Comparison of energy available for evapotranspiration under in-field rainwater harvesting with wide and narrow runoff strips

Weldemichael A. Tesfuhuney[1], Sue Walker[1] and Leon D. van Rensburg[1]

[1]*Department of Soil, Crop and Climate Sciences, University of Free State, PO Box 339 Bloemfontein 9300 RSA*
Email: weldit78@yahoo.com

ABSTRACT

When a maize crop is grown in an arrangement with basin and runoff areas, as in the case of in-field rainwater harvesting (IRWH), heat and water vapour transfer within the canopy influences the energy and water balances. The aim of the study was to quantify the energy balance components and to estimate evapotranspiration (*ET*) from the maize crop under IRWH with wide and narrow runoff strips. Based on micrometeorological measurements, energy balance components were compared for selected days under dry and wet conditions. The diurnal changes and daily peaks of evaporation fluxes around midday were analysed. The average fraction of available energy was used to evaluate the efficiency of converting available energy to latent heat flux (*LE*). The results indicated that the *LE* was dominant and higher in wide compared to narrow runoff strips (RSL) during both dry and wet conditions. However, sensible heat (Hs) showed lower values on wide runoff strips during wet conditions due to the advective effect of the runoff area. Therefore, the wide runoff strip with a higher leaf area index (LAI) of 2.43 had more *ET* and used more energy on evaporating water compared to narrow runoff with a lower LAI of 1.42. Wide runoff strips converted the higher available energy more efficiently into a higher biomass production. During wet days, the wide RSL used more than 70% of the available energy, while the narrow RSL response to the available energy (63%) was stronger during dry compared to wet days.

Keywords: Water harvesting, Energy balance, Micrometeorology, Latent heat flux