

***Local knowledge in each ethnics on termite
mushroom conservation of Huai Kha Yeng,
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. This paper reports on a study in Thailand, the aim is to improve local knowledge on Termitomyces appearance of Thong Pha Phum plantation. The data collection is to investigate the opinion and knowledge that is a local knowledge on Termitomyces appearance and assess the economic value of Termitomyces, the dependence of local people on forest resource, by using questionnaires in data collection. Chi – square is a statistic technique is used in data analysis and statistical significance is set at 0.1. Termitomyces is the most famous non – timber forest product from Thong Pha Phum plantation. Termitomyces has a mutual relation with termite (symbiosis mutualism) which both derives some degree of benefit from each other. Moreover Termitomyce has the economical importance (Jeng et al., 2004). Data on termite mushroom picking, consumption, and sale were collected from households in three rural villages; Ban Tha Madeau, Ban Raipa and Ban Rai where are located in Hua Kha Yeng sub district, Thong Pha Phum District, Kanchanaburi province. Each village is a representative of Thai, Karen and

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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 but some are the governmental officers, while the most of Karen are in the service area and finding for the thing from the forest and Burmeses 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 affects the future appearance of Termitomyces. The survey result in the area of Thong Pha Phoom Plantation in March to May found four types of Termite mushroom Net value of Termitomyces utilization of local people in Hua kha yeng sub district is 685,821 Baht.

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 their 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 is having 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 in termite mushroom (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 mushroom, 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).

Material and Methods

Study area

The study was located at Hua Kha Yeng 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 Figure 1). Focus groups were chosen because of their ability to capture social interactions and shared beliefs among members of ethnic communities. The majority ethnics found in the study area in each village are a representative of Thai, Karen and Burmese, respectively. The local knowledge data were collected through interviews and discussions among local people who finding for the thing from the forest. Data were also collected through questionnaires in their local languages (Thai, Karen and Burmese). Information was collected through interview with person aged between 25-76, who had the local knowledge of termite mushrooms. Questions were asked about the *Termitomyces* used, form of usage either fresh or dried, how to find and pick them back. The data of sampling households were recorded in Table 1.

Table 1 The study area and sampling households in each village

Village	Ethnics	Total household
Ban Tha Madeau	Thai	120
Ban Raipa	Karen	80
Ban Rai	Burmecese	150
Total		350

Sample household		
		40
		32
		65
		137

The data analysis approach followed standard methods for analyzing qualitative data and quantitative data was used SPSS version 10.5 to analyze by setting at 0.1.

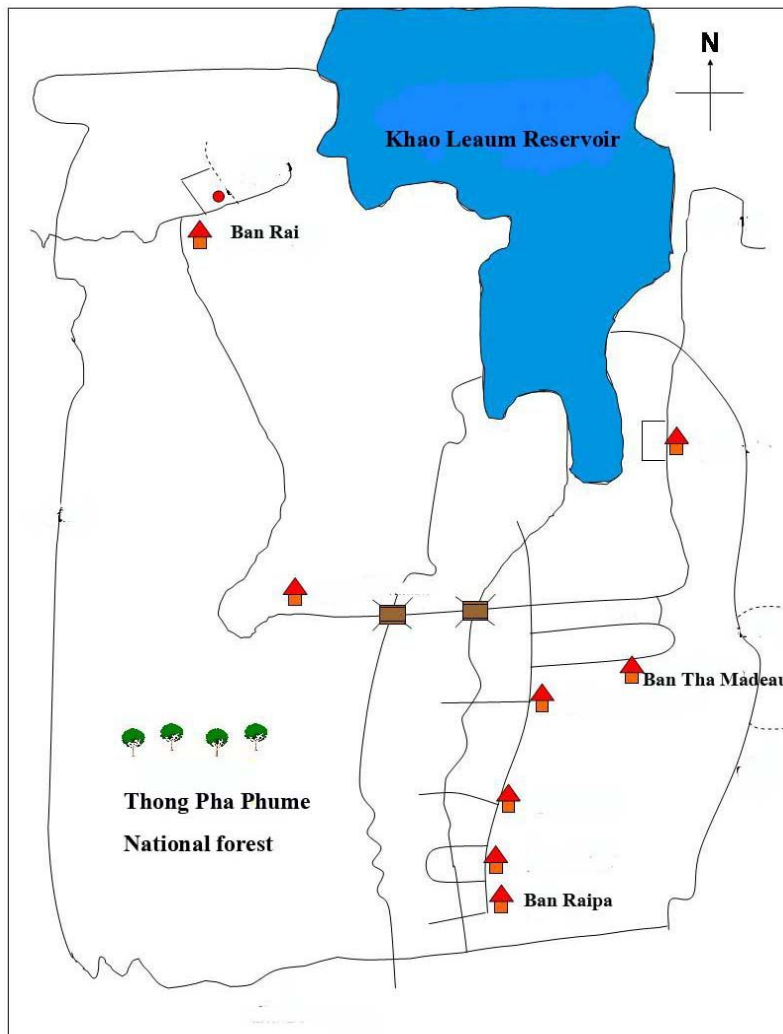


Figure 1 Location map of study area in Hua Kha Yeng sub district, Thong Pha Phum district, Kanchanaburi province, Thailand.

Results and Discussion

From interview, we found that most ethnic sample groups are Thai, Karen, Laos, Burmese and others. The percentages of these ethnics are 37.2, 21.2, 16.1, 16.1, 9.5, respectively. Three ethnics are representative of Ban Tha Madeau, Ban Raipa and Ban Rai and totally 137 households (Table 1) and summarize the percentage of each ethnic in each village in Figure 2.

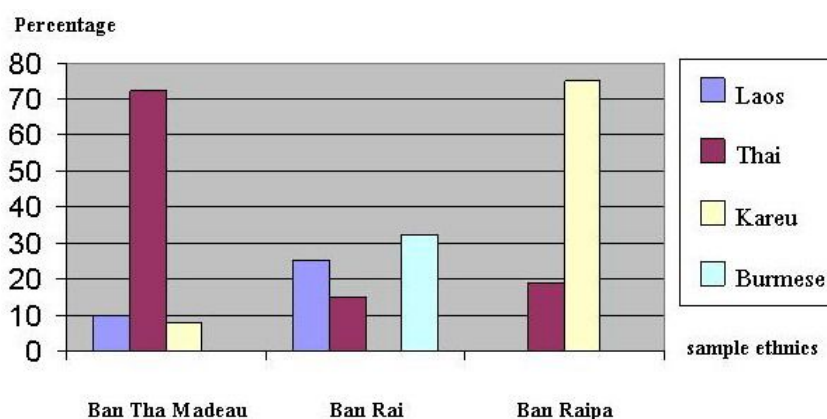


Figure 2 Proportion of ethnic groups in each sampling village

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 but some are the governmental officers, while the most of Karen are in the service area and finding for the thing from the forest and Burmeses almost work as the employees. About the forms of *Termitomyces* mutual support, it was found that Burmese has the highest level. However, most local people have a second job that is collection non-timber forest products, especially termite mushroom (see Figure 3). Picking termite mushroom is a popular pastime and recreational activity. Moreover, mushroom harvests are also commercially important that can generate significant income, in Huai Kha Yeng subditric, the

value of total these mushroom production on the local market is estimated at about 685,821 Baht or about 17,145.5 US \$.

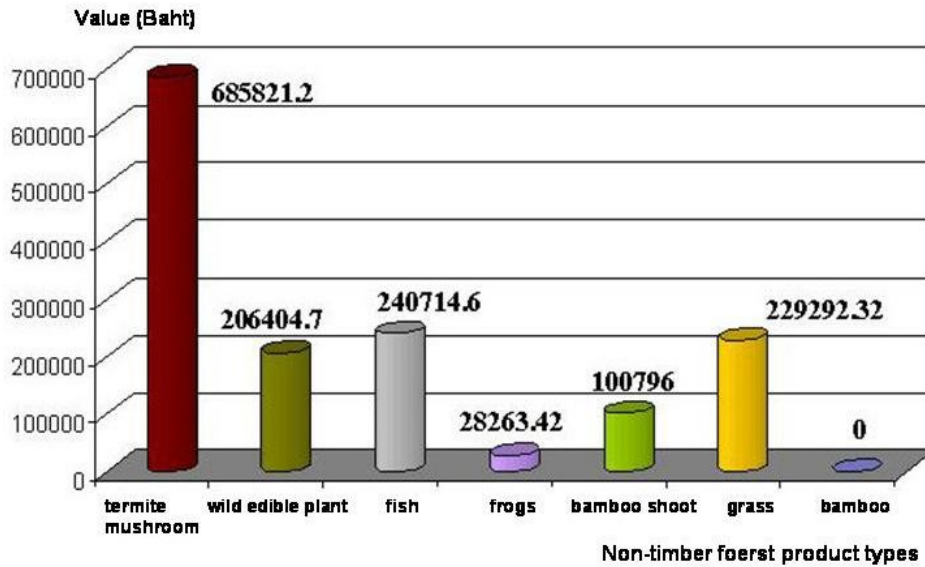


Figure 3 Occupation percentage of sampling groups

The interviews data show that local knowledge of each ethnics group about the origin and *Termitomyces* collecting characteristics are similar, emphasis is based on the collecting that affects the future appearance of *Termitomyces*.

Local knowledge recommend harvest termite mushroom by hand picking and prohibit using any sharp material to pick them. The old people also told that they believe if they use knife or weeding tool to dig termite mushroom, next year, these mushroom will be disappeared. In fact, they would like to protect the fungus garden in termite nest where are the origin the mushroom. Koenig (1799; cited from Lefevre 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 under the form of mycelium and small white nodules (see Figure 4).

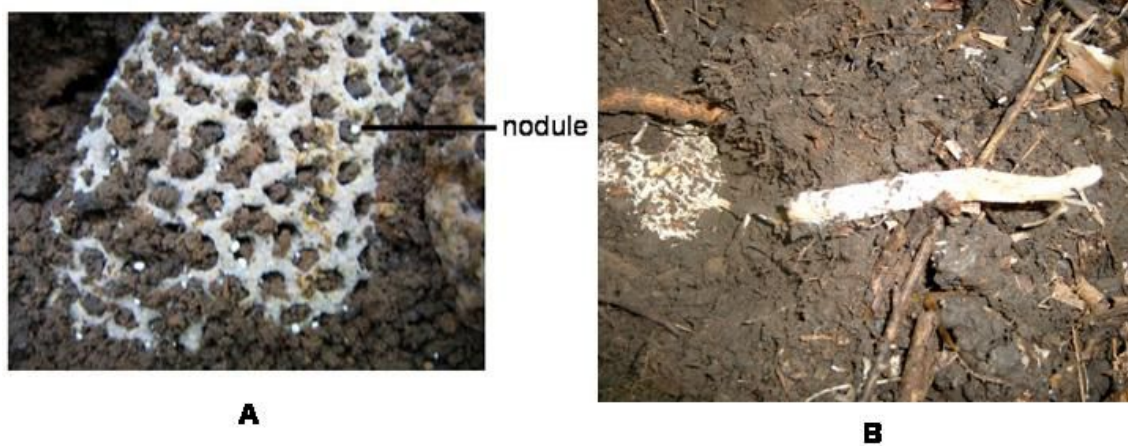


Figure 4 A. white nodules on the fungus comb B. fungus or termite mushroom was formation on the fungus comb

All ethnics believe that termites have evolved a unique mutualism with mushroom grow on a special culture call 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, mycelium develops and produces conidial nodules, which together with older, senescent comb are consumed by workers (Siber and Leuthold, 1981). Local people also told that how can they know this fungus comb will have termite mushroom this year. They observed from the characteristic of fungus comb, if fungus comb has some liquid on this material, termite mushroom will grow up at that year. This result can explain by the study of Wood *et al.* (1983) which indicated that the fungus growing termites mix soil particles with their saliva to build their nests (Grasse, 1984), so liquid of local people mean termite saliva. Most of old fungus comb doesn't have any termites living, mushroom can not grow up.

In addition, local knowledge say that the villager should not watch the mushroom area because it can cause a small amount of mushroom productivity but actually the 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 mushroom because mushroom will release their spore into the ground to be germ for next year.



Figure 5 Interview local people on termite mushroom formation

Further, local knowledge say that people should not wrap termite mushroom by clothes since it can cause mushroom fruiting bodies getting small but actually the aim of this saying is to prevent damaging of mushroom fruiting bodies that can breaking into small pieces and get a bad price.



A



B

Figure 6 A. Location at Teak plantation that found termite mushroom B. Fungus comb in termite nest

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 particular locations such as termite mounds, forest fringes, decayed wood and trees with dried trunk, where mushrooms usually thrive. The old people also told that they try to find termite nest and pick fungus comb back to cultivate this comb in their own land. They hope to success on termite mushroom cultivate and get high mushroom products by copying natural conditions. For example, they bring the fungus comb and put it into the hold where they control physical condition such as temperature and moisture (by using plastic bag or bamboo contain or cover this comb). However, they don't success yet; maybe there are some chemical properties from termite that release and significantly associate termite mushroom growing and nobody know 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 the soil morphology, i.e. soil translocation and formation of subsurface horizons (Fall *et al.*, 2001), the soil structure, i.e. aeration, porosity and structural stability (Garnier-Sillam, 1990), and chemical properties, i.e. enrichment in cation, P, and N (Lobry de Bruyn and Conacher, 1990).

At this study has shown, harvesting pressure has increased over past decades that cause of termite mushroom is claimed. This has led to widespread

concern by local people about overharvesting and damage to mushroom resources because the productivity is rapidly decreased. They also said these bad situation come from local people are not aware and ignored the local knowledge which suggest them how to pick termite mushroom as sustainable use. Termite mushroom are highly valued in Thailand, partially due to their rareness and difficulty in cultivation, so villager just think about economic value and do everyway to collect a large amount of mushroom. Most of them harvest termite mushroom by cutting and digging, thus fungus comb are destroyed and damage.

From field observation, the termite mushrooms includes about 4 species (Figure 7; Table 2). Termite mushrooms are the most frequently gathered during the two periods of the beginning and final duration of rainy season of April to May and September to October every year.



Figure 7 *Termitomyces* sp. from field survey

Table 2 *Termitomyces* species from field survey

Collecting species				
No.	Local name	Family	Genus	Species
1.	Termite mushroom	Tricholomataceae	<i>Termitomyces</i>	<i>Termitomyces</i> <i>sp</i>

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>

Conclusions

Our results raise questions about the usefulness of harvesting restriction and promote local knowledge to their children. We should not underestimate the importance of the local because these knowledge emphasizes based on the mushroom collecting that sustainable use and do not affect the future appearance of *Termitomyces*.

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Biographical Statement

My name is Jiranan Terakunpisut. I graduated from Prince of Songkhla University, Had Yai Campus, Songkhla, Thailand in Bachelor of Science in Biology Faculty of Science (1st honor), and Chulalongkorn University, Bangkok, Thailand in Master of Science in Zoology. Now, I am a lecturer at Zoology Major, Faculty of Liberal Arts and Science, Kasetsart University Kamphaeng Saen Campus, Nakornpratom, Thailand. There are 3 researches which I am a head projects composed of 1) A study of local people knowledge on diversity and formation of *Termitomyces* spp. in Thong Pha Phum forests, Kanchanaburi Province 2) A comparative study of carbon sequestration potential in aboveground biomass in primary forest and secondary forest, Khao Yai National Park and 3) Climate change with carbon dioxide removal by forest in Huai Kha Kheang Wildlife Sanctuary. The honor price that I got after finished my Master degree was a certificate from Professor Thap foundation since I did the best score in my field in Thailand.