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Faidherbia albida agroforestry parkland with cowpea crop, North Region, Cameroon. Photo: Régis Peltier

Three decades of *Faidherbia albida* agroforestry in Far North Region, Cameroon

Amah Akodéwou, Oumarou Palou Madi, Faustin Ambomo Tsanga, Romain Rousgou and Régis Peltier

"The bundle of wood no longer comes carried on our heads, it has come above our heads, from the tops of the trees!"

Introduction

In the semi-arid and subhumid regions of Africa, agroforestry plays an important economic and ecological role. It makes a significant contribution to the livelihoods of rural populations and to the response to climate change through carbon storage and improved adaptation to climatic hazards. Agroforestry is also a solution to land degradation caused by poor farming practices and can meet the growing need for food and firewood.

In the context of the Sahelian (semi-arid) climate, which is not very favourable to reforestation through tree planting, one of the appropriate agroforestry practices is farmer managed natural regeneration (FMNR). When farmers clear and prepare fields or grazing areas, FMNR includes selecting, protecting and managing spontaneous tree saplings and the natural regrowth produced by tree and shrub stumps (Abasse et al. 2023).





Left: At the end of the dry season, a clump of *Faidherbia albida*. Right: The same clump after the farmer selected four shoots; the following year he will keep only two shoots, then one in year 3. Photos: Faustin Ambomo Tsanga

Faidherbia albida, formerly known as *Acacia albida,* is a member of the legume family. It is one of the most suitable and the most recommended tree species for FMNR in areas that are favourable for it, in particular, those with sandy alluvial soils and a shallow water table in the dry season (10–50 m). Where it is not naturally present, planting it is possible, but is much more expensive: at least XAF 1,000 (Central African franc; EUR 1.50) per tree planted instead of XAF 100 per tree (EUR 0.15) protected by FMNR.

This article looks at some of the benefits derived by Sahelian populations from agroforestry parklands with this tree, using the example of Far North Region, Cameroon.

Agroforestry support over a 30-year period

In Far North Region, Cameroon, from 1994 onwards, the *Développement Paysanal et Gestion de Terroir* (DPGT) project encouraged the restoration of *Faidherbia albida* agroforestry parklands. In subsequent years, the Cameroonian (IRAD) and French (CIRAD) agricultural research institutes joined forces to study the restoration dynamics of these areas (Gautier et al. 2002). This work was continued by the *Ecole Nationale du Génie Rural, des Eaux et Forêts* (ENGREF) with support from the *Pôle Regional de recherche Appliquée au développement des Systèmes agricoles d'Afrique Centrale* (PRASAC) (Smektala et al. 2005). It was taken over by CIRAD and IRAD in 2021 (Akodéwou et al. 2022).

Support for farmers

Thanks to a deduction from the sum paid by *Société de Développement du Coton du Cameroun* (Sodécoton) to Village Associations of Agricultural Producers, the DPGT project paid a subsidy of XAF 100 per tree (EUR 0.15) over three years, from 1997 to 2000, to farmers protecting trees in their fields (XAF 50 the first year, then XAF 25 in years 2 and 3 provided the trees are effectively protected). From 2000 to 2004, the subsidy was XAF 75 per tree, half paid by the DPGT and half by the cotton producer groups; the same amount was paid by the *Eau Sol Arbre* (ESA1) project from 2004 to 2008. As of 2009, the ESA2 project abolished the subsidy and financed only the paint for marking the trees to be protected and the bonus paid to the person responsible for marking, amounting to XAF 10 per tree.

Project impacts

In the 2000s, the DPGT project declared that more than one million *Faidherbia albida* trees had been preserved in fields in the Far North Region. In 2020, adding the North Region, an evaluation indicated that an additional 900,000 trees had been conserved since 2010, including other species. However, in two test villages, it was noted that tree protection had "run out of steam" when subsidies ceased.

The diameter at breast height (DBH, at 1.3 m from the ground) of the *faidherbia*, measured in 2012, shows an over-representation of the 11–20 cm and 21–30 cm diameter classes (Marquant 2012). The annual diametric growth being around 2 to 2.5 cm, it is possible to estimate that trees less than 30 cm in diameter were protected after the start of the DPGT and ESA projects, which tends to prove the impact of these projects' conservation policies. The diameter class of young trees (1–10 cm) has a lower density than the larger diameter classes (i.e. trees assumed to be older), indicating a slight decline in the conservation dynamic over the four years preceding the 2012 inventory (subsidies stopped in 2008). In 2022, this trend was confirmed by a remote sensing study (Akodéwou et al. 2022), which shows that there are few young *faidherbia*, even though the projected crown area has more than doubled between 2009 and 2018, increasing from 2.5% to around 5.9% of plot area, due to the increase in crown size of the trees selected during the 2000s (Figure 1).

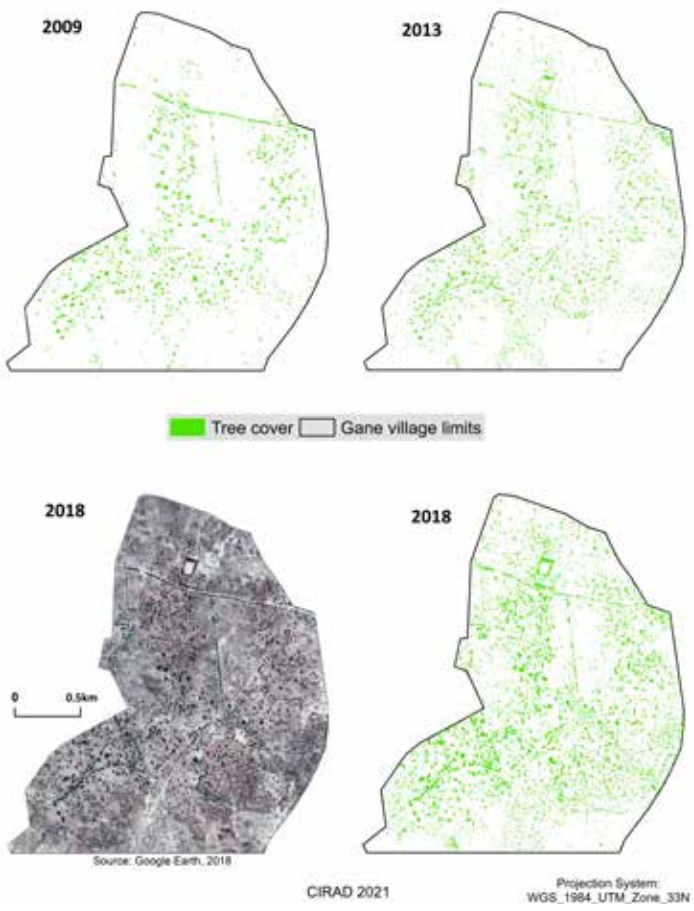


Figure 1. Tree cover change, 2009–2018, Gané, Far North Region, Cameroon. Source: CIRAD

There seem to be many reasons for the decline in interest in selecting new plants by FMNR in recent years. Insecurity of land tenure remains a problem, although some people thought it had been minimized by the fact that they were able to conserve trees with the support of projects and therefore of the state. Formal and informal harassment and fines by state agents persist when farmers want to prune the trees they have protected (as if they were not the real usufructuaries of these trees); this reduces their motivation to practise FMNR. In addition, production (fruit, fodder, wood) and services (improved fertility, microclimate improvement, etc.) are long-term gains, whereas the subsidy, however modest, provided immediate income.

Fortunately, the trend of FMNR running out of steam following the end of subsidies (also observed in central-western Niger; see Boubacar et al. 2022), is not a general one. Studies (e.g., Abasse et al. 2023) have shown that FMNR has expanded as people become aware of its benefits. In south-central Niger, for example, there has been spontaneous adoption of FMNR, promoted and disseminated by non-governmental organizations, and large-scale regreening of the landscape (Toudou et al. 2020).





Left: *Faidherbia* trees, 10 years old, selected by FMNR in rows spaced 4 m apart, to enable cotton to be cultivated with animal traction (ploughing and ridging), in rotation with sorghum associated with cowpea. Right: Aboubacar Njiémoun, an engineer with IRAD, shows a ten-year-old *faidherbia* plant, the base of which has been trimmed of shoots and low branches. Photos: Régis Peltier

Significant economic impact

Faidherbia albida boosts crop yields, especially in situations of poor fertility. It has long been recognized that the species has a positive effect on associated crops. Analyses carried out in Far North Region, Cameroon, on the productivity of associated cotton crops show that there is a strong correlation between the soil fertility of the site and the presence of *faidherbia*, especially in young parklands (around 15 to 50 years old) with poor soil fertility. Under tree crowns, greater vegetative development and a higher average cotton weight were observed. In old parklands with very large trees, however, shade can become a limiting factor in cotton production. Even though *faidherbia* has an inverted phenology (leafing out in the dry season and defoliating in the rainy season), all the branches intercept some of the sunlight. It is therefore recommended that large crowns be pruned and old trees replaced by young seedings selected by FMNR.



Cotton growing in a *faidherbia* parkland. Photo: Régis Peltier



Sorghum just before harvest, in a *faidherbia* parkland at the end of the rainy season (October) on the Fadaré Dune, Far North Region, Cameroon; the *faidherbia* trees have just regained their foliage, but the shade will not reduce the upcoming harvest. On these poor sandy soils, but well supplied with deep water, only millet can be grown in treeless plots, while sorghum, which is more demanding in terms of fertility, can grow only under the trees. Photo: Régis Peltier

Similarly, in a recent updated review of the sustainability of *Faidherbia albida*-based agroforestry in sub-Saharan Africa, Sileshi et al. (2020) showed that maize and sorghum productivity increased by 150% and 73% respectively under the *faidherbia* canopy compared with the canopy-free zone.

Faidherbia *parklands and firewood*

A study of firewood consumption (Marquant 2012) showed that in 2012, the *Faidherbia albida* parkland provided one-quarter of the domestic firewood needs of the villages of Gané (2 kg/capita/day) and Sirlawé (0.9 kg/capita/day); the trees were pruned every six to eight years. *Faidherbia* wood is an excellent fuel, with a calorific value of 4,720 kcal/kg of anhydrous wood (BFT 1989). The parklands therefore provide relief for the women who collect the wood, who otherwise might need to harvest several hours away from their village. As one woman put it: "The bundle of wood no longer comes carried on our heads, it has come above our heads, from the tops of the trees!" The weight of a bundle of firewood in Cameroon's Far North Region varies from 4 to 8 kg and costs XAF 365 (EUR 0.56; Folefack and Abou 2009). Assuming an average of 6 kg per bundle, and bearing in mind that wood is two to three times more expensive in towns than where it is produced, the parklands can generate savings of around XAF 5,900,000 (around EUR 9,000) to XAF 6,600,000 (around EUR 10,000) per year in Gané and Sirlawé respectively.

A fodder and feed supplement

Faidherbia albida parklands also play a very important role in providing supplementary fodder (leaves from pruned branches and pods) in the middle of the dry season, when bush fodder is scarce and not easily digestible. Because of the species' inverted phenology, its fodder and pods are produced at a time that allows livestock to bridge the gap. *Faidherbia* fodder also provides the necessary nitrogen supplement to dry grass fodder. This nitrogen is not available through the consumption of groundnut, cowpea and millet, which are all in short supply. In urban centres in Niger, *Faidherbia albida* pods are expensive (just less than cowpea byproducts and groundnut haulms), and on average have the highest digestible nitrogen content (Dan Gomma et al. 2017).

Conclusions

In the current context of food insecurity and climate change in the Sahel, it is necessary to assess the direct economic and ecological benefits of agroforestry. This

article presents some of the benefits derived by Sahelian populations from agroforestry parklands.

This summary shows that *faidherbia* agroforestry parklands provide significant direct benefits to rural populations, such as the production of firewood through pruning, the production of animal fodder and the improved productivity of associated crops.

By storing carbon, agroforestry parklands also contribute to the process of mitigating climate change. When they are well diversified, they enable the conservation of biodiversity that is directly useful for the yield of non-timber forest products.

However, to guarantee sustainability, certain conditions must be met. These include security of tenure; the right to use all tree products through sustainable management techniques (pruning) enshrined in law and effectively enforced by local forestry officials; support from projects, development companies and the government; publication of research results that are convincing to the government; regular payment of small incentives and confirmation of support from government and international organizations; and the use of simple, low-cost methods in terms of labour and inputs.

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