Effect of plant development on turbulent fluxes of a screenhouse banana plantation

Dicken, U., Cohen, S., **Tanny, J.** (2012)
Irrigation Science, DOI: 10.1007/s00271-012-0346-0

This study focuses on CO2 and water vapor flux measurements, water use efficiency estimates and evapotranspiration modeling during the course of growth of a young banana crop in a screenhouse in northern Israel. An eddy covariance system was deployed at the center of the screenhouse during two growth periods of the banana crop: small and large plants. Results show that daily whole canopy evapotranspiration increased during the measurement period from 2.2 mm day−1 for the smaller plants to 3.4 mm day−1 for the larger plants. The increase in net daily CO2 consumption doubled during the same period, from about 11 to 21.5 g m−2 day−1 per unit ground area. Water vapor and CO2 fluxes per unit leaf area were independent of plant size and averaged with 51 and 0.29 g m−2 day−1, respectively. Consequently, water use efficiency, defined as the ratio between net vertical fluxes of CO2 and water vapor, was nearly constant during growth of the plants. Evapotranspiration models provided more accurate predictions for larger than for smaller plants. This was due to inadequate treatment of the partial cover of young plants, which could be overcome by the use of a crop coefficient. A modified Penman–Monteith evapotranspiration model adapted to the screenhouse environment, applied here for the first time to a banana screenhouse, was in better agreement with the measurements than an open canopy model.