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Field Water Dynamics in Integrated Systems in the Brazilian Cerrado Region

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Abstract

Agroforestry systems were established as a viable option for Brazilian farmers in recent decades. Shading is expected to affect the system's microclimate and thus it is likely to alter water fluxes to the atmosphere via evapotranspiration. In this study we measured the evapotranspiration (ET) with micro-lysimeters in four different treatments as a proxy for different land use systems at EMBRAPA Beef Cattle, the Brazilian Agricultural Research Corporation, located in Campo Grande-MS, Brasil. The four treatments are: Integrated systems with rows of Eucalypt (*Eucalyptus urograndis*) trees (ICLF), integrated systems without Eucalypt trees (ICL), continuous pasture (CP) and native Cerrado (Savannah) vegetation. In the ICLF and ICL plots *Brachiaria brizantha* was planted and in the CP plots *Brachiaria decumbens*. To measure the evapotranspiration lysimeters (diameter of 10 cm and a depth of 20 cm) were inserted into the ground and weighed daily during a period of 8 weeks. Within the ICLF systems, measurements were conducted in three different distances to the tree rows. In the treatments without trees the lysimeters were distributed randomly. Results were linked to data from the microclimate, i.e. wind speed, air humidity, and global radiation.

Preliminary results indicate daily evaporation at CP which was on average 1 mm higher compared to the other systems. Differences between the averages of the ICL and ICLF systems weren't significant but ET tends to be higher in the ICL system. Within the ICLF systems the measurements taken with larger distance from the tree rows showed lower daily rates of evaporation (1 mm). Differences in ET between systems were not significant due to different growth habits of the plants inside the lysimeters. Within the ICLF systems lysimeters with largest distance to trees showed lower ET which an average difference of 3mm. With higher wind velocities and lower air humidity the difference increases. The differences in ET and microclimate are probably a result of lower grass canopy densities close to the tree rows and on CP. This management effect on unproductive water losses via evaporation should be considered in the context of site productivity, system's resilience against drought, and resource use efficiency.

Keywords: Brazilian savannah, evapotranspiration, integrated systems, micro-lysimeter