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Agroforestry as Resilience Tool for Ecological Degraded Agricultural Areas of Northeastern Mexico

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Abstract

In northeastern Mexico predominant livestock under extensive management, coupled with low and erratic rainfall, uneven topography, results in degradation of large areas with phenomena such as soil erosion and loss of biodiversity. The objective of this research was to test agroforestry - systems in response to the problem of soil erosion and is proposed as a dynamic way to support the resilience of these ecosystems damaged through missmanagement, to conserve the ecosystems and to diversify the production in order to generate sustainable benefits for the rural population of the region. The work consisted in the restoration of a degraded area to a productive area with contour lines and reforestation in the region of Linares, Nuevo Leon, Mexico. The following forest species were planted: *Acacia berlandieri*, *A. rigidula*, *Leucaena leucocephala*, *Havardia pallens*, *Prosopis laevigata* and *Opuntia* sp. Forage grass was promoted (*Lolium perenne*) between levels. There where the agroforestry model was established erosion was controlled. The grass showed a yield of 790 kg DM ha⁻¹ y⁻¹ in the first year after establishment and of 4090 kg DM ha⁻¹ y⁻¹ from the third year on. The LAI increased from 0.025 on the degraded area to 2.75 in the agroforestry area. The content of soil organic matter in the agroforestry module increased from 0.6 % in the first year to 4.2 % after 3 years. Statistical analysis indicated that the species with the highest survival rates after three years were *Havardia pallens* and *Acacia rigidula*.

The study area is more suitable for the production of forage grasses (4090 kg ha⁻¹) than for corn production (480 kg ha⁻¹). The species recommended to implement in the agroforestry system are *H. pallens* and *A. rigidula*. It was demonstrated that agroforestry systems can be implemented as a resilience tool on degraded areas.

Keywords: Agroforestry, *Havardia pallens*, leaf index, *Leucaena leucocephala*, *Prosopis laevigata*