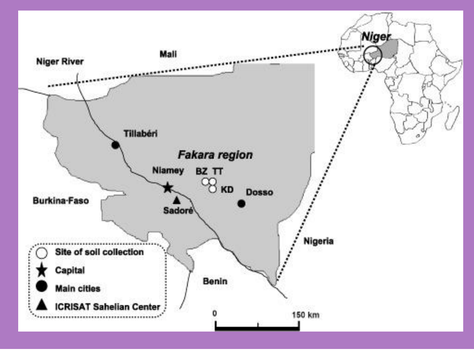
How Climate-Smart is Farmer Managed Natural Regeneration? Co-Benefits Leading to Food Security in Niger



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Introduction

Farmer Managed Natural Regeneration (FMNR) is a set of practices used by farmers on agricultural land to develop the growth of native trees. FMNR is reported to deliver a number of positive impacts, increasing incomes through the sale of products, and agricultural productivity through improvements in soil fertility (Haglund et al. 2011; . Although all the evidence seems to indicate that FMNR is beneficial for crop and livestock production, additional research was needed to explore, and quantify, the climate change mitigation potential of FMNR. Farms where farmers maintain and protect their trees would have larger carbon stocks, so the practice would lead to C sequestration.

Objective: This study aimed at estimating the effects of FMNR on food security, land productivity and potential for climate change mitigation, ingredients of a climate-smart agricultural practice.

Methods

Study site: The location of the study overlaps with Climate Change, Agriculture and Food Security CRP Sahelian benchmark site in Fakara in Kollo, Say district, Niger (mean annual rainfall 470-550 mm with high inter-annual variability, main soil encountered Ferric Luvisols, Ferric Acrisols, soil texture is sandy (85-95%)

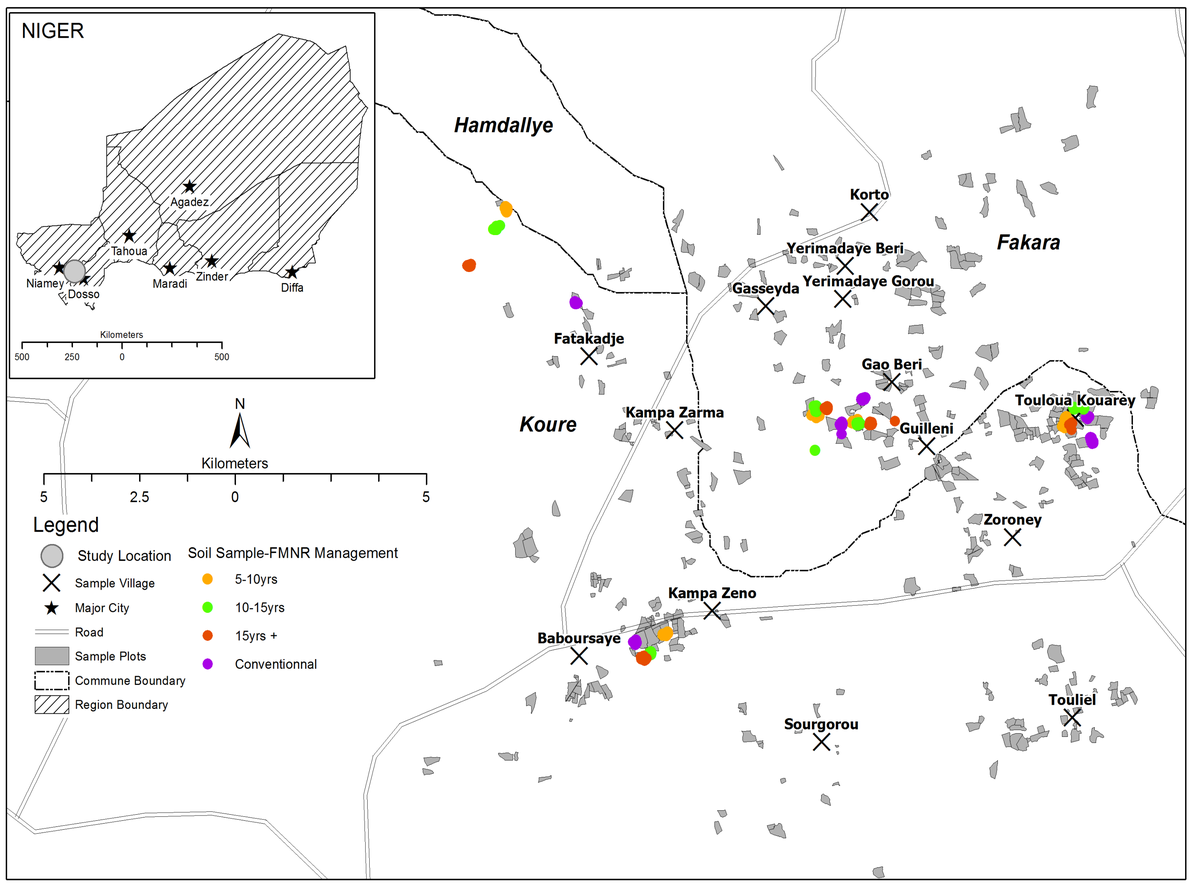

Figure 1: Location of the study site, indicating surveyed villages, farmers' fields and location of soil sampling in Niger.

Household survey: We used **the ImpactLite survey tool** (Rufino et al. 2012, Douxchamps et al. 2015), which collects detailed information on farm and household characteristics, farm management, land productivity and household economics at household and field level. It also allows the analysis of within- site variability of livelihood indicators.

Food security, food self-sufficiency and income indicators were calculated

Woody vegetation cover and tree density data were collected through fieldwork with a GPS, supported by high resolution imagery (obtained from Google Earth™), covering the study area and all the villages surveyed.

Estimation of soil carbon associated to the FMNR practice

Sampling plots were established on sites where both continuous coppicing (CON) and farmers managed natural regeneration (FMNR) are being implemented. FMNR treatments were further subdivided in stands where FMNR has been implemented for 5-10, 10-15 and >15 years. (Figure 1). soil sampling locations were distributed according to stump distance (i.e. close-mid-away; (3)) taking individual trees as independent sampling variables, and this was replicated 4 times using different individual trees. At each location, samples were collected along 5 soil depth intervals (0-5, 5-20, 20-30, 30-50, +50 cm).

Household survey

Soil sampling

Results

- Our farm and village level analyses show a positive association between FMNR and incomes, and FMNR and food security and food self-sufficiency, which would make FMNR a climate smart agricultural practice. These associations are direct and indirect, which suggest that a number of positive benefits are extracted from the FMNR practice.

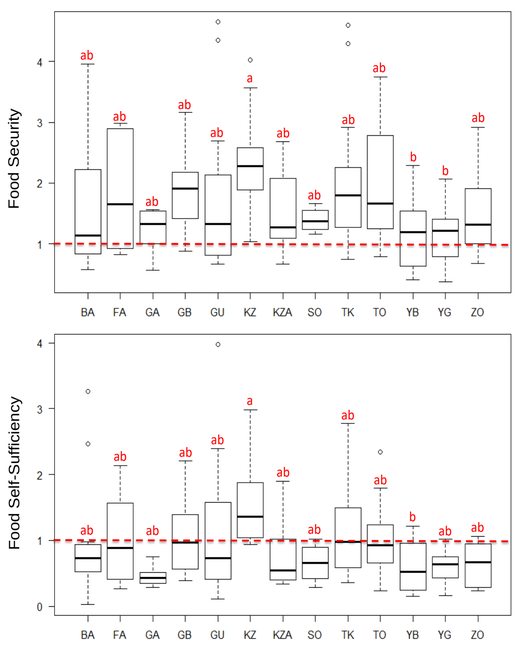

Figure 2: Food security and food self-sufficiency profiles across 13 villages in the Kollo region of Niger

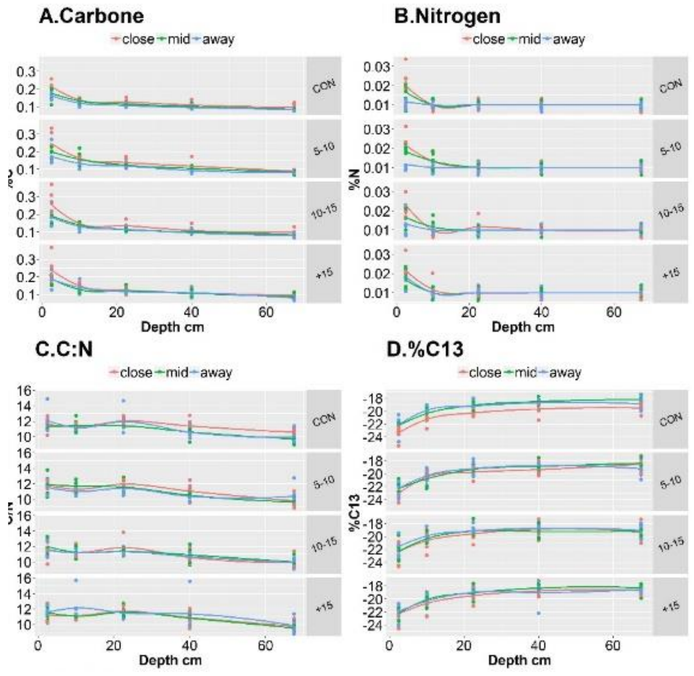

Figure 3: Variation in soil C, N , C:N and $\delta^{13}C$ values for each FMNR treatment at different depth intervals.

- Assessment of soil C data reveals that the implementation of FMNR leads to a modest increase in SOM levels compared to sites where regular coppicing is conducted every year. However, this effect is limited to the topmost soil layers (i.e. 0-20 cm). The years of practice of FMNR seems to have a limited impact on SOM levels. The positive effect of FMNR on SOM levels decreases with distance from the stem, which is indicative of the positive effect that tree canopy has on SOM storage.

References

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