Multi-objective optimization of ecosystem services in an agricultural intensive watershed

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The complex trade-offs of ecosystem services make ecosystem management difficult to achieve win-win goals, especially in a watershed with intensive agriculture. Although a lot of research has been carried out on the types, characteristics and harmonized measures of ecosystem service trade-offs, how to achieve synergistic gain through effective land use management still lacks quantitative Optimization. Combined with models of land use optimization and spatially assessment of ecosystem services, the study build a multi-objective function and a land use optimization method to realize maximization of the total benefit based on the characteristics of ecosystem service trade-off and the driving factors in the Dongting Lake watershed— which is one of the priority areas for ecological protection in China and is also agricultural intensive. First we quantitatively model the water purification service, sediment reduction service and agricultural production using field observation and spatial models of ecosystem services, then the integrated response characteristics of multi-objectives are analyzed according to different land use scenarios based on driven mechanism of ecosystem service trade-offs. Finally the way of optimizing land use allocation and synergetic development of multiple ecosystem services in the watershed is proposed to provide quantitative means for regional land use optimization.