Screening woody species for afforestation of degraded croplands in the Sudano-Sahelian zone of Benin

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In the Soudano-Sahelian zone of Benin, where deforestation and cropland soil degradation persist at alarming rates, the re-introduction of trees on degraded lands may offer a great potential to improve and 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 (1kg 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* (67-100%). Supplemental irrigation significantly reduced five to ten folds the mortality rate of the most drought-sensitive species *Parkia biglobosa* and *Anacardium occidentale* during the dry season. Saplings of all species positively responded to fertilization and watering inputs as reflected in their aboveground morphological traits. The response was most pronounced in *J. curcas*, *L. leucocephala* and *M. oleifera* which showed high overall relative growth rates for diameter (0.19-0.27 % month-1) and height (0.13-0.23 % month-1). In slow-growing species *P. biglobosa* and *A. occidentale*,an enhanced elongation of lateral roots at the expense of the aboveground development was observed in absence of fertilization. Overall, manuring and supplemental irrigation were key for boosting the early growth and facilitating the establishment of tree seedlings on degraded land.

Keywords: Northern Benin, Degraded cropland, Multipurpose tree, Survival rate, Morphological traits