CHAPTER 1

INTRODUCTION

1.1 The background of the study

Population growth, combined with economic growth, has been the primary causes of intensive land use and has increased the pressure on natural resources. Such intensive land use, especially in the highlands, often adversely affect land, water and air quality. This results in forest decline, loss of wildlife habitat and other biodiversity resources.

In Thailand, the northern region population density was 67.40 people per square kilometer for this economically dynamic area. The forest loss from 2002-2011 increased by 119,556 hectares resulting in a change from forest land to agricultural land. Meanwhile, there was a loss of 62,117 hectares from crop land to non-agricultural land use (Office of Agricultural Economics, 2013).

Chiang Mai province is a part of northern Thailand with the fifth highest population, the second highest economy in the country and an average economic growth of 2.3 percent per year. It is rich in natural resources and is an important watershed for the Ping River (Aryupong, 2012). The total area of this province is 16,964,429 hectares. In 2002-2011, the forest area decreased by 16,089 hectares, and 9,018 hectares of agricultural land was lost to non-agricultural sectors (Agricultural Economic Office, 2013). The main forest loss was in the upstream area which also meant the loss of other environmental amenities. This raises concerns regarding the sustainability of the environment and environmental-related economic activities.

The Fang watershed is located in the north of Chiang Mai province covering a total area of 1,948.5 square kilometers in the 3 districts of Chai Prakan, Fang and Mae Ai (Figure 1.1). This area is surrounded by mountains, it has abundant natural resources and most of the area belongs to national parks (Chowprayoon, 2005). In addition, the cold weather is conducive for growing fruit trees, especially citrus. At present, Chiang Mai is a major citrus producing area, producing several crops per year by stimulating branch initiation to obtain continuous production and generating a higher income for farmers (Jumreanma et al., 2005). As a result, the demand for citrus planting areas has continuously increased since 2000. Nevertheless, some problems such as air and water pollution from chemical use in citrus orchards, as well as conflicts over water, have emerged (Chowprayoon, 2005).

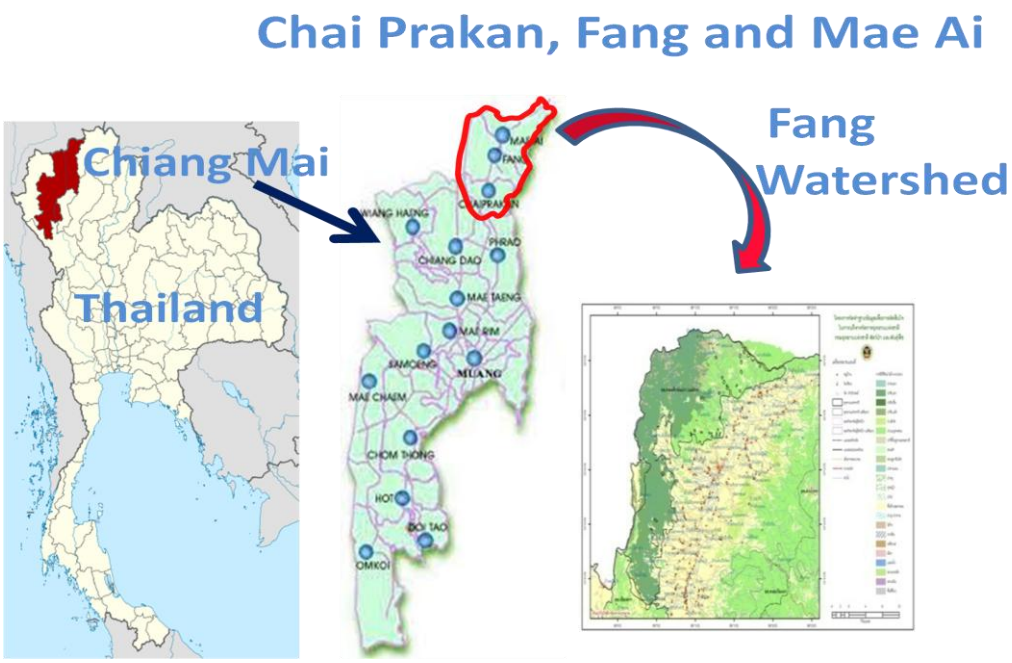

Figure 1.1 The Fang watershed

The production of citrus was in response to market demand. This increased commercialization led to further excessive chemical use which affected the local population's health as well as the environment. This led to a cabinet resolution from the Ministry of Natural Resources and the Environment to seek cooperation with other agencies by forming participatory committees to manage these problems. These committees have since drafted declarations to protect the environment of Chai Prakan, Fang and Mae Ai district for the 5 years between in 2003-2008 (NREMD, 2011).

In general, citrus orchards in the Fang watershed are located on sloping areas which are prone to soil erosion and soil degradation. Meanwhile, the residues from high chemical and fertilizer usage left in the soil were leached and contaminated the stream water. Consequently, this affects soil acidity and soil nutrient imbalance because of the high phosphorus and exchangeable potassium in the soil. In addition, there was also an increase in outbreaks of diseases and pests in this area. These have resulted in a decrease in the citrus yield as well as product quality, together with high input costs, low yields, low prices and low net returns. These have caused a decrease in the citrus plantation area in the Fang watershed. Almost one-third of the farmers either switched to other crops or abandoned the orchards (Santasup and Verunrat, 2011). However, because of the high price of citrus and market demand, most of the farmers still maintain a citrus orchard.

The citrus farming system in the highland watershed landscapes mentioned above revealed conflicts of interests in terms of income generation for farmers, maintenance of viable resources and the environment of the watershed. Such situations require further studies to determine the sustainability of the farming system in relation to the natural resource system.

1.2 Objectives

This study aims to evaluate the optimal resource management for land use regarding household labor, hired labor, loan investments and to provide conditions sufficient for food consumption; so the objectives of this study are as follows:

1. To ascertain the optimal resource management to meet the multiple goals of the citrus-based farming systems in the Fang watershed, both at the farm and watershed levels.
2. To find relationships and tradeoffs in citrus-based natural resource management between the farm and the watershed levels.