFP. Among the edible products, leaves for sauces, fruits, shea nuts for oil/butter and seeds for condiments are the most important. The high frequency of collection of fruits may in part be due to the fact that a wide variety of fruits from many different tree/shrub species were mentioned and all fruits from different species are reported as one category. The plant species producing these foods are mainly: *Vitellaria paradoxa, Parkia biglobosa, Adansonia digitata, Mangifera indica, Detarium microcarpum, Gardenia erubescens, Landolphia senegalensis* and *Tamarindus indica.*

In the villages studied, two-thirds of the products are also sold at the village weekly markets and city markets. Female respondents report selling firewood, fruit, shea nut butter, seeds for condiments, scrubs to wash dishes and brooms for house cleaning to generate income in order to buy condiments and clothes.

Table 1. NTFP groups identified during the study along with the percentages and number of times they were mentioned by interviewees.

Products groups	Percentage of responses	Number of times mentioned
Utensils/Working tools/House materials	5	34
Nuts/seeds for soap	3	22
Furniture	2	12
Fuel/Energy	4	29
Firewood	4	29
Food	54	414
Leaves for sauces	2	17
Fruit	32	244
Shea nut for oil/butter	10	79
Seeds for condiments	10	74
Animal feed	2	12
Fodder from leaves	2	12
Construction materials	19	143
Branches/poles for fencing	2	13
Poles for roofing	4	29
Thatch for roofing	5	41
Rope	3	23
Vines for roofing	2	13
Mats for shelter/partitioning	3	24
Medicines	11	85
Tea leaves in drink to cure malaria	2	13
Tea leaves in drink to relieve stomach ache	2	13
Other medicines	7	59
Other products	6	52
Total	100%	769

The most important products sold by men are furniture, fruit from planted trees (*Mangifera indica, Psidium guajava, Citrus* spp.) and some construction materials (poles, thatch, rope, mats). Villagers reported that the products like fodder and medicine are always sold in cities although villagers also use them for their own purposes.

Many studies stress the importance of firewood and charcoal to villagers in Mali and in other developing countries [DNEF, 1985; Gellar, 1980; Ohler, 1985; Poulsen, 1978]. This importance of firewood and charcoal is expressed in terms of the consequences their exploitation entails to natural tropical forests (deforestation). However, our study as well as others [FAO, 1982; Jackson et al., 1983; Miller, 1984] revealed that fruit, shea nuts, seed for condi-

ments, fodder, medicines, fencing and construction materials are also important to people living in rural areas.

Most NTFP used by villagers come from the native plant species

Among the 108 plant species identified by the villagers as plants producing the NTFP, only *Azadirachta indica* and *Gmelina arborea*, which were each mentioned twice, are used by the Forest Service in plantations. *Eucalyptus camadulensis*, an exotic species used in plantations, was mentioned as a potential plant species for the production of construction poles. The plant species mentioned 25 or more times were: *Adansonia digitata, Andropogon amplectens, Andropogon gayanus, Dehiteropogon hageripii, Detarium microcarpum, Gardenia erubescens, Landolphia senegalensis, Mangifera indica, Parkia biglobosa, Pterocarpus erinaceus, Shizachyrium* spp., *Tamarindus indica, Terminalia macroptera*, and *Vitellaria paradoxa. Parkia biglobosa* and *Vitellaria paradoxa* were mentioned more than 100 times. Only *Mangifera indica* is planted; all other species are in the natural forest. Most species are used by both men and women, often for more than one NTFP. *Andropogon gayanus* (for mats) and *Andropogon amplectens, Dehiteropogon hageripii* and *Shizachyrium* spp. (for thatch roofing) were only mentioned by men. Table 2 presents all the plant species mentioned 5 times or more. These plants provide over 90 percent of the products mentioned and about half of all the plant species mentioned. Table 2 also indicates how often the species was mentioned by interviewees, the major products, gender of collectors, where the species is found, and whether it is natural, planted or exotic.

Natural forests are the dominant production sites of NTFP

Ninety percent of the NTFP collected are from the natural forests, 63% from the fallow lands and 51% from the crop fields. The conversion of natural forests to plantations of single exotic species results in many NTFP becoming scarce or totally unavailable.

Tree tenure is exercised on the crop fields. The trees belong to the household which cultivates the site. Products collected in the crop fields are mostly the ones collected by women: seeds for soap from *Euphorbia balsamifera*; leaves for sauces, mainly from *Adansonia digitata*; fruit from *Vitellaria paradoxa, Parkia biglobosa, Tamarindus indica* and *Mangifera indica*; seeds for condiments from *Parkia biglobosa*; and nuts for oil/butter from *Vitellaria paradoxa.* Men also collect the fruits of *Parkia biglobosa* and *Tamarindus indica* because those fruits are picked on the trees before they fall down. Men usually climb the trees, but women use long sticks to pick fruits. Men also reported collecting fencing materials from cropfields (mostly branches from *Euphorbia balsamifera* and *Zizyphus mauritiana*). *Vitellaria paradoxa* fruits were collected by everyone in the village regardless of who owns the cropfield. Nuts for soap from *Ximenia americana*, furniture from *Raphia*

Table 2. Species mentioned five times or more, their major products, collectors' gender, and place collected.

Plant species[a]	Frequencies of plant species	Major Products	Gender of collectors[b]	Place collected[c]
*Adansonia digitata**	25	Leaves for sauces, fruit, condiments	W	NF, FL, CF
Afromosia laxiflora	9	Poles for roofing, medicines, fences	M, W	NF
Afzelia africana	8	Tools, utensils, fodder, poles, mortars	M	NF
*Anacardium occidentale***	8	Fruit	M, W	CF
Andropogon amplectens	38	Thatch, browse	M	NF, FL
Andropogon gayanus	25	Mats	M	NF, FL
Anogeissus leocarpus	7	Fences, poles, medicines	M	NF
Anthocleista procera	12	Fruit, vine	M	NF
Bambusa vulgaris	17	Poles	M	NF
Bauhinia spp.	6	Rope	M	NF, FL
Bauhinia reticulata	8	Rope, medicines	M, W	NF, FL
Bombax costatum	5	Utensils, condiments	M, W	NF
Borassus aethiopum	17	Fruit, sponges, baskets	W	NF
Burkea africana	12	Poles, toothbrush, medicines	M	NF
Cassia siberiana	6	Furniture, poles, medicines	M	NF
Citrus spp.**	6	Fruit	M	CF
Combretum spp.	9	Firewood	W	NF, FL
Combretum gazalense	20	Firewood	W	NF, FL
Combretum glutinosum	10	Firewood	W	NF, FL
Combretum velutinum	6	Firewood	W	NF, FL
Cordyla pinnata	6	Mortars, medicines	M	NF
Crossopteryx febrifuga	5	Firewood, medicines	W	NF
Dehiteropogon hageripii	37	Thatch, browse	M	NF, FL
Detarium microcarpum	48	Firewood, fruit	W	NF, FL
Diospyros mespiliformis	5	Fruit, poles, medicines	M, W	NF
*Euphorbia balsamifera**	16	Soap, fences	W	CF
Gardenia erubescens	27	Fruit	W	NF

Gibourtia copallifera	6	Firewood, poles	W	NF
Hyparrenia spp.	11	Rope	M, W	NF
Isoberlinia doka	19	Firewood, poles	M, W	NF
Khaya senegalensis	13	Furniture, mortars	M	NF
Landolphia senegalensis	46	Fruit, vine, medicines	M, W	NF, FL
Lanea acida	13	Fruit, rope, medicines	W	NF
Loudetia superba	8	Broom	W	NF, FL
*Mangifera indica***	25	Fruit	M, W	CF
*Maytenus senegalensis**	9	Sauces, medicines, poles	M, W	CF
Opilia celtidifolia	10	Fruit, medicines	W	NF
Oxytenanthera abyssinica	14	Poles	M	NF
Parkia biglobosa	145	Condiments, fruit, medicines	W	NF, FL, CF
Pennisetum pedicellatum	7	Thatch, browse	M	NF, FL
Prosopis africana	10	Tool handles, poles, medicines, pestle	M	NF
Psidium guayava	6	Fruit	M	CF
Ptelopsis suberosa	18	Firewood, medicines	W	NF, FL
Pterocarpus erinaceus	50	Poles, firewood, fodder	M, W	NF
Raphia sudanica	20	Poles	M	NF
Shizachyrium spp.	39	Thatch	M	NF, FL
Tamarindus indica	29	Fruit, medicines	M, W	NF, FL, CF
Teclea grandifolia	5	Beverage	M, W	NF
Teclea sudanica	15	Medicines	W	NF
Terminalia macroptera	27	Firewood, medicines, poles	M, W	NF, FL
Trichilia emetica	5	Medicines	W	NF
Vitellaria paradoxa	122	Butter, fruit	W	NF, FL, CF
Ximenia americana	22	Soap, fruit	W	NF, FL
Ziziphus mauritiana	11	Fences, fruit	M, W	NF, FL

[a] * Planted species, ** Exotic species.

[b] M = men, W = women.

[c] NF = natural forest, FL = fallowlands, CF = cropfields.

sudanica and *Khaya senegalensis*, fruits from many species, ropes, vines for roofing, mats, thatch, medicines and most products collected in the crop fields are also gathered in the natural forests.

There is a difference between men's forest use and women's forest use concerning the collection of NTFP

An important objective of this study was to interview both men and women about NTFP to determine the differences in gender perceptions in forest use, i.e., who collects which NTFP in the household and who is aware of the use of which products. Men reported that 57% of the products they named as being collected in their household were collected by males and 43% by females. However, of the products mentioned by the women, 81% were collected by females, only 19% by males. The chi-square test (137.1; $p > 0.001$) indicates there was a statistically significant difference.

Some important products, like firewood, were almost always mentioned by women and collected by women. Other important products like shea nut butter and seeds for condiments from *Parkia biglobosa* are mentioned by both men and women and gathered by women. Leaves for sauce and nuts/seeds for soap are primarily mentioned by women and are gathered by women. Men are interested in products for furniture and construction. They are the ones who mention these products as well as collect them. Products like fruit and medicine are gathered by both men and women. Table 3 shows the products collected by gender and their frequencies.

Men mentioned almost the entire range of products collected by women, but did not report knowing that women collected them as often as the women reported collecting them. Women did not talk about all the products collected by men. The perceptions by both genders as to who collects more of the three regularly used items (firewood, food and fodder) were similar. However, there are large differences in gender perceptions over the collection of all irregularly used items (house materials, construction materials, medicines, other products). Women reported little awareness of the construction materials collected by men for both personal use and to generate income, according to the men.

Management implications

Forest planners should consider the forest products and plant species important to rural people in forest planning. The wise use of the forest and the forest resources will only come about when the people's interests are taken into consideration and they freely participate in forest activities. The Forest Service must work with the villagers near the natural forest to determine a sustained use of the forest products identified by villagers. This type of policy could relieve the natural forest from the pressure of fires and over-

Table 3. Frequency of products mentioned by gender.

Products	Male interview		Female interview	
	Collected by male	Collected by female	Collected by male	Collected by female
House materials				
Nuts/seeds for soap	0	4	0	18
Furniture	12	0	NM	NM
Firewood	2	4	1	25
Food				
Leaves for sauces	0	2	1	15
Fruit	78	114	51	121
Shea nuts	1	35	1	44
Seeds for condiments	4	31	3	40
Fodder	10	7	2	1
Construction materials				
Branches/poles for fencing	12	2	1	0
Poles for roofing	27	1	1	0
Thatch for roofing	38	0	2	0
Rope	21	1	0	2
Vines for roofing	13	2	NM	NM
Mats for shelter/partitioning	24	0	NM	NM
Medicines				
Tea leaves in drink to cure malaria	8	7	1	5
Tea leaves in drink to relieve stomach ache	5	4	1	8
Other medicines	28	18	7	29
Other products	27	7	3	18
Total*	310	239	75	326

NM = Not Mentioned when interviewing female respondents.
* The frequencies add up to more than 769 because many products are collected by both men and women.

cuttings. Forest planners should recognize which forest products are important in the lifestyle of local people (villagers). Promoting those products and making them accessible to villagers will contribute to their rising living standards.

Extension Foresters should share their knowledge with villages. The usefulness of some products are not known by the villagers. For example, *Anacardium occidentale* (plant species producing the cashew nuts) grows easily in the zone of the study. Some people from the capital city buy the nuts in weekly markets of the villages surveyed at 50 CFA francs and sell

them in they city at 400 CFA francs. The big buyers in the cities are reported to sell the nuts outside the country. The foresters can easily increase the living standard of local people by creating some type of association of villagers based on plantations of *Anacardium occidentale* which can bear fruit the fourth year of its plantation.

The indigenous species that were mentioned frequently during the interviews are not used in plantations because they are believed to be slow-growing plant species. It is only recently that the Malian Forest Service has started experimenting with some of the native species. Forests and biologists need to continue to learn the performances of native species (adapted to the local ecological conditions) in order to implement good techniques of their plantation management. Fast-growing species may be suitable for marginal lands if their purpose is to combat deforestation. Focusing on the improved management of existing natural forest would address some of the constraints inherent in community forestry projects [Falconer, 1987] and would meet more of the needs of local people for a wide variety of products.

The information from the gender analysis suggests forest planners lose valuable information by just working with men. Almost all the forest projects in Mali as well as most in the rest of the world, have focused almost exclusively on working with men. This fact may account for the failure of many of these programs. Hoskins [1982] found that a number of village woodlot projects in West Africa had failed even though they were planned with local villagers (men). Forest planners should consider women's involvement in forest planning because they are significant users of the forests as well and their use is not identical to that of men.

Although this study provides valuable new information on NTFP, there are still many unanswered questions. One of the most important ones to forest managers is the determination of the amounts of NTFP that people are using. Techniques for measuring such a wide variety of products need to be developed.

Conclusion

In a country such as Mali, which faces the effects of desertification, one of the most important development policies is the struggle against moving desert, wood scarcity and drought effects. The information from this research can help foresters develop a method of forest resources management which involves the people's interests and thus, helps people overcome the lack of firewood, food and pasture, increases their living standard and at the same time combats desertification.

Villagers know much about the forest and forest products and they were proud and glad to be given the opportunity to share their knowledge. The information they provided can be very useful to any foresters seeking people's participation or biological information about the plant species in the region.

Also rural people's knowledge can contribute much in a short period of time to any research project investigating the genetic contribution of native plants. Rural community life is characterized by substantial variety in natural and social systems and in individual preferences [Korten, 1987]. Optimizing productivity and sustainability in resource use to improve human well-being depends on appropriate adaptation to this variety [Korten, 1987].

The results of this research suggest that villagers' use of forests and trees needs to be included in the decision making process about the future of forests and trees in Mali. Forest Service support of villagers using NTFP will create an economic relationship between the forest and the people in its vicinity because people will be willing to safeguard their interests. A partnership between foresters and the people they serve is essential for the forest's protection and long-term survival.

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