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Impact study of biochar and biomass amendment of *Gliricidia sepium* and shading on the productivity of agroforestry systems

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Abstract

In recent decades, soils in West Africa have begun to gradually lose their fertility due to their misuse. This has led to a decline in agricultural productivity and yields. In order to achieve successful production, it is necessary to apply fertilisers (mineral or organic) rationally and use good production techniques. However, the economic constraints of households limit their adoption. This study was conducted in Cobly, a commune in the Atacora region of northwestern Benin. The average annual rainfall is 1,000 mm per year and is irregularly distributed during the rainy season. The objective of this study is to evaluate the effect of amendments and shading on millet productivity in agroforestry systems. A split-plot experimental design consisting of three blocks each associated with a species (*Parkia biglobosa*, *Vitellaria paradoxa, Lanea microcarpa*) with three replications. Four amendments (Control, gliricidia, biochar, gliricidia + biochar) are applied in concentric zones under and outside the tree. Analyses were performed with R 4.1.1 software. A linear mixed-effects model was used to identify determinants of growth and determinants of yield and a generalised mixed-effects model was used to assess variation in leaf number. Species, position, and treatment determined millet dry weight and millet grain weight. Biochar+Gliricidia treatment increased millet dry weight ($p < 0.001$). Only *Parkia biglobosa* has a shadow that negatively influences grain and dry weight of millet. The treatments increased millet height when the millet was out of the canopy ($p = 0.033$). Under the canopy, only Biochar+Gliricidia increased height.

Keywords: Amendment, Benin, shading, sorghum bicolor, traditional agroforestry systems

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