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Land evaluation for peri-urban agriculture using analytical hierarchical process and geographic information system techniques: A case study of Hanoi

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Abstract

This paper presents an integrated technique of analytical hierarchical process (AHP) and geographic information system (GIS) to evaluate the land for peri-urban agriculture. Hanoi province, Vietnam was selected for the case study. Transformation of conventional agriculture to modern cash crops is the current trend in peri-urban Hanoi. A field survey with focused group discussions was conducted. Based on field survey data analysis, soil, land use, water resources, road network and market were chosen as major factors affecting the peri-urban agriculture. A map of each factor with different logical criteria was prepared. The AHP method was applied to identify the priority weight of each factor. Five spatial layers with their corresponding weights were linearly combined to prepare the suitability map. The map was further scaled as high suitable, medium suitable, low suitable and unsuitable land for the peri-urban agriculture. This empirical scenario provides a cost effective, rapid land evaluation framework which may help policy makers, urban and regional planners and researchers working in developing countries.

Keywords: Peri-urban agriculture; Urban fringe; Land evaluation; AHP method; Suitability assessment; Hanoi

Introduction

Peri-urban zones are considered as a transitional zone between urban and rural areas. The habitat of a diversity of populations, the heterogeneity of land uses, the morphological conditions and densities of the built areas, the complex functional relations and the changing social structure are some of the characteristics of the peri-urban area (Adell, 1999; Allen, 2001; Tacoli, 2001). These characteristics of peri-urban area will be transformed to the urban system. The transformation process decreases the cultivated area because of significant trend of city sprawl to urban and peri-urban agricultural areas (Zeng et al., 2005). Urban expansion is governed by geographic and socio-economic factors such as population growth, policy and economic development (Xiao et al., 2006). As cities expand physically, the frontiers between urban, peri-urban and rural activity distort and merge, thereby, presenting opportunities for beneficial linkages (Rondinelli, 1985; Kaur, 1995).

In developing countries, a substantial and growing proportion of the population lives in or around metropolitan areas and large cities including the peri-urban zone, where their livelihoods depend to some extent on natural resources such as land for food, water, fuel and space for living (Allen, 2001). Rapid growth at the peri-urban fringe has resulted in increased commercial development along arterial roads connecting cities and the countryside (Sullivan and Lovell, 2006). The sustainability of both urban and rural areas is affected by the dynamic and changing flows of commodities, capital, natural resources, people and pollution at the peri-urban interface (Brook and Davila, 2000; Allen, 2001). Peri-urban agriculture shall provide a solution to ecologically unhealthy development of large urban agglomerations, whereas urbanization is

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driven by the desire for short run economic growth and wealth in ever growing cities (Neuppenau, 2002). According to local ecological conditions and habitat, peri-urban agriculture can contribute to preserve natural areas despite the increase of the price of land (Borne et al., 2003) to favor intensive production of perishable foods like fruits, vegetables, meat and fish, dairy products. The demand of perishable products can be expected to remain high in urban areas because people living in those areas mainly depend on market supplies for their food consumption as compared to rural people (Jansen et al., 1996). Supplying perishable products to the urban dwellers, peri-urban agriculture can also generate formal and informal employment for farmers themselves as well as food processors and distributors. Many urban farmers, especially women are likely to use income earned from farming on food provision for the family (McGee and Robinson, 1995).

Uncontrolled momentum of urban sprawl and land use change raises many issues (Brook and Davila, 2000) which

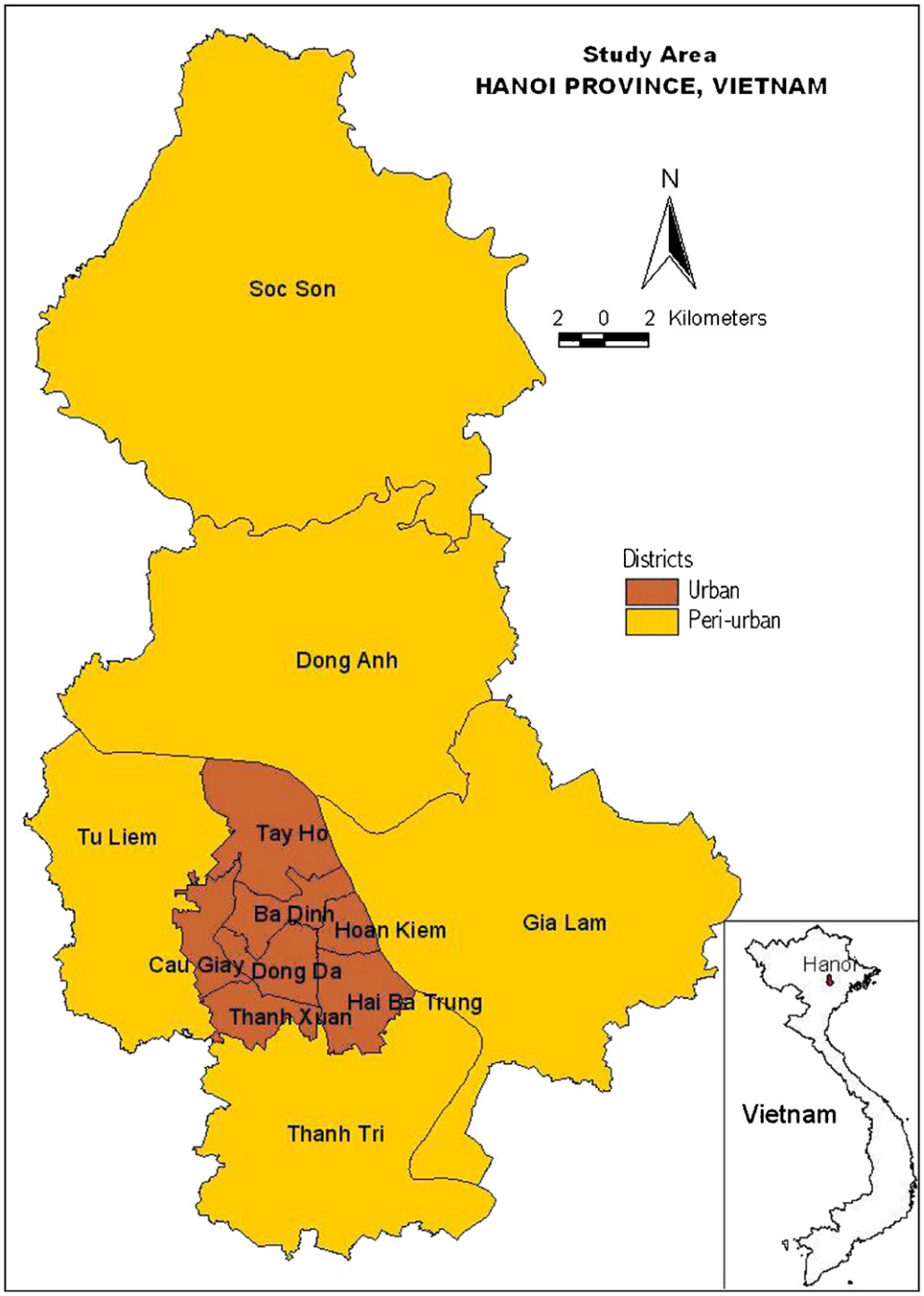

Fig. 1. Study area, Hanoi province, Vietnam.