

# CHAPTER 1

## Introduction

### 1.1 Background

For thousands of years, humans worldwide have relied profoundly on natural resources, especially on plants, for their ways of life. Plants provide, directly and indirectly, for the four human basic needs which are food, clothing, medicine, and shelter. Knowledge concerning plant uses has accumulated and has been passed down from generation to generation by spoken word and by lifestyle. In particular, an enormous amount of traditional medicinal plant knowledge, which is considered one of the most important knowledge, has been gained by trial and error. It also manifests the distinctive cultural differences between people who settle in different areas. Moreover, at the present time in the 21st century, 80% of the world inhabitants and 88% of the inhabitants of underdeveloped countries rely mainly on traditional medicine for their primary health care systems especially in China, Mexico, Nigeria, and Thailand (Balick and Cox, 1997; Hoareau and DaSilva, 1999). In addition, medicinal plants play an important role for the world's population in terms of providing new drugs, herbal supplements, and food supplement products.

The Karen are an ethnic group who originated in a region called Thibi Kawbi, where the Gobi Desert is now found. Later, they migrated southward to settle in southern China and some of South-East Asia countries especially Myanmar some centuries ago. However, from the 18<sup>th</sup> century onwards the Karen in Myanmar began to cross the River Salween and enter Thailand (Perve, 2006). Currently, the Karen can be found along the Thai Myanmar border especially in valleys with at elevations of 500-1,000 meters above sea level and depressions within the hills near sources of water (Anderson, 1993; Santasombat, 2003). In Thailand, the Karen are the largest hill tribe constituting 48% of the total hill tribe population corresponding to more than 430,000 Karens (Department of Social Development and Welfare, 2002). Most of them dwell in

Chiang Mai province in northern Thailand, which is an area with many natural resources and high biodiversity. Furthermore, the Karen are hill tribe people who still practice their own way of living and who rely on natural ecosystems. Particularly, they have used medicinal plants for primary health care to cure various disorders from times immemorial. As a result of residing in the forest, members of households are able to gather valuable medicinal plants around their village to cure relatively simple illnesses. Most Karen, therefore, know the common medicinal plants and how to utilize them. In contrast, better and specific medicinal plants are usually gathered from the remote undisturbed fallow fields or forested areas. They are used by a shaman or folk healer to cure severe medical problems (Lewis and Lewis, 1984; Anderson, 1993).

Currently, it is clear that anthropogenic climate change has already had marked effects on species ranges and ecological communities around the world (Thomas et al. 2004). The Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2013) reported that world temperature has become higher at the earth surface than any preceding decade since 1850. The concentration of greenhouse gases has increased, the amounts of snow and ice have diminished and sea level has risen. Moreover, there have also been precipitation changes, and precipitation is likely to increase at high latitudes, but decrease at tropical latitudes (IPCC, 2013). More extreme weather is also predicted for the near future, with more frequent heavy precipitation events, increasing tropical cyclone intensity and increasingly frequent droughts, especially in the tropical and subtropical areas (IPCC 2013). The unusual seasonality and uncertain precipitation are also major problems in many regions of the world after rising global temperature (Turner and Clifton, 2009).

As a result of ongoing climate change, plant ecology is likely affected via direct (e.g., drought and heat wave effects on photosynthesis, respiration, transpiration and phenology) and indirect (e.g., fire regime, parasites and diseases, litter quality and decomposition) effects (Barbosa et al., 2012; IPCC, 20013; Sandel and Svenning, 2013) which are likely to increase plant mortality and extinction risk in many areas (IPCC, 2013). Particularly tropical plants are expected to be more sensitive to climate change than those in other ecoregions due to their narrow climatic tolerance (Feeley et al.,

2013). Many of them were predicted to lose suitable habitats (Trisurat et al., 2011) or become extinct in the very near future (Feeley et al., 2013). Thus, the Karen's traditional medicinal plants, which mostly occupy montane ecosystem, are vulnerable and have a high risk for extinction during the present and impending climate change. This dire situation may lead to the disappearance of a number of medicinal plants which provide herbal supplements and medicine for the Karen.

In recent years, many studies have used species distribution models (SDM) to assess the potential impact on plant species from climate change using their current geographic distribution to develop a model of most suitable climate conditions for natural species occurrence, and projecting this into the future on the basis of result from the SDMs (Elith et al., 2006). Such models are well suited for identifying spatial patterns in biological diversity, which can be of value for assessing conservation priorities. SDMs, therefore, are effective tools for evaluating the extinction risk of plant species and provide a potential for conservation planners, managers, and other decision makers to anticipate biodiversity losses.

## **1.2 Research Objectives**

- 1.2.1 To study knowledge about the use of medicinal plants among the Karen in Chiang Mai province.
- 1.2.2 To evaluate the potential impacts of climate change using SDMs on medicinal plants used by the Karen in the study area.
- 1.2.3 To assess the extinction risks for medicinal plants used by the Karen in the study area.
- 1.2.4 To consider potential adaptation strategies for mitigating the impact of climate change on medicinal plants used by Karen in the study area.