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"Solidarity in a competing world — fair use of resources"

Screening Woody Species for Afforestation of Degraded Croplands in the Sudano-Sahelian Zone of Benin

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Abstract

In the Sudano-Sahelian zone of Benin, where deforestation and cropland soil degradation persist at alarming rates, the re-introduction of trees on degraded lands may offer great opportunities to sustain farming systems. To improve the understanding of the vital process of tree establishment and early growth, we conducted an afforestation experiment with five woody species on degraded cropland. The survival and growth response to manuring (1 kg plant^{-1}) and drip irrigation (0.5 liter of water sapling^{-1} day^{-1}) were monitored over the first 15 months, covering two growing seasons and one dry season. The overall high survival rates (>60 %) with a very low incidence rate (<0.01 %) indicated a successful establishment of all species, particularly *Jatropha curcas*, *Leucaena leucocephala* and *Moringa oleifera* which had the highest rates (67–100 %). Supplemental irrigation reduced by ten-folds the mortality rate of the most drought-sensitive species *Parkia biglobosa* during the dry season. Significantly higher relative growth rates were recorded for *L. leucocephala*, *M. oleifera* and *J. curcas* (0.41-0.52 g g^{-1} month^{-1}) than for *Anacardium occidentale* and *P. biglobosa* (0.31 and 0.33 g g^{-1} month^{-1}). The plants responded to fertilization and irrigation treatments by enhancing the shoot growth, as observed in both fast-growers (*L. leucocephala*, *M. oleifera* and *J. curcas*) and slow-growers (*A. occidentale* and *P. biglobosa*) during wet season. Increasing belowground development was observed in slow-growers during dry and wet seasons. Overall, the five examined species showed great potential for afforestation of degraded croplands, and manuring and irrigation were key for boosting and facilitating early growth and establishment of seedlings.

Keywords: Degraded cropland, morphological traits, multipurpose tree, northern Benin, survival rate

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