

Water use efficiency as depending on agro-ecological factors

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This paper presents empirical evidence of the relationship between agro-climatic and physiological factors on *Penisetum* sp. (a very efficient C4 species) and water use performance and efficiency (WUE) determinations. In arid and semiarid zones animal production is limited by the lack of forage availability. To increase the sustainability of ruminant production, local fodder resources are necessary to feed the animals. As irrigation is necessary, high efficient species in terms of yield and water use must be used.

Many studies on climate change utilize WUE values depending only on the plant species. However, weather conditions can transform a very efficient plant into a less efficient one, since, as an example, slight temperature changes can be decisive in terms of WUE because they drastically affect plant yield. Therefore, as in this study the plants lived under different climatic conditions before each harvest, different WUE values were obtained. These values are suitable to be used in climatic models.

An automatic weather station was used to acquire climatic parameters and to calculate evapotranspiration (ETo) Penman-Montheith. Soil temperature and volumetric soil moisture at 0-10 cm and 10-20 cm was monitored simultaneously throughout the growing seasons to demonstrate that all amount of water provided by the irrigation system remained in the root system. A portable LC-Pro was used to acquire full photosynthesis data.

A subsurface drip irrigation provided two water quantity treatments (based on different percentages of ETo). Utilizing a flow meter to measure the amount of water applied in each growing period and measuring the yield, water use performance and efficiency (WUE) were calculated from different harvest periods of *Penisetum* sp.