

Farmers' perceptions of the role of trees in the agricultural landscape of the Sudanian zone of Senegal: the case of Medina Yoro Foulah in Upper Casamance.

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Abstract

A study was conducted to ascertain farmers' perceptions of trees in the agricultural landscape of the Sudanian zone of Medina Yoro Foulah in Senegal. Survey results indicate that trees play a central role in the agricultural production system through social (production of food, fodder and drugs), economic (wood production and income generation), agronomic and ecological (soil conservation) functions. Farmers' preference of tree species is dictated by the roles the species plays but generally the typical ranking in decreasing order is: fodder production > food production > high quality wood > soil fertility maintenance > medicinal > income generation. Farmers are averse to trees with negative or competitive effects on crop production and those with superficial rooting systems (which makes land preparation harder). Constraints to increasing and/or stabilization of tree numbers in the landscape mainly include recurrent wild fires and termites. Based on kept or planted species and on farmer preferences, a list of six priority species with significant potential to spark strong interest among farmers was established.

Media Summary

Trees in Parkland agroforestry systems of Senegal contribute sustainable improvement of soil fertility.

Keywords

Fertility, soils, sustainable conservation, agroforestry

Introduction

Trees play an important role in many farming systems through soil conservation and the provision of other products e.g. food, fuel, fodder and medicine which help cover basic needs of rural people. In contrast to countries like Burkina Faso where studies have been carried out to improve parkland agroforestry systems in both the sahelian (Ouedraogo, 1994) and sudanian zones (Mahamane, 1996), in Senegal, available literature almost exclusively focuses on the sahelian zone (Lericollais, 1990; Sène, 1994). This study is an attempt to fill that gap by covering the sudanian zone of Medina Yoro Foulah (Upper Casamance), an area characterized by gravelly soils that are very sensitive to water erosion and agricultural intensification. In such an area, a rational management of natural resources, especially of the tree cover is necessary to avoid in the short-term a rapid degradation of soils and a decline in agricultural productivity. This study highlights the various functions of trees in these agricultural system, presents farmers' species preferences, the reasons for their choices, and discusses the constraints to the conservation of trees in the landscape.

Data and methods

This work was conducted in Medina Yoro Foulah an area in southeastern Senegal under the influence of the sudano-guinean climate. Rainfall is relatively high-1042 mm per year (Kouta, 1998), but not well distributed (60 to 80 % of total annual rainfall recorded between August and September). There are two main soil types in the area: *ferralitic* and *ferruginous* tropical leached soils which are inherently very sensitive to water erosion. Contemporary vegetation consists mainly of highly degraded forests occasioned by poor land management and wildfires. The native Peuls, the major local tribe, cultivate various crops (millet, maize, sorghum, peanut, cotton, fonio) and practice extensive and sedentary livestock husbandry. However, agricultural expansion due to increased population inflows from northern

regions has led to a reduction of fallows and thus to reduced animal mobility during the rainy season. Thirty six farm households randomly selected in four villages (Dinguiraye, Sinthiou Daouda Sarr, Hamdalla? and Yalal) were surveyed. Collected data includes available tree species farmers' tree preferences and constraints to maintaining trees in the landscape.

Results and Discussion

Twenty three tree species are maintained in the fields by farmers, twenty of which are what farmers would prefer to have on their fields (Figure 1). The main ones are in decreasing order of preference: *Cordyla pinnata*, *Pterocarpus erinaceus*, *Bombax costatum*, *Lannea acida*, *Parkia?biglobosa*, *Sterculia setigera* and *Faidherbia albida*. The first reason given by farmers to explain their choice is fodder production (*Pterocarpus erinaceus*, *Bombax costatum* and *Faidherbia albida*) or food production *Cordyla pinnata*, *Lannea acida*, *Parkia?biglobosa* et *Sterculia setigera* (Table 1).

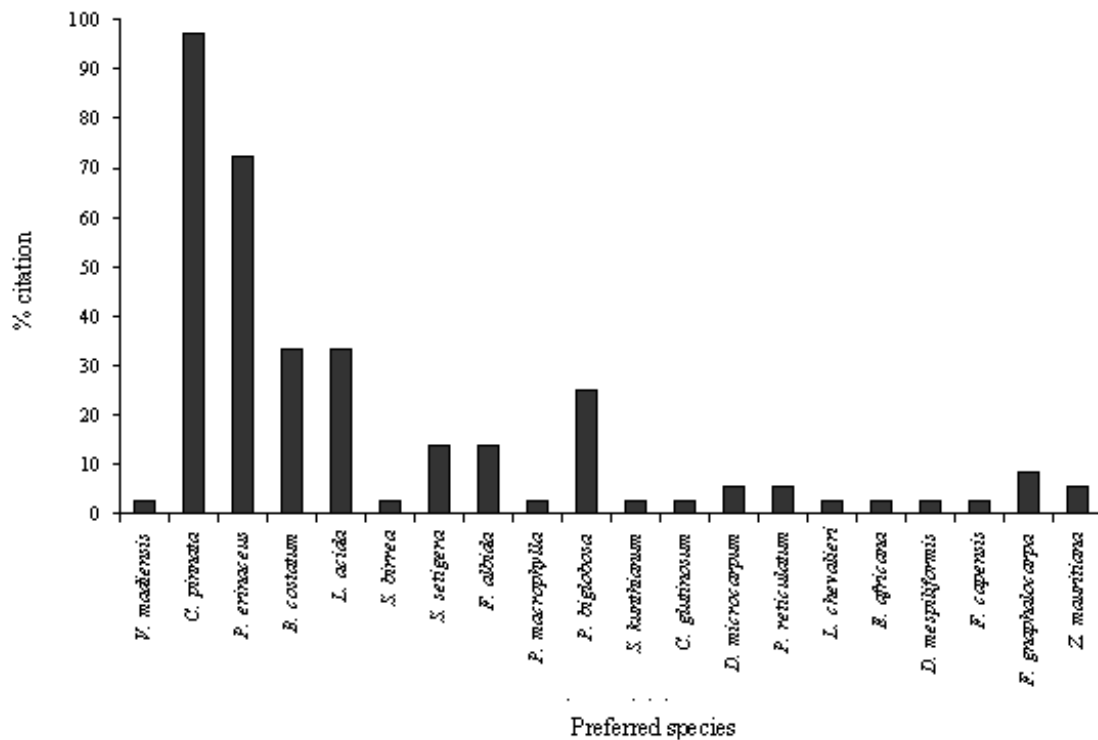


Figure 1. Preferred tree species in crop fields.

Table 1. Preference Indicators for tree species in crop fields

Indicators of preferences for tree species	% of responses
Production of quality wood	19
Conservation of soil fertility	17
Food for human consumption	21

Generation of income	3
Medical/health care	16
Production of fodder	22
Shade provision	2

Food species provide supplemental food supplies to populations during the “hunger” season that coincides with the peak period of agricultural labor use for field work. Fodder species provide animal feed during the dry season when pasture lands are dry and of low nutritional value. Other reasons for farmers’ preferences are wood production, the contribution to soil fertility conservation and the use for medical purposes. Income generation capacity appears as a secondary criterion.

Figure 2 shows that 19 species are not desired in the crop fields by farmers. Mostly cited is *Erythrophleum africanum*, followed by *Lannea acida*, *Terminalia macroptera*, *Sterculia setigera*, *Ficus gnaphalocarpa* and *Combretum glutinosum*. It is worth mentioning that some farmers do not wish to have on their crop fields species (*Pterocarpus erinaceus*, *Bombax costatum*, *Lannea acida*, *Parkia?biglobosa*, *Sterculia setigera*) that have a high score in the species preference ranking list. As argued by S?ne (1994), this illustrates the high level of heterogeneity in farmers’ perceptions. A given specie may have advantages and drawbacks at the same time. That is the case of species with strong shade allowing very little light through for ground crops, resulting in yield losses.

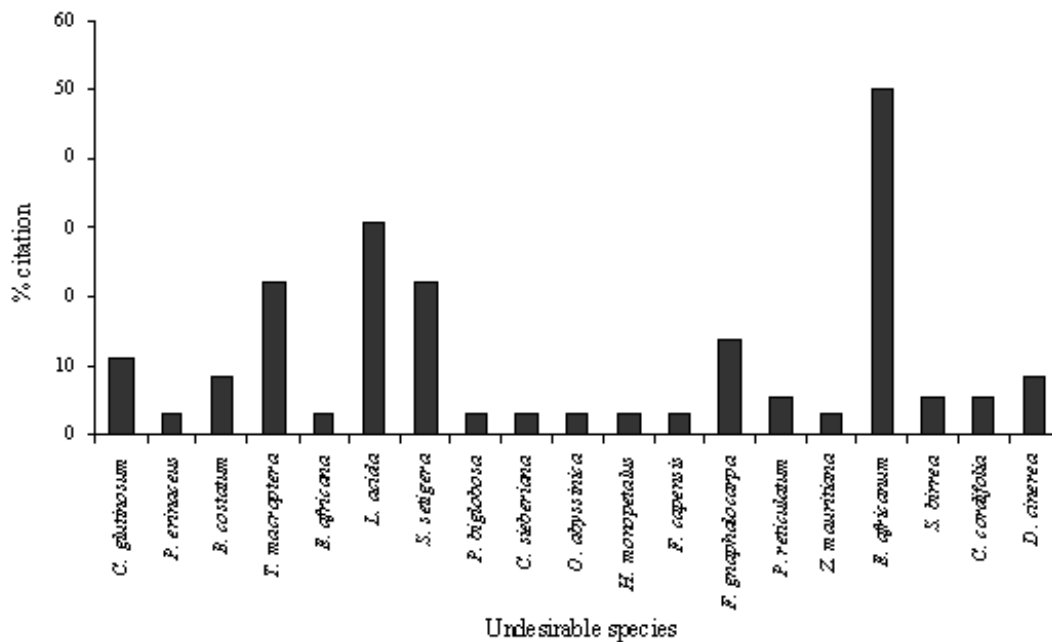


Figure 2. Tree species not desired in crop fields.

Reasons for farmers’ rejection of species are presented in Table 2 and are in decreasing order of importance : negative effects on crops (*Lannea acida*, *Combretum glutinosum*, *Terminalia macroptera*, *Entada africana*), toxic effect (*Erythrophleum africanum*), being thorny (*Dichrostachys cinerea*), the

superficial rooting system that increases hardship of soil preparation (*Sterculia setigera*), excessive growth habit (*Terminalia macroptera*) and the production of low quality wood.

Table 2. Indicators of rejection of tree species.

Indicators of rejection	% of responses
Negative effect on crops	45
Presence of thorns	11
Toxicity	34
Superficial rooting system	6
<i>Excessive growth habit</i>	2
Low quality wood	2

Wildfires are the main cause of degradation of the tree population in the study zone (Figure 3) followed by termites, damage caused by wandering animals, the cutting and destruction of trees by farm implements and attacks from diverse parasites. Tree planting is not yet a very widely adopted practice because only 69 % of farmers claim having done so. Five cited species are of exotic nature (Table 3) and are planted for their fruits (*Mangifera indica*, *Carica papaya* and *Anacardium occidentale*) and their wood (*Azadirachta indica* and *Eucalyptus camaldulensis*). Eighty per cent of farmers who have planted trees have done it in their compound gardens?; tree planting in bush crop fields is rare.

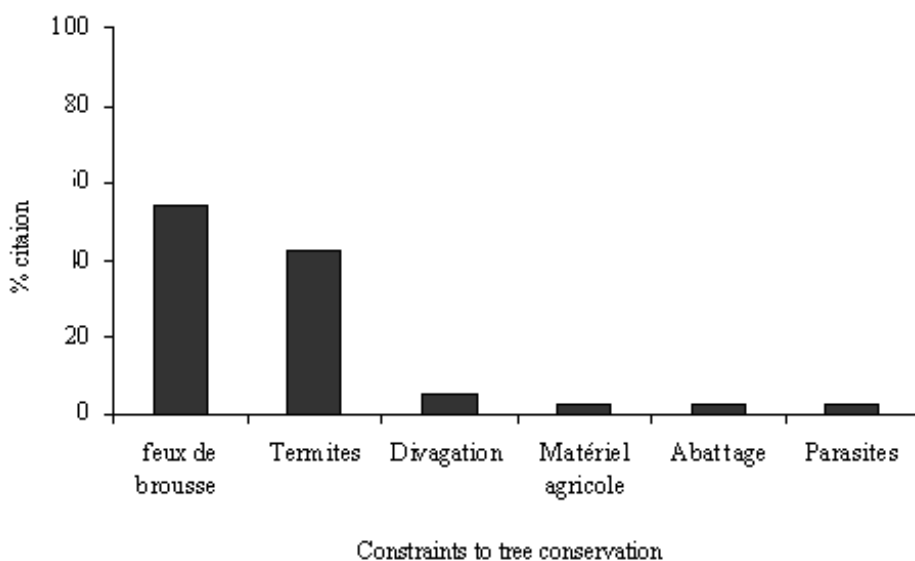


Figure 3. Constraints to the maintenance of tree species in crop fields.

Table 3. Tree species planted by farmers.

Species	% of responses
<i>Mangifera indica</i>	87
<i>Eucalyptus camaldulensis</i>	4
<i>Azadirachta indica</i>	22
<i>Carica papaya</i>	4
<i>Anacardium occidentale</i>	22

Conclusion

The integration of trees in the agricultural system is a common practice in the Medina Yoro Foulah zone. Farmers justify it by the multiple functions played by trees (social, economic, and agronomic if not ecological). However, the sustainable conservation of trees may be threatened by recurrent wildfires and termite attacks. Based on species kept or planted on the fields, as well as those preferred or not desired by farmers, a list of six priority species (*Cordia alliodora*, *Pterocarpus erinaceus*, *Parkia biglobosa*, *Mangifera indica*, *Anacardium occidentale* and *Azadirachta indica*) with potential to generate interest of local populations in research and development programs has been established.

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