

## Local knowledge of Ethnic Groups on Termite Mushroom Conservation at Huai Khayeng, Kanchanaburi, Thailand

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**Abstract:** This study focused on local knowledge of termite mushroom (genus *Termitomyces*) formation and considering as policy and management interventions to support rural livelihoods and promote sustainable resource use. Data on termite mushroom picking, consumption, and sale were collected from three rural villages; Ban Tha Madeau, Ban Raipa and Ban Rai where are located in Hua khayeng subdistrict, Thong Pha Phum District, Kanchanaburi province. Each village is a representative of Thai, Karen and Burmese, respectively. The result found that the main occupation of each ethnic group is significantly different from each other that is almost of Thai do the agriculture, while the most of Karen are in the service area and finding for the thing from the forest and Burmese almost work as the employees. About the forms of *Termitomyces* mutual support, it was found that Burmese has the highest level while the local knowledge of each ethnics group about the origin and *Termitomyces* collecting characteristics are similar, emphasis is based on the collecting that are not affect the future appearance of *Termitomyces*. The survey result in the area of Thong Pha Phum Plantation in March to May found four types of Termite mushroom. Net value of *Termitomyces* utilization of local people in Hua khayeng subdistrict is 685,821 Baht.

**Key words:** local knowledge, ethnics, termite mushroom, conservation

### Introduction

Local knowledge generally refers to the matured long-standing traditions and practices of certain regional, indigenous, or local communities. In many cases, local knowledge has been orally passed for generations from person to person. Other forms of local knowledge are often expressed through different means. Such knowledge typically distinguishes one community from another. In a sense, it becomes their "identity". For many communities, local knowledge takes on a personal and spiritual meaning. Recently, international attention has turned to intellectual property laws to preserve, protect, and promote local knowledge. The reasons for this are complex. In 1992, the Convention on Biological Diversity (CBD) recognized the value of local knowledge in protecting species, ecosystems and landscapes, and incorporated language regulating access to it and its use (discussed below). It soon became apparent that implementing these provisions would require that international intellectual property agreements would need to be revised to accommodate them. In response, the states who

had ratified the CBD requested the World Intellectual Property Organization (WIPO) to investigate the relationship between intellectual property rights, biodiversity and local knowledge. WIPO began this work with a fact finding mission in 1999. Considering the issues involved with biodiversity and the broader issues in TRIPs (involving all forms of cultural expressions, not just those associated with biodiversity - including traditional designs, music, songs, stories, designs, etc.). Initial concern was over the territorial rights and traditional resource rights of these communities. Indigenous peoples soon showed concern for the misappropriation and misuse of their "intangible" knowledge and cultural heritage. Indigenous peoples and local communities have resisted, among other things: the use of traditional symbols and designs as mascots, derivative arts and crafts; the use or modification of traditional songs; the patenting of traditional uses of medicinal plants; and the copyrighting and distribution of traditional stories (Alexander et al., 2004).

There is growing international awareness of the importance and value of

natural resources in the lives of rural communities throughout the world. This realization has simultaneously come about in what have, at times, been viewed as the antagonistic disciplines of development economics and conservation (Marshall et al., 2003) such that now there is a significant international policy agenda to demonstrate complementarities between the two (Scherr et al., 2003). The theme of biodiversity and society provides an opportunity to look beyond skewed environmental ideologies that lead biodiversity researchers to ignore land “tarnished” by humans in search of pristine ecosystems. Many experts suggest that biodiversity is the result of natural processes and relegate social processes to a category of disturbances. In response to the biodiversity crisis, many advances have been made in identifying endangered organisms, ecosystems, landscapes and environments. Most specialists agree, however, that the scientific community must seek more effective ways of mitigating these threats. Common approaches to this goal include the establishment of a multiplicity of protected areas (Berkes, 1999).

Thailand has rich vegetation with a wide variety of plants, because of the extreme variations in geographical and climatic conditions prevailing in the country. Non-timber forest products such as plants, edible herbs and mushrooms have been used since ancient times for the treatment of various ailments. The traditional systems of non-timber product use as food or medicine together with folklore systems continue to serve a large portion of the population, particularly in rural areas. Therefore, this study is focusing on local knowledge of termite mushrooms (genus *Termitomyces*) that have been used as food and food flavouring material in soups and sauces for centuries, due to their unique and subtle flavour. Termite mushrooms, are highly valued in Kanchanaburi province, Thailand, partially due to their rareness and difficulty in cultivation. *Termitomyces* is a symbiotic fungus found in tropical Africa and Asia. Termites cultivate this

fungus in their nests as food (Heim, 1977). The fruit bodies form inside the tunnels and bore through the very hard layer of inert matter, forcing their way through it with a special umbo (Kendrick, 2001).

### Methodology

The study was located at Huai Khayeng sub district, Thong Pha Phum District, Kanchanaburi Province, Thailand. Data on termite mushroom picking, consumption, and sale were collected from households in three rural villages; Ban Tha Madeau, Ban Raipa and Ban Rai (see Fig. 1). Focus groups were chosen because of their ability to capture social interactions and shared beliefs among members of ethnic communities. The majority of ethnics found in the study area in each village are representatives of Thai, Karen and Burmese, respectively. The local knowledge data were collected through interviews and discussions among local people who collect from the forest. Data were also collected through questionnaires in their local languages (Thai, Karen and Burmese). Information was collected through interviews with persons aged from 25-76, who had the local knowledge of termite mushrooms. Questions were asked about the *Termitomyces* used, the form of usage either fresh or dried, and about methods for finding and collecting them. The details of sampling households are shown in Table 1.

The data analysis approach followed standard methods for analyzing qualitative data and quantitative data using SPSS version 10.5.

### Results

From interviews, we found that most ethnic sample groups are Thai, Karen, Laos, Burmese and others. The percentages of these ethnic groups were 37.2, 21.2, 16.1, 16.1, and 9.5, respectively. Three ethnic groups were represented in Ban Tha Madeau, Ban Raipa and Ban Rai, which had a total of 137 households (Table 1). The percentage of each ethnic group in each village is shown in Fig. 2.

The results found that the main

Table 1. The study area and sampling households in each village

Village	Ethnics	Total household	Sample household
Ban Tha Madeau	Thai	120	40
Ban Raipa	Karen	80	32
Ban Rai	Burmese	150	65
Total		350	137

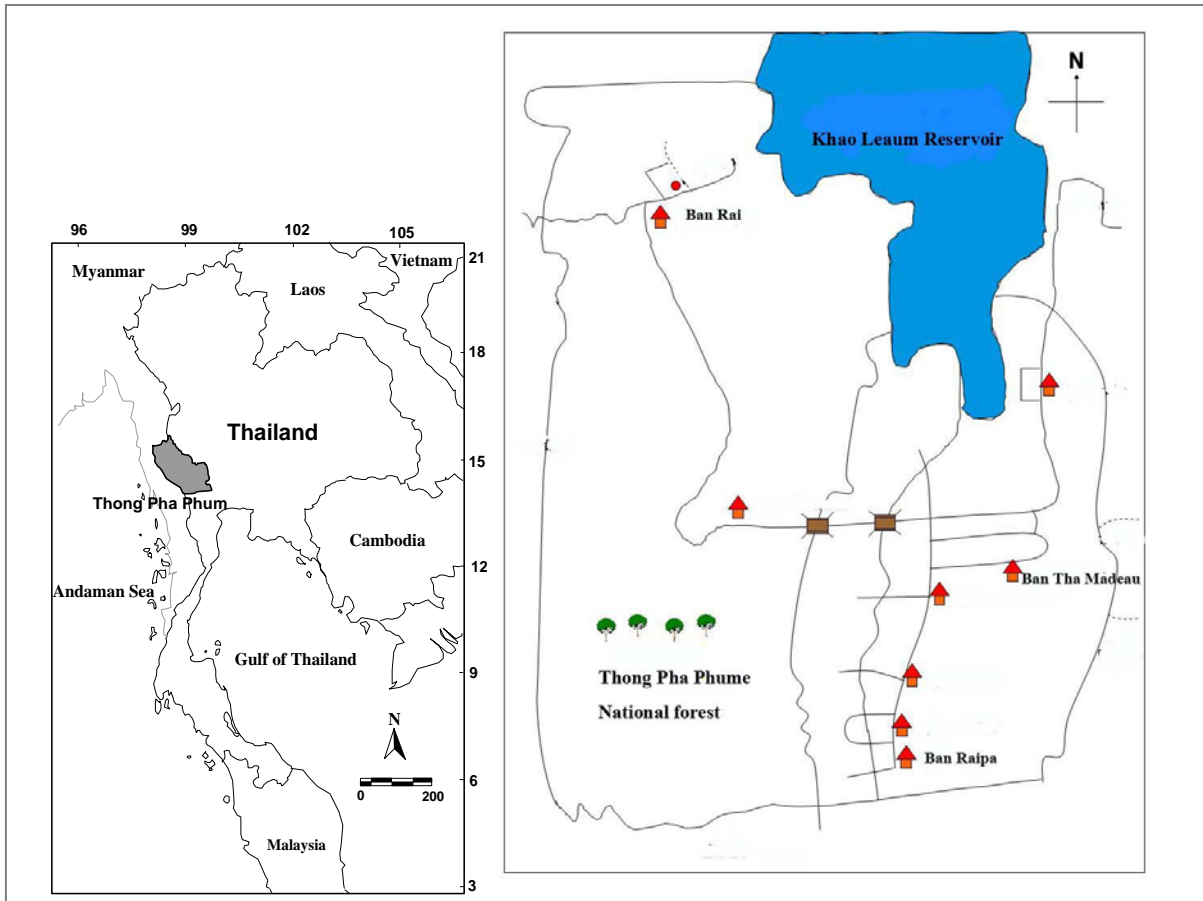


Figure 1. Location map of study area in Huai Khayeng sub district, Thong Pha Phum District, Kanchanaburi Province, Thailand.

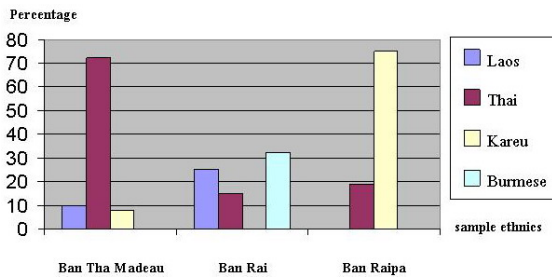


Figure 2. Proportion of ethnic groups in each sampling village

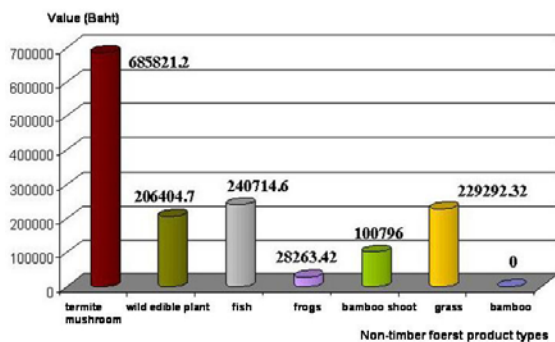


Figure 3. Value of non-timber forest products

occupation is significantly different among ethnic groups. Most Thai do agriculture but some are government officers, while most Karen are in the service area and collect products from the forest and most Burmese almost work as employees. About the forms of *Termitomyces* mutual support, it was found that Burmese had the highest level. However, most local people had a second job, that is, collection of non-timber forest products, especially termite mushrooms (see Fig. 3). Picking termite mushroom is a popular pastime and recreational activity. Moreover, mushroom harvests are also commercially important because they can generate significant income. In Huai Khayeng subdistrict, the total value of this mushroom production on the local market is estimated at about 685,821 Baht or about 17,145.5 US \$.

The interviews data showed that local knowledge of each ethnic group about the origin and collecting characteristics of *Termitomyces* are similar; emphasis is placed on the way of collecting that affects the future appearance of *Termitomyces*.

Local knowledge recommends harvesting termite mushrooms by hand picking and prohibits using any sharp material to collect them. The old people also said that they believe if they use knife or weeding tool to dig termite mushroom, next year, these mushrooms will not appeared. In fact, they would like to protect fungus gardens in termite nests which are the origin of the mushroom. Koenig (1799) (cited in Lefevre et al., 2002.) identified for the first time, inside a termite nest, brain-like formations with a diameter of several centimeters. These formations were later designated fungus combs or fungus gardens. On these plant structures, a fungus was developing in the form of mycelium and small white nodules (see Fig. 4).

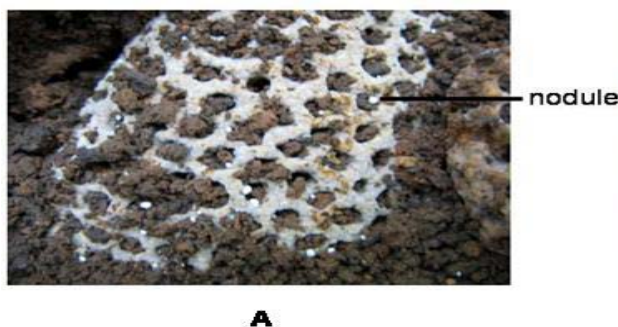
All ethnic groups believe that termites have evolved a unique mutualism with mushrooms that grow on a special culture called the fungus comb. They said that the fungus comb is made from partly digested foraged plant litter which passes rapidly through the termite's gut. The resulting faecal pellets are pressed together to make a comb like matrix. As the comb matures, mycelia develop and produce conidial nodules, which together with older, senescent combs are consumed by workers (Siber and Leuthold, 1981). Local people also told how they can know if a fungus comb will have termite mushrooms this year. They observed from the characteristics of the fungus comb; if the fungus comb has some liquid on it, the termite mushroom will grow up in that year. This result can be explained that maybe local people means they observe from appear or disappear termite in the mound, almost fresh mound that they find, this mound will be found living termite and almost of soil in that mound is moist. Most old fungus comb do not have any living termites and mushrooms can not grow up.

In addition, local knowledge says that a villager should not watch a mushroom area because it can cause mushroom productivity to

be low. However, the actual aim of this saying is to help spore dispersal. They fear that the removal of mushroom fruit bodies from the forest before spore dispersal might impair their reproduction. Now they try to introduce legal restrictions on the harvesting of termite mushrooms in natural habitats. They realize that spores are important for the survival, migration and distribution of these mushrooms, so they try to collect mature mushrooms because the mushrooms would have released their spore already into the ground to be germ for next year.

Further, local knowledge says that people should not wrap termite mushrooms with cloth because it can cause mushroom fruiting bodies to get small but actually the aim of this saying is to prevent damage of mushroom fruiting bodies that may break into small pieces and get a bad price.

Another result indicates that men mainly collect the mushroom though some women do so occasionally. Mushrooms are seasonal and very specific in their habitat. Local people are knowledgeable in locating termite mushrooms, often based on the smell of spores and recognition of particular locations such as termite mounds, forest fringes, decayed wood and trees with dried trunks, where mushrooms usually thrive. The old people also said that they try to find termite nests and collect fungus combs and take them back to cultivate them on their own land. They hope to be successful with termite mushroom cultivation and get high value mushroom products by copying natural conditions. For example, they bring the fungus comb and put it into a hold where they control physical conditions such as temperature and moisture (by using plastic bags or bamboo containers or by covering the combs). However, they don't have success yet; maybe there are some chemical substances released from termites that are significant to termite



**A**

Figure 4. A. White nodules on a fungus comb



**B**

B. Fungus or termite mushroom that formed on a fungus comb





Figure 5. *Termitomyces* sp. from field survey

Table 2. *Termitomyces* species from field survey

No.	Local name	Collecting species		
		Family	Genus	Species
1.	Termite mushroom	Tricholomataceae	<i>Termitomyces</i>	<i>Termitomyces</i> sp.
2.	Khao Tok mushroom	Amanitoceae	<i>Termitomyces</i>	<i>T. microcapus</i>
3.	Kha Yao mushroom	Tricholomataceae	<i>Termitomyces</i>	<i>T. albuminosus</i>
4.	Termite mushroom	Tricholomataceae	<i>Termitomyces</i>	<i>T. striatus</i>

mushroom growing but nobody knows yet. Collin (1997) showed several roles for the fungal symbiont, for example, the provision of heat and moisture, the provision of a concentrated nitrogen source and the enrichment of nitrogen in foraged foodstuffs by virtue of the fungal metabolism. The impact of termites is mainly due to their building activity where the mounds represent the most spectacular biogenic structures. The mounds and their associated biogenic structure (fungus combs) have a significant impact on the physico-chemical features of the soil, such as soil morphology, i.e. soil translocation and formation of subsurface horizons (Fall et al., 2001), soil structure, i.e. aeration, porosity and structural stability (Garnier-Sillam, 1990), and chemical properties, i.e. enrichment by cations, P, and N (Lobry de Bruyn and Conacher, 1990).

As this study has shown, harvesting pressure has increased over past decades which has caused a decline in the termite mushroom. This has led to widespread concern by local people about overharvesting and damage to mushroom resources because the productivity is rapidly decreasing. They also said that this bad situation has come about from local people not being aware of and ignoring local knowledge

which shows how to harvest termite mushrooms for sustainable use. Termite mushrooms are highly valued in Thailand, partially due to their rareness and difficulty in cultivation, so villagers just think about their economic value and do everything they can to collect large amounts of mushrooms. Most of them harvest termite mushrooms by cutting and digging, and thus fungus combs are destroyed or damaged.

From field observations, the termite mushrooms include about 4 species (Fig. 5; Table 2). Termite mushrooms are the most frequently gathered during two periods at the beginning and the final duration of the rainy season from April to May and September to October, respectively, every year.

### Discussion and Conclusion

Our results indicate the usefulness of harvesting restrictions and promoting the knowledge of local people to their children. We should not underestimate the importance of local wisdom because the emphasis of this knowledge is on mushroom collecting for sustainable use and does not affect the future appearance of *Termitomyces*.

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