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Water Acquisition from the Seasonal Wetland and Root Development of Pearl Millet Intercropped with Cowpea in a Flooding Ecosystem of Northern Namibia

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Abstract: Seasonal wetlands, locally called oshanas, are characteristic of the densely populated northern Namibia, a desert country in southwest Africa. The formation of seasonal wetlands, which will sustain the water balance of a semiarid environment, was quite unstable depending entirely on the variable rainfall in the upper catchments of Angola. The objective of the present study was to evaluate the use of seasonal wetland water by pearl millet, the local staple food crop intercropped with cowpea, to discuss the water competition pattern of intercropped species. Root system development of the intercropped species was also evaluated together with the water source analysis. For this purpose, field experiments using pearl millet intercropped with cowpea in the seasonal wetland in Namibia University (Exp. 1) and monocropped pearl millet in the local farmers field (Exp. 2) were conducted in northern Namibia. Both pearl millet and cowpea developed deeper root systems as the distance from the seasonal wetland water increased. At flowering time, the δD value of intercropped cowpea was similar to that of wetland water, while that in pearl millet was much lower than those of both the wetland water and groundwater. This indicated that intercropped pearl millet did not have full access to the wetland water when there was competition with cowpea for water derived from various water sources. Under such circumstances, intercropped pearl millet probably relies more on the rainfall water, which is just sufficient to sustain its growth in a semiarid environment. By contrast,

intercropped cowpea wins in the competition with pearl millet and can acquire water from the existing stored wetland water.

Keywords: Deuterium, δD, Drought, Heavy water, Intercropping, Stable isotope, Water stress, Water uptake

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