
Preface

Land cover is the most obvious landscape signal for characterizing the influence of human activities on terrestrial ecosystems. In history, particularly in the past 300 years, land use/cover change (LUCC) has been an important parameter used to conduct long-time scale climate simulation studies, diagnose climate forming mechanisms, identify the sensitivity of the climatic system to the nature and human forces, predict future climate changes, and so on. In the mid-1990s, IGBP and IHDP jointly launched a land use/cover change project, in which it was emphasized that we must implement various approaches to reconstruct historical land use variation. Since then, historical land cover, particularly that of a high-precision spatial feature, has drawn extensive attentions from scholars.

China locates in the East Asian monsoon region that features most dramatic LUCC, a plenty of water bodies, fertile soil, precipitation, and suitable climate, which in all provides a sound humid-heat condition for agricultural production. Meanwhile, China has been a magnificent agricultural production nation in history and accumulates a plenty of historical documents, books, taxation records, statistics, and available research outcomes about historical agricultural plantation, i.e., China is inherently of advantages in reconstructing the spatial distribution of farmland.

Quantitative reconstruction of historical farmland in China is one of the core scientific issues to understanding spatial distribution of farmland amount and the influence of land use changes on global climate and environment. This book first briefs the replacement of the dynasties and development of economy and society in China, and summarizes the evolution of historical land, population, and economic policies in Chap. 1. Reconstruction ideology, assumptions, major models, methods of verification, and research results about rebuilding historical land cover in the whole world are reviewed in Chap. 2. It is detailed in Chap. 3 about the geographical features, expansion process of land reclamation, and changes of administrative boundaries in China, then unifies space–time dimensions, and also introduces data sources in this book. To grasp the tendency and features of population changes and then to recover the historical farmland amount, population changes and the evolution of temporal–spatial distribution patterns in China in the past 300 years are reexamined in Chap. 4. While in Chap. 5, after collecting, compiling, identifying, and calibrating historical land resource statistics from all sorts of historical documents, we have finally reconstructed the historical farmland amounts at the provincial level in the past 300 years.

In Chaps. 6–7, studies of reconstructing historical farmland with high resolution based on different modeling frameworks are introduced respectively. In Chap. 6, different from the traditional “top-down” model, a constrained CA model coupled with a continuity assumptions of farmland has been introduced and verified in Shandong Province as a case study. Meanwhile, taking characteristics of human land use behaviors into consideration, multi-agent systems (MAS) are introduced into historical farmland spatial pattern reconstruction to further incorporate the complex behaviors and interactions between behavioral subjects in the site selection process. Further, we have discussed the advantages and disadvantages of constrained CA and MAS models, respectively, from the point-by-point accuracy evaluation, simulation spatial pattern, and consuming time. In Chap. 7, in order to improve the efficiency and

accuracy of model, a multi-region synchronization CA model has been applied to reconstruct the spatial pattern of farmland in China in the past 300 years, which integrates available historical farmland data into the model as an external variable to control the scale of reconstructed historical farmland spatial pattern for each region.

Finally, Chap. 8 concludes the main viewpoints of our study and explores the research prospects in reconstructing historical land cover from data synthesis, improving the comprehensiveness with multiple land use types, coordinating reconstruction methodologies, and synthesizing multiple verification methods.

We hope this book can provide some insights about feasible historical land cover reconstruction methods to worldwide researchers.

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