Abstract

Water Dynamics and Management During the Establishment of Tree Species in Agroforestry Systems of the Yucatan Dry Tropics

The proposed research compares water dynamics and water use efficiency in three agroforestry systems of the Yucatan dry tropics. Successful establishment of tree species in these systems is heavily dependent on water availability during initial stages of plant community development. Deep, rooted tree species have the potential to redistribute soil water within soil profiles by hydraulic lift, making it available for use by young or shallow rooted species. Novel techniques assessing stable isotopes of C, O, H, in combination with measurements for plant and soil water potential, will be used to determine the spatial and temporal patterns of water use by two tree species at varying ages. Our main research objectives are to (1) determine the source of water used by plants established on substrates with different depths to groundwater over the course of dry and wet seasons; (2) determine the potential effects of hydraulic lift in structuring agroforestry communities and influencing the water dynamics of these systems; (3) determine the appropriate irrigation methods to promote deep rooting and early access to groundwater resources by seedlings. The results obtained will have implications to restoration and management of dry tropical plant communities. Designing and managing agroforestry systems based on optimal utilization of water sources can maximize their productivity and sustainability.