



FINAL REPORT

Project Title:

**Drought Monitoring and Impact Assessment on
Rice in a Lower Part of Northeastern Thailand for a
Basis of Decision Support System**

By

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This research has successfully developed a new methodology to calibrate an agro-hydrological model (Soil-Water-Atmosphere-Plant or SWAP model) through data assimilation by genetic algorithm (GA) using remote sensing (RS) data. The method is one of the so called RS-SWAP-GA methods. The model simulates soil moisture, water stress and yield in rainfed paddy in order to evaluate the impacts of on-going droughts or drought scenarios. The calibration does not require intensive field observation or field sample testing, thus the methodology can be applied at regional scale.

Two real-time observation stations were setup in rainfed paddy fields in 2 districts namely Trakan Phutphon and Det Udom in Ubon Ratchathani province. General meteorological observation, energy flux observation including evapotranspiration, soil moisture observation, soil sampling test and rice growth monitoring were carried out. The system directly measured 23 items while 7 items were derived.

MODIS remote sensing data were used to retrieve leaf area index (LAI), actual evapotranspiration (ET_a) and water stress maps. The actual evapotranspiration was estimated using SEBAL model. It was concluded that the estimated satellite ET_a was reasonable.

The data from the field observation and remote sensing played important roles as resources for calibration, simulation and validation of the models and the results.

Although no drought phenomenon has occurred in Ubon Ratchathani during the study period, the usefulness of the methodology was demonstrated using historical weather and yield records. Meanwhile, synthesized drought scenarios were evaluated to understand the characteristics of the drought impacts to the yield.

The results demonstrated its fairly high potential to be a part of a drought monitoring system as well as the agricultural decision support system in Thailand, It can provide useful and near real-time information such as soil moisture, water stress and impact on rice yield.

Key words: Drought Monitoring, Drought Impact Assessment, Rainfed Rice, Remote Sensing, MODIS, Field Observation, LAI, Soil Moisture, Evapotranspiration, SWAP, GA, SEBAL, Ubon Ratchathani, Decision Support System