Chapter 1

Introduction

In the past, water resource was abundant and easily accessible. However, a steady increase in water demand due to intensive agricultural production and expansion of urban areas has been experienced in many areas of northern Thailand. The situation is also worsened by erratic climatic conditions especially drought. This makes water resource become an issue of global concern and increase in water productivity is one of the goal to be reached at the farm and regional scale.

The best practice of water control and management is through the development of irrigation systems. Chiang Mai valley has been utilized for intensive cropping as the results of four main irrigation projects (Gypmantasiri *et al.*, 1980). Although, triple cropping can be practiced in some areas but in many areas irrigation water is used on supplementary basis for main season rice crop (Ekasingh *et al.*, 2005), in those areas dry season crop can not be successfully produced and farmer livelihoods have to depend on non-farm activity. To alleviate water shortage problem, improving water productivity by increasing land productivity and irrigation efficiency are commonly practiced.

Cai and Rosegrant (2003) estimated that world population will reach 7.5 billion by 2025. Consequently, high increase in water requirement is expected while water resource will be severely limited. International Water Management Institute (IWMI) has focused their efforts on promoting water saving and increase water productivity by assessing from water productivity index. The water productivity is defined as production per unit of water consumed (Molden, 1997). In agriculture, production can be measured in term of yield or net return.

Most research efforts in engineering have emphasized on water allocation and irrigation scheduling at the project level (Bhaktikul, 2001; Wongtragoon, 2003) while agricultural research concentrated on designing the experiments to study water use of cash crops at the farm level (Supakosol, 2001). To understand water as a whole, system approach is required for creating the framework that is useful for identifying critical problems and suitable solutions to improve the situation (Wilson and Morren, 1990).

Although in the past, there have been a number of studies on assessment of irrigation performance in various irrigation projects (Polperm, 1990; Sompobtrakoon, 2001; Ongcharoensook, 2001), the multi-scale assessment of water productivity in Thailand that reveals the interrelation among land unit, irrigation zone and irrigation project level is still lacking.

Recently, advances in spatial analysis and systems modeling made it possible to develop a decision support system to facilitate data collection, interpretation and assessment of spatial water productivity at different scales (Droogers and Kite, 2001). This approach will greatly enhance the understanding of agricultural resource availability and utilization hence enable more effective strategic planning and help evaluate alternative scenarios on the dynamics of agricultural systems and natural resource management. This study attempts to integrated spatial information and modeling in a decision support system for facilitating water management strategy, policy makers, planners and resources managers.

The objective of this study was to employ Geographic Information System (GIS) to 1) develop geodatabases for water productivity assessment, 2) determine spatial variability of water balance and productivity, and 3) develop a customized spatial modeling tool for assessing water productivity in Chiang Mai-Lamphun valley.