

## 2. LITERATURE REVIEW

Benefited from the reports of LUCC projects in the past few years, our understanding of land-use/cover change was greatly improved. For example, traditionally, land use change was thought to be occurred everywhere. But it is realized that land use change concentrated spatially in 'Hot spots'. The land use change was also realized with influences from remote urban centers, amplified or attenuated by globalization, and with strong local-global interplay. (E. F. Lambin & H. J. Geist, 2002) Four related topics were reviewed to formulate the structure of the study. Finally, a hypothesis was addressed after the work of literature review.

### 2-1. The loss of paddy field

Land use refers to human manipulation of the land to fulfill a need or want (Turner and Meyer 1991.) Land use change may involve: (1) Shift to a different use such as from rice paddy to built-up land, or (2) expansion or intensification of an existing one (Matson et al. 1997.) Traditionally, statistical methods were used to analyze the change of agricultural land use (Ichinose, 1999.) The other approach was spatially mapping the land use and quantify the changes. (Tsai, 2000, Himiyama, 2001)

It is clear that population growth is not the only driving force of agricultural land use change, but also due to people's response to changes in economic opportunities and policies, with biophysical and socio-economic triggered events. (E. F. Lambin & H. J. Geist, 2002)

In Asia, rice-produced areas occupied most of the agriculture land use in the plain area. Due to the economic development and urbanization, paddy fields were decreased in some high economic developed areas over the past few decades. The change of paddy field should play an important role in the shifting of land use. (Figure 2) Study the loosening of paddy field has at least three advantages.

- The other approach towards better understanding of urban expansion
- Realizing the shift of land use from paddy fields to the other land use types
- Relating the food supply and the issue of biophysical environment change.

### 2-2. Comparative Case Study

Comparison of different places is a traditional study method of geography, and it is commonly found in such fields as urban ecology or cultural geography. However it has not been as popular as desired in the study of land use/cover change. Thus, two international organizations (LUCC, IGU-LUCC) highlight the significance of comparative case studies of land use/cover changes. Himiyama (2002) explained the essential of using comparative perspective in land use studies as follows:

'At the international level, there are broad similarities between different countries at similar stages of different. In particular, as countries undergo development, they may experience recurring sets of land-use problems. The causes behind such patterns are best studied in a comparative perspective.' (Himiyama 2002)

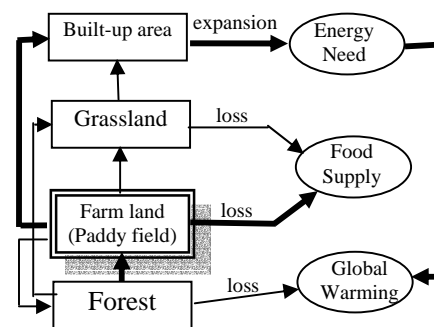


Figure2: The shifting of land use and related environment issues

However, In terms of the high heterogeneity in the patterns of land use change at a local level, most comparative studies are only a case study of an area in LUCC studies. The strategy of LUCC is the building of a network for case study comparison to generate the land use dynamics between local and region level. (Figure 3)

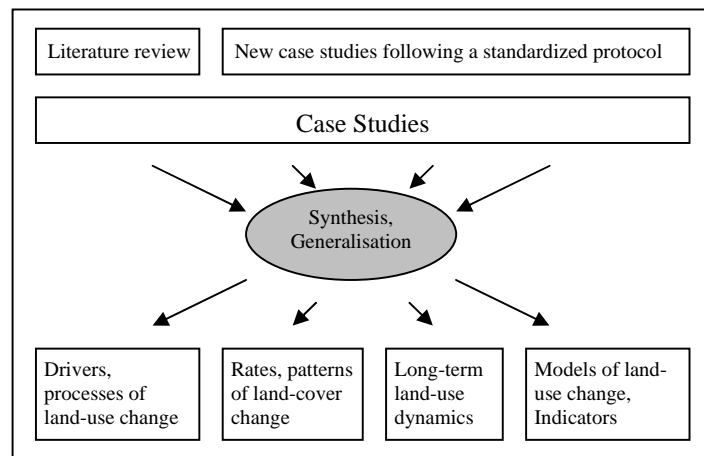


Figure 3 Case study comparisons  
Source: LUCC newsletter 7

### **2-3.Main driving force**

The mix of driving forces of land use change varies in time and space, across scales. (E. F. Lambin & H. J. Geist, 2002) Land use change often triggered by a shock event or an important policy decision in a short temporal scale. For example, a war or economic crisis may play a major role in driving land use change, while comparative case studies often take a long term perspective in LUCC researches. 5 main human driving forces are revealed in LUCC reports, as following lists:

- 1) Demographic factors
- 2) Economic factors
- 3) Technological factors
- 4) Political and institutional factors
- 5) Cultural or sociopolitical factors

Land used by agriculture was the main motivation for an economic treatment of land. In a long term perspective, economic development may gradually affect the agricultural land use. However, neoclassical core economic theory gave less attention to land use, generally regarding it as a production factor of relatively little importance. (Gunther Fischer, 2002)

Developing a model of land-use change needs a good understanding of the major human causes, while driving forces of land use change differs in each geographical and historical context. In the case of the loss of paddy fields, economic factors could be an objective function in developing models for regions.

### **2-4.Spatially based empirical model:**

To our knowledge, a model that can effectively and completely describe the possible outcome of land use change has not been developed. And although a couple of modeling tools have been developed, each of them has deficient and limitations. (Figure4) Considering the scale of time and space in this comparative case study, spatially based model would be a better solution for model designing. Spatially based model is based upon spatial comparison studies in which land use data (or remote sensing images are compared via GIS and statistics. In this GIS and statistics approach, the possible driving factors of land use are identified first. Then, patterns of driving factor changes are conceptualized into models with multivariate analysis. (Marco G. A. Huigen 2003)

Logistic regression model was chosen in this study to develop a spatially based empirical model of LUCC research. An example of a related research is the CLUE model by the Wageningen University. Logistic regression techniques are used in the conversion of land use and its effects to extract patterns of land cover. These patterns are used to predict future development of the land. Except for areas with minimal human influence, these patterns are the result of a long history of land use change, and contain, therefore, valuable information about the relations between land use and its driving factors. (Verburg et al. 1999)

Another example is the LU/GEC project launched by the National Institute of Environment Studies, Japan. This project used multinomial logit model in predicting the land use change of KANSAI district in Japan. The distribution of four types of land use, including built up area, forestry land, Farm land, and other land, was estimated by evaluating the land use ratio function with the projected value of the driving force. (Hidenori Morita et al. 1997)

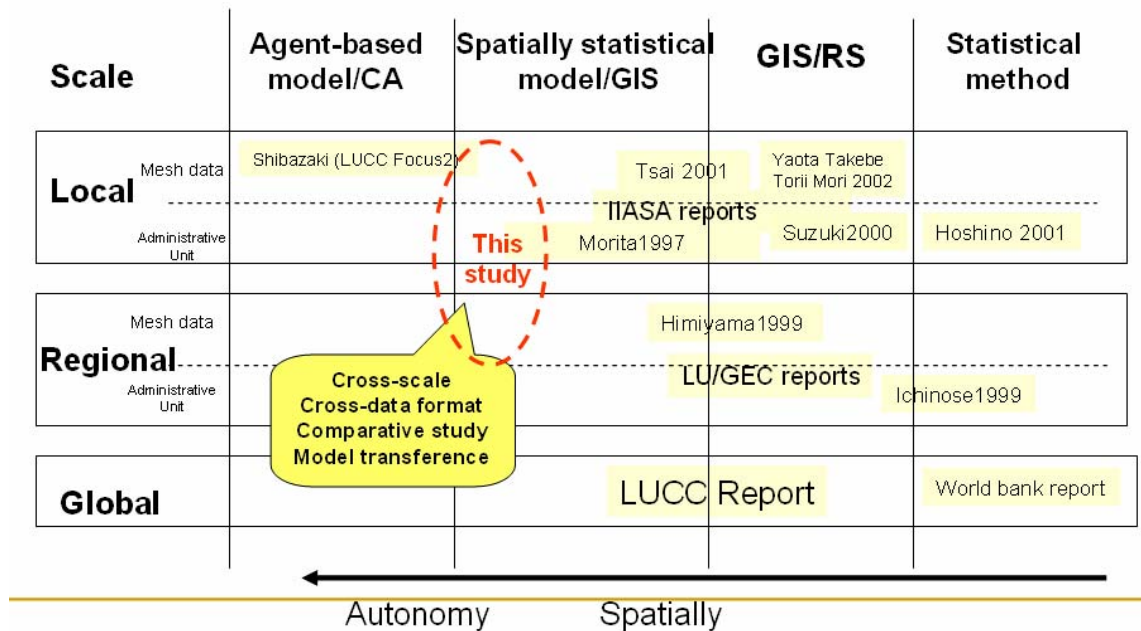


Figure4: Models in agricultural land use change