Modeling Population as a Factor in the Deforestation of Nang Rong, Thailand

This paper will describe and present a cellular automata (CA) model of land use/land cover change in Nang Rong, Thailand. We use the CA model to examine how population, measured in terms of the location and changing size of villages in the district, affects land use/land cover change, given resource endowments and proximities and allowing for exogenous shocks in the prices of agricultural products. Of particular interest is the conversion of forest to agricultural uses, specifically paddy rice cultivation and upland crops.

Our CA model is composed of a spatially referenced grid of cells each in a land use/land cover state that are iteratively updated in discrete time steps. The cells occupy one of three land use/land cover states: forest; rice; upland crops. The state of a cell is determined by a set of rules concerning the states of neighboring cells in the previous time step as well as landform type, slope of the land, distance to water, soil moisture, soil suitabilities, and proximity to villages changing at varying rates. We have developed these rules from our assembled image time-series, analysis of data distributions, field observation, and the assistance of knowledgeable local informants to associate patterns of land cover change to associated processes. The model runs stochastically. We calibrate and validate the CA results by comparing the composition and spatial pattern of simulated land cover to observed patterns represented in a classified satellite data set for the same annual time periods. Summary correlations and pattern metrics are used to assess differences between observed and expected land cover on the basis of composition and spatial organization.