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The impact of rural out-migration on land use transition in China: Past, present and trend

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ABSTRACT

Although rural out-migration has significantly transformed land use at the local to regional scale, the links between rural out-migration and land use change are not well understood. This paper connects Zelinsky's mobility transition model to land use transition theory and identifies the impacts of rural out-migration on land use transition. It then explores the significant influences of rural out-migration on land use transition in China. Since the introduction of economic reforms in 1978, China has undergone rapid and significant changes. Extensive rural out-migration has transformed China from a land-attached agricultural society to an urban and industrial society. This has produced several contrasting land use trends: increased land demand in urban areas at the expense of high-quality cultivated land, increased number of total settlement areas and emerging "hollowed villages" in the countryside. China's policies addressing these problems could benefit to other developing countries, such as restricting frontier clearing through land zoning and other ecological protection policies; encouraging nonmigrants to adjust their agricultural land holdings; protecting nonmigrants' interest through subsidizing agricultural land, and improving rural infrastructure and farmers' living conditions. Rural out-migration is thus a critical element in addressing the fundamental question of land use—how to balance the land demand for economic development, food security and conservation. This article explores the impacts of rural out-migration on land use change, analyzes the process of migration and land use transition and then examines how rural out-migration affects land use transition in China. This paper also explores future land use change in China, by considering the trend of rural–urban migration and the dynamics of population transition. In so doing, we try to link current rural out-migration dynamics and land use change to facilitate future research and policy considerations. We propose that in order to facilitate policymaking, further research should take a multiscale perspective: cross-country research should be based on an understanding of the dynamics and issues of rural out-migration and land use change in developing countries with different characteristics; country-level research should focus on land use change and problems caused by rural out-migration and its spatial characteristics; and community and household-level research should examine the effects of out-migration of household or household members on agricultural and other land use change.

Introduction

Rural out-migration is an important driver of local land use and land cover change (Kates and Parris, 2003; GLP, 2005; Lambin and Meyfroidt, 2011; Seto et al., 2012). However, the relationship between them is not yet fully understood. The migration literature has largely overlooked land use and land cover change (LUCC) as an outcome of rural out-migration. Similarly, LUCC research has not yet fully addressed the key links of land use change to migration processes (Carr, 2009). Migration has often been considered the step-child of demography and has been neglected in land use

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and food (in)security research (Teller and Hailemariam, 2011). The impact of migration on LUCC is one of the major research frontiers in the Global Land Project (GLP), especially in relation to globalization and urbanization (GLP, 2005). While considerable progress has been made in LUCC research, few studies have directly examined the links between migration and LUCC. Understanding the dynamics of LUCC still faces a number of significant challenges (GLP, 2005; Rounsevell et al., 2012). Empirical analysis on the relationship between migration and LUCC can provide critical insights into the dynamics of land use transitions.

Since the 16th century, migration in Europe has functioned as a driving force behind land use change (Antrop, 2005). Urban areas in the United States grew quickly due to population movement from the countryside to the cities during the transition from the 19th to the 20th centuries (Brown et al., 2005; Bell et al., 2010). Following the decade of the 1960s, countries in Latin America experienced rapid urbanization, with more than 70% of the population moving into urban areas in 2000s (Aide and Grau, 2004; Grau and Aide, 2008). The population and land use change dynamics in developing countries are similar to what has occurred in Europe and North America: when national or regional economies shift from agriculture to industry, cities grow, consumption increases and meanwhile, rural settlements decline and forests recover (Aide and Grau, 2004; Grau and Aide, 2007, 2008). However, case studies on migration and land use transition in Latin America have been either concerned with rural–urban migration and forest transition (Rudel, 1998; Rudel et al., 2002; Hecht and Saatchi, 2007), or focused on rural–rural migration and deforestation (Carr et al., 2005; Carr, 2009). Those authors analyzed only the relationship at local or regional scales, but a wholistic approach is needed to integrate these different landscape dynamics over time. Bell et al. (2010) reviewed migration and land use change in Europe, but they mostly focused on migration change, and the dynamic relationship between migration and land use transition was not well addressed. Migration will continue to be a major influence on land use change in this century, and studies which consider migration and land use change as discrete subjects of inquiry are likely to miss important connections (Bell et al., 2010).

China is the largest developing country in the world. Since its economic reforms were initiated in 1978, it has changed rapidly and significantly (Fan, 2008). Massive rural out-migration has transformed China from an agricultural society to an urban and industrial society (Long et al., 2012). With rapid urbanization and rural transformation, China faces a number of challenges in urban and rural development, such as expanding urban areas, emerging "hollowed villages," and settlement abandonment. The most highlighted issue of current Chinese land use is how to balance the land demand for economy development, food security and conservation. The so-called food–environment-development trilemma is a great challenge to the rural and urban sustainable development.

This article explores the impacts of rural out-migration on land use change. We analyze the process of migration and land use transition and then examine how rural out-migration affects land use transition in China. We also explore future land use change in China, in consideration of the trends of rural–urban migration and the dynamics of population transition. In so doing, we examine links between current rural out-migration dynamics and land use change, in order to facilitate future research and policy consideration.

Theory on the relationship between rural out-migration and land use transition

There is a general consensus that rural out-migration plays a significant role in many aspects of land use change. But there are questions concerning how they relate to each other and how firm the links are in various circumstances. Land use change is a nonlinear process and is associated with population change through a series of transitions. The concept of land use transition refers to a process of land use change in which the structural character of the system transforms. It is a change in land morphology within a certain region driven by socio-economic change and innovation (Lambin and Meyfroidt, 2010; Long and Li, 2012). The links between out-migration and land use transition are complex and differentiated by a wide variety of social, economic and ecological factors.

In Boserup's "induced intensification theory," population is the prime engine of technology innovation and land use intensification, and out-migration is the final resort to alleviating population pressure (Boserup, 1965; Turner and Fischer-Kowalski, 2010). Zelinsky provided a hypothesis of the mobility transition model focusing on migration, identifying five stages in the transition of a society, from one that depends on subsistence agriculture to one that is super-advanced (post-industrial), in which migration flows are absorbed by modern telecommunication systems (Zelinsky, 1971). In this mobility transition model, the links between migration and land use change were not examined. Foley et al. (2005) pointed out that land use transition co-evolves with demographic transition. But how migration affects land use change has not been clearly interpreted. Bilsborrow and Geores (1992) observe that rural out-migration causes human capital gain in destination areas, while origin areas lose it. In the classical Lewis world, where rural migrant-sending areas are characterized by a surplus of labor force, the loss of labor through migration does not induce a production decline (Lewis, 1954; Ranis and Fei, 1961). However, if migrants take capital with them, it may increase the size of the redundant labor force and cause new rounds of rural out-migration. Even when migrants do not take capital with them, in leaving a rural area, human capital attached to these migrants also leaves the rural sector. This results in lowered productivity (Taylor and Martin, 2001). On the other hand, returned migrant brings new technology which can lead to land use intensification in rural migrant-sending areas. Lambin and Meyfroidt (2011) noted the remittance effect of rural out-migration can accelerate land conversion. Recently, a proposed concept of urban land teleconnections applied a process-based framework to understand how flows of capital, people, materials, energy, and waste connects multiple urban and rural systems (Seto et al., 2012). In this framework, local land use transition is shaped by a network of rural–urban connections. In consideration of the process of rural out-migration in east China, Long et al. (2012) presented a four-stage evolution model to illustrate the development of "hollowed villages"—a phenomenon of de-population leading to abandonment of houses throughout the rural settlements in China. The basic idea of the model is to represent the process of land use change in rural China and its interaction with rural out-migration. The model is consistent with McLeman's settlement abandonment model, which depicts a process of settlement abandonment caused by out-migration (McLeman, 2011). Despite great progress in this field, challenges to understanding the impact of migration on land use transition still exist.

Here we connect Zelinsky's hypothesis of mobility transition with the land use transition model (Fig. 1). The pre-modern traditional society in Zelinsky's model is characterized by "little genuine residential migration and only such limited circulation as is sanctioned by customary practice in land utilization, social visits, commerce, warfare, or religious observances" (Zelinsky, 1971). At this stage, rural population is attached to land with limited mobility, and livelihoods are dominated by small-scale subsistence agriculture. To feed the increasing population, agricultural land extensification takes place at the expense of forest and other natural land clearing (stage 1 in Fig. 1). At the second stage, rural areas become a transitional society, which is characterized by "massive