

【Workshop 2】 Crop Production under Heat Stress
Estimation of Saturated Area in Northeast Thailand
Using Large-scale Water Balance Model

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Northeast Thailand is the major rice production region where the most of rice is cultivated in a rainfed lowland paddy without irrigation facilities. Therefore the rice production is highly influenced by a fluctuation of climatic conditions, especially by spatiotemporal variabilities of precipitation. We developed a simple hydrological model that not only simulates large-scale hydrological process, but also provides the fractional saturated area within each unit cell of the model; aiming to evaluate surface water conditions and rice productivity in rainfed lowland paddy in Northeast Thailand. The concept of TOPMODEL which can represent spatial heterogeneity of soil moisture and groundwater level on sub-grid scale through the effect of topographic features was used for reproducing the variation of saturated area fraction. The model was implemented during from 1977 to 2006 using gridded daily meteorological data which were created by spatially interpolating the observed data. Simulation results confirmed that large saturated areas occurred in areas where accumulated precipitation was high and water tended to concentrate in topographically low areas such as valleys and basins, which is a relevant feature of water condition. The time series of saturated area calculated from the model was compared with the observed rice-planted area in Northeast Thailand. We found that the saturated area in mid-August was highly correlated with rice-planted area, implying that rice-planted area could be estimated appropriately from the simulated water-saturated area at this time. This result also suggests that transplanting of rice in this region must be finished by the end of August, because the photoperiod-sensitive rice cultivars used will be immature at the time of flowering and heading if planted later than August.