（学位第３号様式）

学　位　論　文　要　旨

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題　目	Optimized Sugarcane Modelling for Sugarcane Production in the Northeast of Thailand. (東北タイにおけるサトウキビ生産についての最適モデル化)

Agricultural systems are vulnerable to the climate change. These changes directly affected crop production. To reduce these effects new management strategies must be identified. Such management strategies under climate change need to be evaluated using crop models. These crop models require at least 2 groups of input data. One group is considered conservative, in that the parameters should remain basically constant under different growing conditions and water regimes. The other group encompasses parameters that are dependent on location, crop cultivar, and management practices, and must be specified by the user. So the model needs local calibration and validation before being applied. The first study, we calibrated and validated two crop models for estimating sugarcane yields in North-eastern Thailand. In the calibration, we optimized parameters of both models and got realistic predictions. In the validation, optimizing water demand in DNDC95 gave good results, but DSSAT-CANEGRO overestimated yields. When we optimized water balance specific to sugarcane, DSSAT-CANEGRO also simulated yields well. After that we selected the CANEGRO model to simulate the sugarcane yield of existing cultivation areas under rainfed and irrigated conditions for identifying the highest priority areas for irrigation development. We then calculated the benefit of the irrigation development using the simulation results and actual data for groundwater well capacities, sugarcane prices, and irrigation development and running costs. And then we analyzed the results of the benefit calculation by ABC analysis and the decision tree method. The decision tree analysis confirmed that well capacity most influenced benefit. Areas with higher rainfall had high yields under rainfed condition, so the benefit from irrigation was small. A notable finding was that low soil available water content resulted in low yields in both rainfed and irrigated conditions, and high available water content resulted in high yields under rainfed conditions. Therefore, both low and high available water content resulted in low benefit from irrigation development. However, using the crop models were limited by the input data, especially weather data, for the accuracy simulation in some locations. For this study, we also developed the simple models for estimating sugarcane yield and evapotranspiration with minimum input data and high accuracy. The “Cal Cane” is the application to estimate sugarcane yield of cultivars KK3 and LK92-11 which can be downloaded on the google play store. The technique for getting the good data using for the application have discussed in the section general discussion. The simple model for estimating evapotranspiration and change of soil moisture in sugarcane fields also can be use with only using the solar radiation and precipitation, available on all sub district around Thailand, for the input data. Both simple models were better use for the specific area. In conclusion, the crop parameters for sugarcane cultivar KK3, LK92-11, and 02-2-058 can be used for the CANEGRO and DNDC, and gave the good estimation of sugarcane yield in both irrigated and rainfed condition. In case of limitation of local input data, the simple models can estimate sugarcane yield, evapotranspiration, and soil moisture changes in the specific area.