

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

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## Introduction

The sub-humid tropical climate of central west Brazil mostly provides sufficient rainfall and adequate temperatures for year-round integrated crop-livestock-forestry (ICLF) production systems.

ICLF systems were developed to increase resource use efficiency, but how these systems affect the water balance was hardly considered so far. However, this aspect gained considerable attention with regard to increasing climate variability and change.



## Objective:

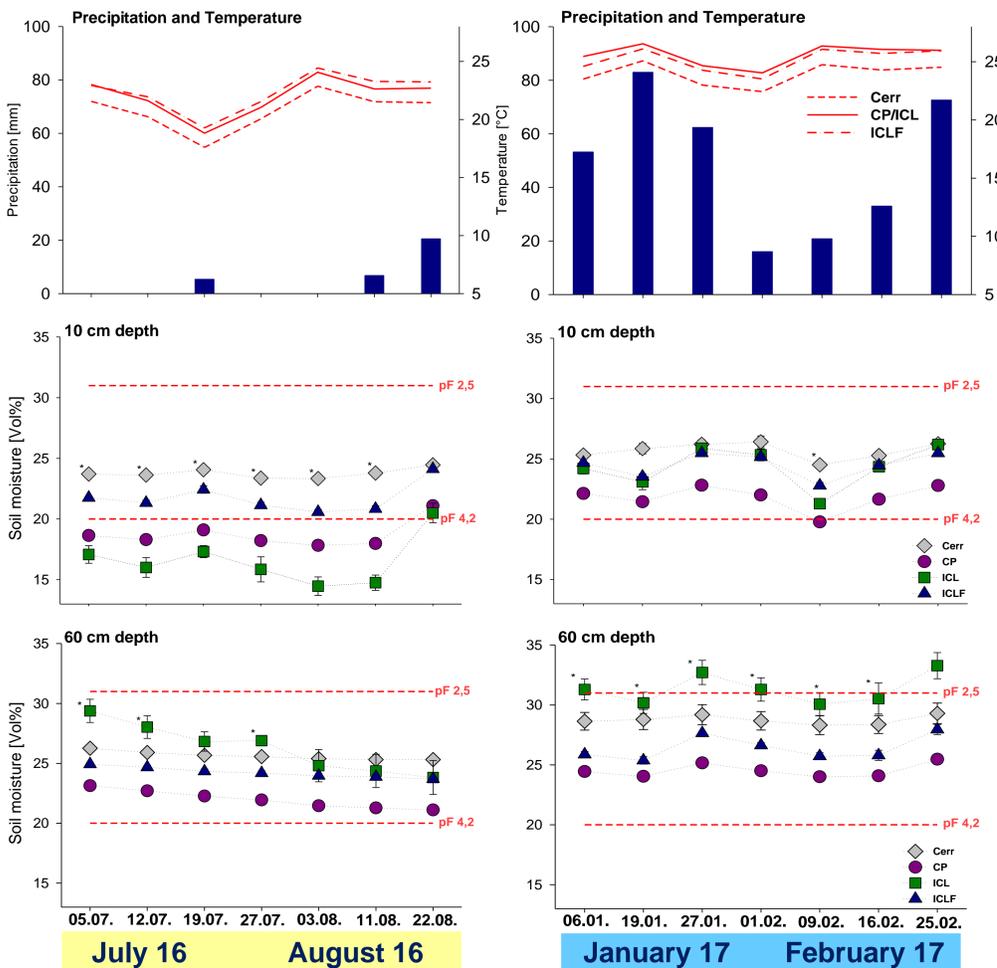
Analyse top and sub soil moisture dynamics for dry and wet season comparing different land use systems: Cerrado (natural savannah ecosystem), CP (continuous pasture), ICLF (integrated crop livestock forestry), ICL (integrated crop livestock).

## Conclusion:

Less water stress in the top soil of the integrated system with trees (ICLF) compared to the integrated system without trees (ICL) and the continuous pasture (CP).

## Dry season

## Rainy season



## Results

- Dry season: CP and ICL soil moisture at 10 cm depth were underneath the permanent wilting point (< pF 4,2). ICL top soil was driest.
- Rainy season: top soil water content was plant available at all treatments. CP had lower soil water content compared to other treatments.
- Soil moisture measured in the Cerrado ecosystem was most balanced between the seasons, the ICLF system showed a very similar dynamic.
- No plant water stress in 60 cm depth was measured throughout the year for all treatments, however subsoil at CP was driest, ICL wettest.

## Discussion

- Soil moisture dynamics of ICLF systems were relatively close to the characteristics of a natural Cerrado ecosystem.
- Trees appear to buffer the seasonal extremes of soil moisture most likely through an altered microclimate.
- ICLF's and Cerrado water dynamics appear better adapted to cope with climate variability and change.
- At CP and ICL sites, water stress for plants will likely be more severe under drought. For ICL sites water logging may develop in a strong rainfall period.

## Materials and Methods

- Soil moisture measured weekly (dry and rainy season) with a PR2/6 FDR profile probe (Delta-T) in 10 cm, 20 cm, 30 cm, 40 cm, 60 cm and 100 cm.
- Soil moisture retention curve (pF curve) determined with the centrifuge method.
- Precipitation was measured on site with a automatic rain gauge connected to a HOBO logger
- Temperature measured for each treatment using Tiny Tag loggers (every 15 min).
- Soil type: Ferralsol with 55% sand, 6% silt, 38 clay (sandy clay)

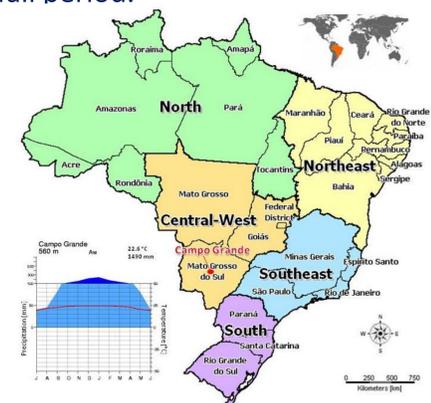


Figure : Map of Brazil with location and climate diagram of study area.



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