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Soil Moisture and Microclimate in Integrated Crop-Livestock-Forestry Systems of Central West Brazil

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Abstract

Integrated-crop-livestock-forestry (ICLF) systems were developed to increase resource use efficiency, while at the same time these systems were attributed to be more sustainable compared to most monocultures. However, how ICLF systems affect the water balance was hardly considered so far but this aspect gained considerable attention with regard to increasing climate variability and change.

In this study we measured the soil moisture and the microclimate of ICLF demonstration plots at the Brazilian Agricultural Research Corporation – EMBRAPA Beef Cattle, located in Campo Grande-MS, Brazil. Measurements were taken in four different treatments: ICLF, ICL, continuous pasture (CP) and Cerrado (native savannah vegetation). During data collection the ICLF treatment consisted of grass pasture (*Brachiaria brizantha*) lined with strips of Eucalyptus trees (*Eucalyptus urograndis*), the ICL and CP treatments consisted of *Brachiaria brizantha* and *Brachiaria decumbens* pasture, respectively. The soil moisture was monitored weekly with a FDR profile probe in the dry season (April 16 – Sept 16) and in the rainy season (Oct 16 – March 17). Microclimate parameters (temperature, relative humidity, precipitation, global radiation) were measured for each treatment.

The results of the microclimate measurements indicate differences in temperature and air humidity between the treatments. The maximum temperatures for treatments with trees (ICLF and Cerrado) were lower compared to treatments without trees (ICL and CP). This can be attributed to the shading effect of trees. Regarding soil moisture, points next to the tree rows in the ICLF treatment generally had lower values compared to the central points. This could mainly be due to enhanced exploration by tree roots. Comparing the treatments, independently of the season the natural Cerrado always had the highest amount of soil moisture followed by ICL, CP and ICLF. The total amount of soil moisture for each treatments changed with the season. Spatial and temporal dynamics of the soil moisture and microclimate will be presented in detail. The natural cerrado showed the highest amount of soil moisture throughout the year indicating a higher resilience against drought compared to the land use treatments. ICLF systems should be carefully analysed with regard to their adaptive capacity against climate variability and change.

Keywords: Brazil, integrated crop-livestock-forestry systems, microclimate, pasture, soil moisture

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