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Fallow to forest: Applying indigenous and scientific knowledge of swidden cultivation to tropical forest restoration

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ABSTRACT

Rotational swidden cultivation systems, with fallow periods long enough for the regeneration of secondary forests are capable of maintaining forest cover and plant diversity in a dynamic balance in swidden cultivation landscapes. Regeneration of secondary forests through several successional stages and by a combination of coppicing and seedling development is still poorly understood, especially the influence of different swiddening practices and the role of animals as seed dispersers. Swidden cultivators possess a vast knowledge of plants growing in swidden fallows and of fallow dynamics as well. Forest restoration in Thailand has been carried out mainly on the basis of experimental research on the potential of indigenous tree species to promote natural forest regeneration and biodiversity recovery; the so-called framework species. Another viable source of knowledge for forest restoration can be the study of the semi-natural revegetation processes in fallows and the indigenous knowledge of swiddeners of these processes. The research presented here was carried out to attain a better understanding of forest regeneration on fallow swiddens under different swiddening regimes and how it may be applied to practical forest restoration, We investigated the vegetation characteristics of from various stages of secondary succession in fallow swiddens of the Karen and Lawa ethnic groups in the Mae Chaem watershed, Chiang Mai province, northern Thailand. Indigenous knowledge on the use of species and traditional ecological processes in swiddening was recorded by questioning key informants. The data were analyzed and discussed with respect to their application in forest restoration and participatory forest management.

1. Introduction

Swidden cultivation is a traditional form of agriculture, which has been practiced for more than thousand years in the mountainous regions of mainland Southeast Asia, *i.e.* Cambodia, Laos, Myanmar, Thailand, Vietnam, and China's Yunnan province (Spencer, 1966; Fox, 2000). In this land use system, patches of forest are cut down and burned during the dry season to clear and fertilize the site for cultivation. The cleared fields are planted for one or more years with upland rice or other crops during the rainy season and then left to lie "fallow" for periods of varying length to allow for natural succession that results in secondary forest (Schmidt-Vogt, 1999, 2001; Mertz et al., 2009). Ethnic minority groups have accumulated indigenous knowledge on cropping, as well as on the ecology and uses of secondary forests (Kunstadter et al., 1978; Anderson, 1993; Nakashima and Roué, 2002; Santasombat, 2003; Hares, 2006). Well-known examples are the Karen (Delang, 2003) and the Lawa (Kunstadter et al., 1978; Schmidt-Vogt, 1997a,b, 1998, 1999, 2000, 2007) ethnic groups in Northern Thailand. Some swidden cultivators perform selective felling before cultivation, to preserve parent trees or relict emergents for subsequent forest regeneration (Kerkhoff and Sharma, 2006; Schmidt-Vogt, 2007; Rerkasem et al., 2009). The fallow phase allows soils to stabilize and gives forest vegetation an opportunity to re-grow, to accumulate biomass, and to provide various non-timber forest products. Moreover, if the fallow phase is long enough, there is considerable opportunity for both carbon sequestration and biodiversity conservation (Lawrence et al., 1998; Rerkasem et al., 2009).

However, population growth as well as social and policy changes exert increasing pressure on shifting cultivators (Delang, 2002; Xu et al., 2009). Commercialization and an increasing demand for cash crops provide incentive to growing commercial crops, intensively with shorter fallow periods or none at all. Although such land use offers almost immediate financial benefits to the farmers, it may have many long-term adverse environmental impacts, as a shortened fallow phases are often

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unsustainable (Wangpakapattanawong, 2001), allowing dominance of herbaceous weeds and grasses and eventually soil degradation (Ramakrishnan, 2006).

Indigenous knowledge is often discussed as a basis of information to be incorporated with changing resource management paradigms (Ellen et al., 2000; Davidson-Hunt and Berkes, 2001). The protection of indigenous knowledge for ecosystem integrity and biodiversity recovery is a focal area of the Convention on Biodiversity (CBD)'s Targets in 2010 (CBD, 2007, http://www.cbd.int/2010-target). The challenge for sustainable forest restoration and management is how to build strategies for incorporating indigenous knowledge into state-driven forestry policy and implementation (He et al., 2009). Thus, in order to assess the indigenous knowledge of swidden cultivators and to combine it with scientific knowledge obtained through field research as a tool for forest restoration and management, a vegetation survey in fallow fields was conducted from the viewpoint of ethnoscience (Rist and Dahdouh-Guebas, 2006). We tested the hypothesis that regeneration processes in fallow swiddens may provide information that can be usefully applied to tropical forest restoration techniques. For example, it is well understood that sprouting from living stumps and rootstocks after clearing and burning is an important process in secondary fallow successions (Schmidt-Vogt, 1999, 2001; Fukushima et al., 2007). The contribution to forest regrowth by tree growing from seeds is less well understood. Dispersal of seeds from surviving forest remnants into the forest restoration sites is, however, a crucial process in forest restoration (Wunderle, 1997; Willson and Traveset, 2000; Clark et al., 2001; Corlett, 2002). We also tested the hypothesis that swidden cultivators are knowledgeable about ecological functions such as seed dispersal, seed establishment and coppicing.

2. Materials and methods

2.1. Study site

Two sites (site 1 is Mae Hae Tai Karen and site 2 is Ban Hor Lawa hilltribe villages), where rotational shifting cultivation is

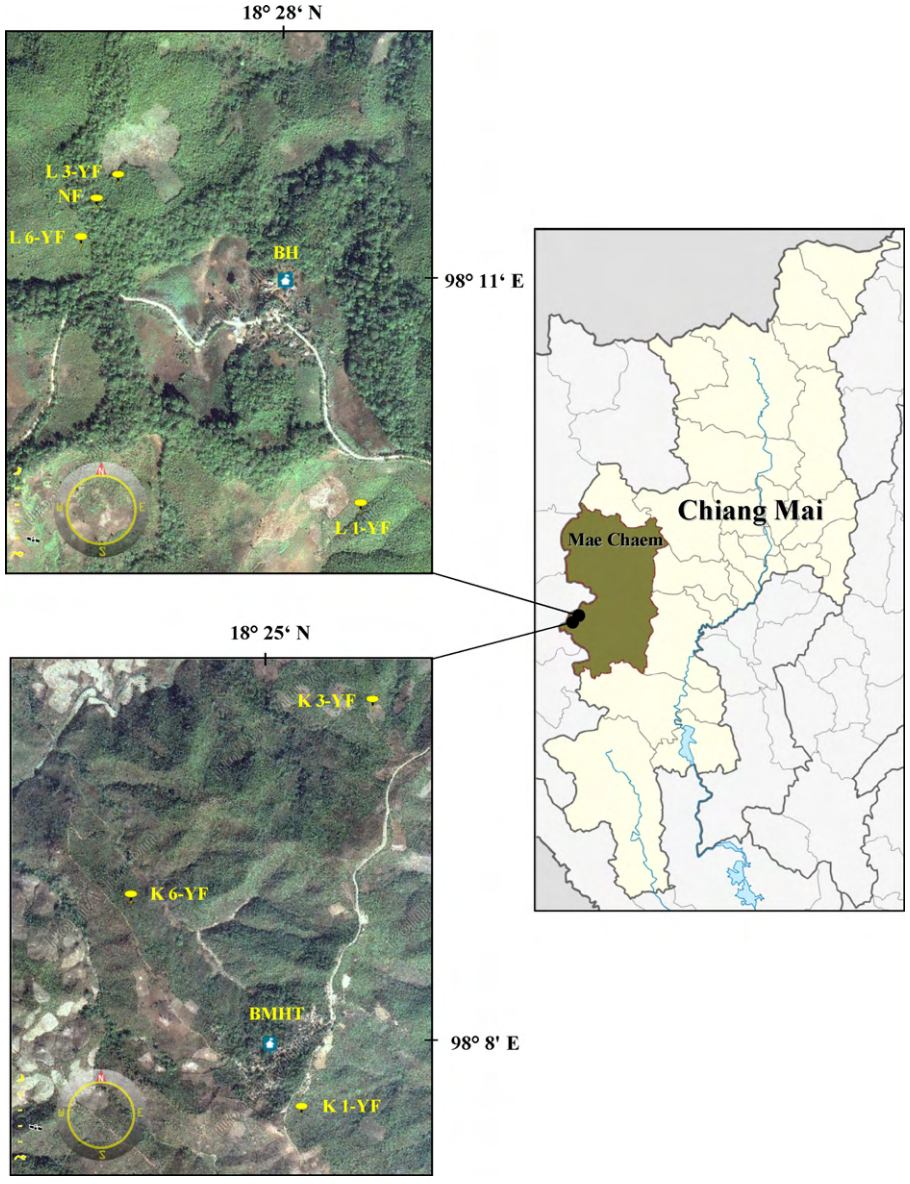

Fig. 1. The study site is located in the Mae Chaem watershed in Chiang Mai province, northern Thailand. Sampling plots were labeled according to sampling plots location; 1-year (K 1-YF), 3-year (K 3-YF), and 6-year fallows (K 6-YF) around Karen village (Ban Mae Hae Tai; BMHT) and 1-year (L 1-YF), 3-year (L 3-YF), 6-year fallows (L 6-YF) and natural forest (NF) around Lawa village (Ban Hor; BH). Map of Chiang Mai province, Thailand, highlighting the district Mae Chaem © 2009 Wikimedia commons. Satellite imagery © 2010 PointAsia.com Version: 1.1.0007.00 (Beta).