

A Cellular Automata Model on Agricultural Land-use Change of Poyang Lake Region

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Abstract

Agricultural land-use has become an important research topic because of its relationship to food production, rural livelihoods, and environmental sustainability. Rural households' crop choices are increasingly influenced by macro-level processes in today's interconnected world. In China, urbanization has already led to agricultural decline in some regions. However, the Chinese government has also stepped up its effort in farmland consolidation to stimulate agriculture. The goal of this project is to explore future agricultural land-use and examine the potential effects of farmland consolidation. The project focuses on the Poyang Lake Region (PLR), which is an important agricultural base in Jiangxi Province and China. Rice is the dominant crop in the region. Rice can be grown once a year on a plot, called one-season rice, or twice a year on the same plot, called two-season rice. Due to the influence of off-farm income, two-season rice has been converted to one-season rice in many villages. This project uses a Cellular Automata (CA) model to simulate agricultural land-use with a focus on the transition between one-season rice and two-season rice. The model experiments suggest that without further policy interventions, we expect to see a continuous reduction of two-season rice in the future. But the reduction is not equally distributed throughout the region. In the important rice production bases, intensive two-season rice will likely remain stable assuming that the current wages of migratory workers stay the same, while one-season rice will likely continue to dominate in areas near urban centers and roads or with higher elevations. Where rice cropping choices show high uncertainty is mostly in the urban-rural transition areas and associated with farmland with medium elevations. Under the scenario of increasing number of large farms resulting from farmland consolidation, the model predicts some slight differences in the spatial distribution of two-season rice.

Keywords: Agricultural land-use; Cellular Automata; prediction; farmland consolidation policy; DINAMICA EGO; China