

A Multi-Agent Model for Land Use and Land Development Decisions in Rural South China (43)

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The distribution of human population and economic development are two major factors influencing land use. In the past two decades, the massive inflow of foreign investment has stimulated migration to southern China and its coastal regions, where opportunities for employment in labor-intensive sectors are the greatest. Shifts of labor into off-farm employment, out-migration from rural to exurban-urban locations, and the development of new and expanded markets have been dramatic, influencing agricultural production, consumption, marketing behaviors, as well as rural land use and land cover change. Farm-level labor shortages result in within-village trading of land use-rights, abandonment of agriculture on marginal land, and conversion of agricultural land to urban/exurban development, including commercial, industrial, and residential. The conflicts of land use in rural south China are between selling agricultural land to satisfy development purposes and reserving agricultural land to secure the food supply to the world's largest population.

During 2006, we conducted a socio-economic field survey of rural households in three provinces in southern China; 502 surveys were collected, including 247 surveys by women and 255 surveys by men in the same village study sites. GPS data were collected, based on the exact location of surveyed farm households. Households were sampled along the rural-exurban gradient from rural Hunan province into more southern provinces proximate to Hong Kong (i.e., Guangdong and Guanxi). These data provide insights into household decision-making (and decision rules) regarding land and labor choices. Key informant interviews were also conducted, focusing on agricultural trends, rural-urban employment forces, and policy.

A multi-agent system will be used to model an artificial society consisting of farm households, non-farm developers, and state-level authorities making land decisions. Experiments will be conducted through simulations, reflecting costs and benefits. Farm households maximize utility,

making on-farm and off-farm work choices which directly affect land-use decisions. Developers are profit maximizers and purchase land use-rights from farmers and permanently change agricultural land into industrial, commercial or residential uses. They also offer off-farm opportunities to farmers. Government authorities have the twin goals of regional economic development and reservation of land resources. They also hold rights to interfere when land is sold by farmers to developers. This study investigates 1) the economic strategies relative to rural labor mobility and agricultural land reservation among farm households, 2) land use efficiency conditions in underdeveloped regions, and 3) government policy impacts on agricultural land use. Java-based Recursive Porous Agent Simulation Toolkit (Repast-J) software is used together with SWARM for simulating the interactions of agents and their emergent collective behaviors.

The research provides insight into agricultural land use in South China. Study results are expected to have broad implications for food production in China and land (use) policy, as well as migration and off-employment outcomes. Presentation of the paper is expected to generate discussion on the interrelationships between labor resources, population mobility and land use, and application of agent-based models to understand economic phenomena over different geographical regions.