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"Challenges to Organic Farming and Sustainable Land Use in the Tropics and Subtropics"

Advanced Irrigation Scheduling for Lychee Orchards in Northern Thailand

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Abstract

In the northern highlands of Thailand irrigation is performed in the dry season when water is scarce. Water for irrigation is been taken from creeks, which are also supposed to supply the farmers in the valleys. Thus, conflicts between highland and lowland farmers with ubiquous.

In order to prevent water losses by inefficient irrigation, appropriate irrigation scheduling for lychee orchards is needed. Therefore the model CropWat 4.3 has been tested. However, the model generates too high irrigation recommendations. Sensitivity analysis detected that the crop coefficient (k_c-value) is the most sensitive parameter. As crop coefficients for lychee trees are not available, considerable miscalculations, based on the estimated values are possible. Furthermore, interactions between soil water suction and transpiration of lychee trees, which are important to predict water stress have not been investigated yet. Therefore, the goal of this study is to evaluate precise crop coefficients for lychee trees and to investigate the reaction of lychee tree transpiration to different soil water suctions.

The potential evapotranspiration of lychee trees (ET_l) is determined by multiplying a potential reference evapotranspiration (ET_o) with the specific crop k_c-value. Knowing ET_o and ET_l, the k_c-value for lychee trees can be calculated. Parameters for computing ET_o are measured by weather stations, ET_l will be determined by sapflow measurements using the Granier-Method. Since ET_l represents only water losses by transpiration the dual FAO approach (with separated k-values for plants and soils) for calculating ET_l will be adopted. The needed soil parameters have been analysed previously.

The impact of different soil water suctions to lychee tree transpiration will be detected by measurements of stomata conductance, transpiration rate and photosynthesis rate of lychee leaves. Simultaneously, water content measurements with TDR probes will be carried out. Using *in situ* determined teta-psi functions the corresponding water suction in the soil can be identified. By comparing leaf stomata conductance and soil water suction data it is possible to specify a proper threshold for the soil water suction when water shortage will affect lychee tree transpiration.

Keywords: Crop coefficient, evapotranspiration, sapflow, stomata conductance, TDR

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