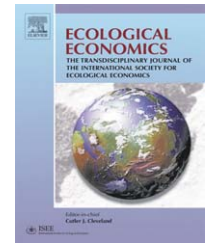


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ANALYSIS

Not just minor forest products: The economic rationale for the consumption of wild food plants by subsistence farmers

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ABSTRACT

Non-Timber Forest Products (NTFPs) make an important contribution to the livelihood of the households who gather and consume them. In particular, the consumption of NTFPs allows gatherers to live with lower amounts of cash than if they had to buy in the market what they can obtain from the forest for free. Understanding the economic value of non-marketed NTFPs helps determine the true income of the gatherers, and the amount of extra cash that they would need if they could no longer gather NTFPs. It also helps ascertain the true value of the standing forest, leading to more rational decisions about its alternative uses. Yet, the NTFPs that are not marketed are often ignored when estimates are made of the economic importance of NTFPs to rural populations. This article briefly describes five methods for estimating the value of non-marketed wild edible plants. It then compares two of these methods with data from one month of fieldwork in two Pwo Karen villages in Thung Yai Naresuan Wildlife Sanctuary in western Thailand. The article concludes that wild food plants remain a preferred alternative to commercial food crops because gathering wild food plants is a much more efficient use of time than engaging in the market economy in order to purchase commercial food crops.

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1. Introduction

Populations living near or in forests have a long history of Non-Timber Forest Products (NTFPs) extraction for sustenance or sale. As implied in the term, NTFPs include all biological materials, except timber, that are found in the forest, such as wild food plants, honey, resin, spices, wildlife products, fuel wood, charcoal, and raw materials for handicrafts, such as rattan, vines, bamboo, and grasses.¹ These fulfil different roles in the sustenance of populations, and allow them to live with less cash.

Historically, there has been little interest in NTFPs, because most NTFPs were consumed by local populations, and not marketed. Hence the name 'minor forest product' often given to the NTFPs (Michael Arnold and Ruiz Pérez, 2001). The seminal work by Peters et al. (1989) is often considered a landmark that has raised the interest on the economic potential of NTFPs to the local population. In that study – followed by others that reached similar conclusions, such as Grimes et al. (1994) and Balick and Mendelson (1992) – the authors compared the market value of two kinds of NTFPs (fruits and latex) with the potential profits made from

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E-mail address: delang@cseas.kyoto-u.ac.jp.¹ Some authors (e.g. Chopra, 1993) also include service functions rendered by forestlands, including grazing, watershed protection, and tourism.

plantations and cattle ranching, and concluded that NTFPs have a higher value. The method of evaluation used in that study has been severely criticised. Nevertheless, the study raised interest in the potential contribution that NTFPs can make to achieving the concomitant objectives of rural development and natural resource conservation.

The argument was that if NTFPs can be a secure and constant source of cash income, rural populations have a strong incentive in preventing the degradation of the forest (Uma Shankar et al., 1996).² This ‘conservation by commercialisation’ (Evans, 1993) approach is accompanied, in spirit and in substance, by the support for the development of markets for NTFPs. However, after an initial enthusiasm, there has been growing distrust in the role that a market for NTFPs can play in poverty alleviation and biodiversity conservation, and a growing scepticism over the long-term ecological integrity of the extraction of NTFPs (Freese, 1996; Peters, 1996). Empirical studies have shown that a market for NTFPs leads to their competitive exploitation, followed by biological degradation (Pandit and Thapa, 2003: 289). Similar problems have been described for other open access resources, such as fishery (Bjorndal et al., 2004; Mackinson et al., 1997; Lansford and Howorth, 1994), where the competitive extraction leads to the degradation or depletion of the resource. There have also been some concerns about the distribution of the incomes from NTFPs. While the rich are often considered to be in a better position to control the extraction and commercialisation of NTFPs, Godoy et al. (1995) and Ambrose-Oji (2003) pointed out that it is sometimes neither the rich nor the very poor, but the group in the middle that gains the greatest economic benefits from selling NTFPs. The poor are excluded when the extraction of NTFPs requires specialised equipment that they cannot purchase (Bhuiyan, 1995) and when they do not have the status and power to control the resources that generate the highest profit. On the other hand, the richest members of the community often have other sources of income that are either more profitable or more fashionable than gathering products from forests.

The consumptive use of the NTFPs has attracted much less attention than their commercial use. Many authors, while acknowledging the dietary and medical importance of NTFPs to the local populations, consider non-marketed NTFPs as food of the poor, a safety net, or reserve food in case of famine (e.g. Senaratne et al., 2003; Hedge et al., 1996; Shackleton et al., 2002). Hence, they only include marketed NTFPs in their estimates of the economic role that the forest play in people’s livelihood, ignoring those NTFPs that are directly consumed by the collectors themselves. For example, Narendran et al. (2001), while acknowledging the dependence on fuel wood, fruits, greens, tubers, manure, and fodder (p. 532), only used the marketed NTFPs to calculate the ‘per capita household income’ (p. 533). Yet, NTFPs play an important role in the sustenance of the gatherers who consume them. NTFPs are the most important sources of (at least) food, building

material, and cattle feed for millions of people in the world. In many communities (such as the one discussed in this paper), NTFPs that are directly consumed play a more important role in the livelihood of the population than the cash earned with the sale of NTFPs or other commodities. Indeed, the NTFPs that are consumed rather than sold in the market can be considered income *in kind* rather than *in cash*. Thus, ignoring the role of NTFP consumption in the livelihoods of rural populations gives a very distorted view of the importance of NTFPs — and of their economic values. It also gives the wrong message that everything that does not go through the market, and does not have a market price, does not have an economic value, and therefore is not worth protecting.

Furthermore, while the majority of NTFPs are not marketed, the emphasis in the academic literature on marketed NTFPs gives the impression that *all* NTFPs are marketed, and are subject to the same (potential) problems of marketed NTFPs — such as their competitive exploitation, which can lead to over-exploitation, environmental degradation, and social stratification. Ignoring the NTFPs that are consumed by the gatherers themselves has particularly negative consequences when the goal of research is that of setting the policies for the extraction of all NTFPs, including those that are not marketed. Policy recommendations are then made to solve the perceived problems of marketed NTFPs (for example the need to increase the market reach, or to make their extraction more sustainable through reforms in the forest tenureship system), while the sustainable extraction of non-marketed NTFPs might need diametrically different policies.

Estimating the economic value of non-marketed NTFPs has two advantages in particular. First, it helps determine the true income of the gatherers, and estimate the amount of extra cash that they would need if they could no longer collect NTFPs, either because their extraction is prohibited, or because the forest was destined for alternative uses (e.g. logging, cattle ranching). Second, it helps ascertain the true value of the standing forest, thus leading to more rational decisions about the alternative uses of the forest. Since the non-marketed NTFPs would disappear if the forest were clear-cut or destined for cattle ranching, the value of these NTFPs should be included in estimates of the value of the standing forest, together with its value as a carbon sink (Solberg, 1997), its watershed services (Guo et al., 2001), the value of its biological diversity (Pearce, 2001), as a tourism destination (Scarpa et al., 2000) and its option value (Forsyth, 2000), among others.

This raises the question of which methods can be used to estimate the economic value of non-marketed NTFPs. The paper first describes five methods that can be used. It then introduces the fieldwork area, and compares two methods of evaluation using data collected during one-month fieldwork. The article concludes with a discussion of the findings, and their policy implications.

2. Valuing non-marketed NTFPs

It is relatively easy to give a monetary value to the NTFPs that are sold, even though the approach used by Peters et al. (1989) — using the market price of the NTFPs to estimate the

² A sustainable harvest could be defined as the level of harvest that does not impair the ability of the harvested population to replace itself (Hall and Bawa, 1993), or that does not impair the ability of the populations that depend upon the harvested species to replace themselves.

maximum total income that can be earned if all available NTFPs were sold – has been severely criticised (e.g. Godoy et al., 1993). However, when there is no market for the NTFPs, the methods of evaluation are not as straightforward. While environmental economists and ecological economists have done extensive research on hypothetical markets, the techniques they have developed are not always suitable to estimate the value of non-marketed NTFPs. Most NTFPs are consumed by rural populations in developing countries, with often poorly developed markets. Even when there are markets, people might find it difficult to give a monetary value to goods that have never been sold or purchased.

In the following pages I only review methods that can be used to estimate the economic values of non-marketed wild food plants. Different techniques of evaluation need to be used to estimate the economic value of other NTFPs, such as medicines, fertilisers, ornaments, thatching and roping materials, fuel wood, or construction material. The values of the amenities that the forest provides – such as soil conservation, its roles in the hydrological cycle, in the preservation of biodiversity, and as tourism and recreation destination, which some also consider NTFPs – need very different economic evaluation techniques, but a great deal of research has been carried out, and the techniques tested and perfected (Chopra, 1993). Five related techniques are available for measuring the economic value of non-marketed wild food plants.

2.1. Time needed to collect the NTFPs

This approach might be considered an extension of the travel cost method used by environmental economists to estimate the value of recreational fishing, for example (Shrestha et al., 2002). It involves measuring the time the people spent collecting the NTFPs from the forest, and then giving a monetary value to the time. Usually the local wage rate is used, so that this method in effect calculates the opportunity cost of the time expended gathering NTFPs.

This method has a few problems. First, it is difficult to calculate the exact time spent collecting NTFPs in the forest. Many people do not have a watch and only a limited perception of the time. Researchers can record departure from and return to the village (Hurtago and Hill, 1990). However, some of the time spent in the forest might be used for other activities than the collection of NTFPs, such as looking after the cattle, farming, hunting, fishing, resting, visiting friends and eating (Hawkes and O'Connell, 1981). Furthermore, many people gather NTFPs on their way back to the village. Rarely do people go to the forest expressly to collect NTFPs, and when they do, they usually go to areas close to the village.³ A preferred approach would be that of participant observation, but this is very time consuming, and not always accepted by the people, especially in activities such as hunting, which might be illegal or best carried out by small parties. Second, the people themselves would not necessarily always give the same value to time. The value given to the time spent gathering NTFPs in the forest during a sunny day in

spring would be very different from the value given to the time spent collecting NTFPs during a rainy day in winter.

2.2. Contingent valuation

This method is related to the contingent valuation method used by ecological economists to estimate the economic value of a wide variety of goods, from protected areas (Dharmaratne et al., 2000) to whales (Bulte and Van Kooten, 1999). Researchers pose direct questions to consumers about their willingness to pay for environmental benefits, or their willingness to accept compensation for losing them. In the present context, this method consists in asking people how much the NTFPs they have collected would be worth in the market, or how much they would be willing to sell them for.

Questions arise as to the plausibility of such estimates. First, the household might feel under pressure from interviewers to value the NTFPs they gathered, and in consequence they might simply invent a figure to please the interviewers. Second, it is legitimately difficult to give a price to something that has always been free, especially for people who do not often participate in market transactions. Therefore they might not take the same care in evaluating NTFPs as they would with marketed goods, such as crops or livestock (Cavendish, 2002: 44). According to Godoy and Lubowski (1992), contingent valuation is 'of limited use in nonmonetized economies because it was designed for valuing goods with markets and assumes that the value people say they are willing to pay is the value they would actually pay' (p. 427). Third, the market 'exchange value' is lower than the 'use value' of a commodity, since the latter includes the consumer surplus – the additional satisfaction that a consumer gains over and above the market price of the item (Richards et al., 2003: 97). Comparing the answers given by the interviewees might be complicated by the fact that some people give the 'exchange value' of their products, while others give their 'use value'.

2.3. Participatory environmental value

This method is an extension of the previous method, and seeks to address the second problem by removing money from the analysis, and introducing a yardstick for comparison. Usually this yardstick consists of a commodity which has significance as an item of value, and whose value is relatively fixed and known to all. Emerton (1996) uses a variation of this method to evaluate the relative importance of a range of forest products – which she considers rather broadly, since she adds grazing, water, and construction to more 'conventional' NTFPs such as fuel wood, medicines, hunting and wild foods. Emerton uses a young castrated bullock as the yardstick, since the young castrated bullock is a 'component of the local economy which represents wealth and value, is a major medium of exchange, and can be readily converted to cash in times of need' (p. 23). The problem with this approach is that a yardstick with a known and fixed value might not always be available. Also, respondents might not always be able to decide what fraction of the yardstick an NTFP would be exchanged with, especially when the NTFP being valued is a small amount of a wild food plant.

³ This is also a reason why the Karen always set their villages near the river: there are plenty of NTFPs the year round.

2.4. *Substitute products value*

This approach uses some characteristics of marketed products to estimate the prices of ‘similar’ NTFPs. It requires ‘establishing a relative price between the priced and unpriced products, which can be done on the basis of product characteristics’ Godoy et al. (1993: 224). A similar approach has also been used by Gunatilake et al. (1993: 276) to calculate the values of the NTFPs that have ‘no price in either the village or the market’, but have ‘close substitutes with value in the village’.

The difficulty with this method lies in identifying products that can be considered close substitutes. Many factors have to be taken into account when choosing the products, including relative scarcity (i.e. the difficulty involved in finding the product), taste preferences, size, and social (non-market) attributes, such as the status of different products and tenureship rights. Another problem with this approach is whether one should use the price of substitute products that are sold or bartered within the village (if there are any), or the sale price in the market. The first is usually lower, because it is ‘affected by the existence of patron–client or other socially rooted interactions’ (Chopra, 1993: 251).

2.5. *Exchange value*

In some communities, NTFPs might be exchanged for marketed products, rather than sold directly. In this case, the marketed products can be used as a proxy for the value of the NTFPs themselves. For example, Mahapatra et al. (2005) used the retail sale price of the exchanged commodity (oil, salt, and rice) to give a cash value to the NTFPs that were bartered for these products, rather than sold.

One problem with this approach is that the prices of marketed commodities in rural, isolated areas might be much higher than the prices of the same commodities in urban centers, partly because of the high costs involved in transporting the commodities from the urban centers to the villages

(Renshaw, 2001). The whole valuation exercise would then be rather meaningless. In particular, higher incomes – when the goal of the exercise is that of comparing the true income of the gatherers to that of populations that do not gather wild food plants – would not reflect higher consumption levels, but only the higher prices of the marketed products that are used as the proxy. The second problem with this approach is that the price of marketed commodities can change quite dramatically with exogenous changes, such as an improvement in the road network that expedites the transport of commodities from the urban centers.

I now introduce the fieldwork area, Thung Yai Naresuan Wildlife Sanctuary. This will be followed by an estimate of the economic value of non-marketed NTFPs consumed by the Pwo Karen in Thung Yai Naresuan, using two of the five methods just described. The different values will then be used for a discussion of the importance of NTFPs to the gatherers, and the economic rationality for consuming wild food plants, rather than buying domesticated food plants in the market.

3. **Thung Yai Naresuan Wildlife Sanctuary**

The data analysed in the following section were collected in Thung Yai Naresuan, a UNESCO Wildlife Sanctuary situated in the west of Thailand. Thung Yai Naresuan is located along the Thai–Burmese border on an area covering some 3600 km². In 1974 the area was declared a Wildlife Sanctuary (Boonchai, 2002: 2). In 1991, UNESCO declared it a World Heritage Site, together with the adjacent Huai Kha Khaeng Wildlife Sanctuary (Buergin, 2002, 2004). Together with other Wildlife Sanctuaries and national parks, these two Wildlife Sanctuaries form the core of the ‘Western Forest Complex’ (WFC), which is Thailand’s largest forest area, covering about 18,700 km² (Fig. 1). The WFC contains considerable biological diversity and is of considerable importance with respect to

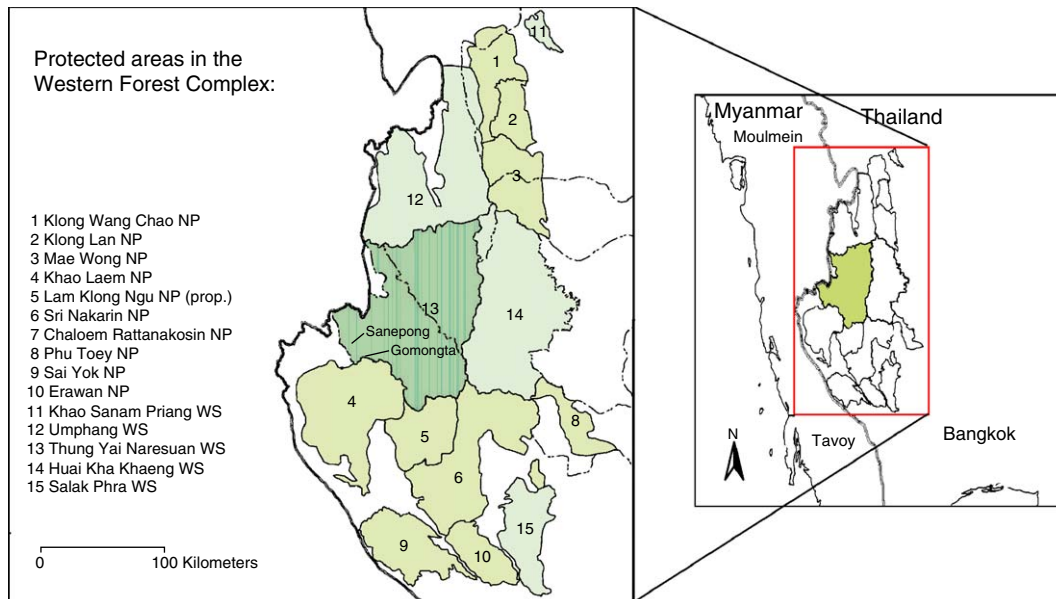


Fig. 1– The western forest complex. Source: Delang (forthcoming).

wildlife conservation, not only in Thailand, but also in Southeast Asia and globally (Buergin, 2003).

The Thung Yai Naresuan Wildlife Sanctuary has been inhabited for over 200 years by Pwo Karen, and at present approximately 4000 members of the Karen ethnic minority group live in the Wildlife Sanctuary (Emphandhu, 2003). Before the Wildlife Sanctuary was declared a UNESCO World Heritage Site, the Royal Forest Department (RFD) suggested the removal of these Karen villages:

Most of the forests still remain pristine except for the areas that the Karen live in, that are cleared for farmland. Compared to the entire area, only 10% are destroyed by the Karen. This can be easily solved by evacuating them to new settlements arranged by the state (Forestry Science Faculty and RFD, 1988, quoted in Boonchai, 2002: 3).

Since then, the Royal Forest Department (RFD) has tried to remove the Karen, sometimes with arbitrary arrests, confiscation of Thai ID cards, and various forms of harassment (Buergin, 2003). The opposition of the Karen and of various academics and NGOs has forced the RFD to desist and defer the forced relocation of the Karen. Nevertheless, the RFD has imposed upon the Karen some important restrictions, in particular in relation to their swidden farming practices and to the commercialisation of NTFPs.

The Karen have traditionally been secondary forest swidden farmers, whereby they cleared a small patch of secondary forest, farmed it for one year, and then left it fallow for a number of years. When the vegetation on that land had recovered, it was burned again (thereby returning the nutrients to the soil), and the cycle was repeated. In Thung Yai Naresuan, the Karen used to leave their fields fallow for 10 to 15 years or so (Buergin, 2002). This allowed for a sustainable harvest with no needs for artificial fertilisers and pesticides. However, it was rather land intensive, and to limit the amount of forestland cleared by the Karen, the RFD imposed a fallow period of five years at most. Over the years, this has led to a sharp reduction in the level of the harvest, since five years of fallow are not sufficient for the soil to regain its original fertility. Many Karen now need to buy rice. In spite of this, the needs for cash are still rather small, also because the availability of NTFPs diminishes the amount of food that the Karen need to buy. The Karen have traditionally lived in small, isolated hamlets far from the market, growing the rice they needed and extracting from the forest the wild food plants that supplemented their rice harvest. Food plants gathered in the forest still form an essential part of Karen diet. According to the Karen interviewed, approximately 80% of the food plants they eat come from the forest.

This article only considers these wild food plants that the Karen gather from the forest. However, the Karen consume many other forest products. Apart from wild plants for food, the Karen sometimes take roots for ornamental purposes, fuel wood, wood and bamboo for building (for people and animals) and fencing, weeds for thatching and roping material, medicinal plants, and fish and other water creatures from the rivers.

Together with the restriction on farmland, the RFD imposed restrictions on the sale of NTFPs. The Karen are still

allowed to gather NTFPs for consumption, but are no longer allowed to sell them. An RFD station is located on the road from the villages to the market, so the law forbidding the sale of NTFPs is easily enforced. Apart from a very few exceptions, such as bamboo shoots, none of the NTFPs extracted from the forest by the Karen are sold in Thai markets. Therefore, very few NTFPs have a market price.

Fieldwork was carried out during the month of December 2004 with the help of two Karen research assistants, one local Pwo Karen, and one Karen refugee from Burma. The two villages included in the fieldwork – Gomongta and Sanepong – were approximately one hour by motorcycle from Sangkhlaburi, the capital of the sub-district and the location of the nearest market. Of all the villages in the Wildlife Sanctuary, these are the two villages in which cash incomes are highest and most important, economic stratification is most pronounced and access to markets is easiest. Thus, it is likely that wild food plants are even more common in the other villages in the Wildlife Sanctuary than in these two villages. Gomongta has a population of approximately 150 households (840 people), while Sanepong's population is about half, around 90 households (440 individuals). The average of 5.33 individuals per household in these two villages is used in the analysis of the data.

4. Data analysis

In the following pages, I compare two methods, the time needed to collect the wild edible plant (first method) and the value of substitute products (fourth method), with data collected during the fieldwork. During December 2004, 35 households in the two villages were selected through systematic sampling, whereby one in every seven households was selected for interview. The member of the household present at the time of calling (interviews were always carried out during the day, from Monday to Saturday) was interviewed. Interviewees were asked about the wild edible plants they extracted from the forest, the frequency of extraction, the quantity extracted, and the number of times each wild edible plant had been consumed during the previous year.

By interviewing forest dwellers about the wild edible plants they had gathered, this approach is similar to that followed by Padoch (1988) and Hedge et al. (1996). It is acknowledged that this method might lack in precision, since people may find it difficult to remember the details of their activities. The most accurate method to value the types and quantity of products extracted from the forest is to identify and weight or measure them each day, as they enter the village (Stearman, 1990; Godoy et al., 2000). There is no doubt that the accuracy of information diminishes when people are asked to recall past events, especially quantitative data (Bernard et al., 1984). However, taking daily measurements would have involved a 12 months long fieldwork to include seasonal variation, and insufficient time was available for this.

A total of 134 different wild food plants eaten by the Karen and extracted from the forest was recorded. The majority of the plants eaten by the Karen are small plants with large leaves, which includes bushes, herbaceous annuals, or perennials without lignified parts (52), followed by parts of

trees (38), epiphytic and non-epiphytic vines (29), bamboo shoots (4), grasses (2) and other epiphytes (2). At times these wild food plants are sold within the village, but this is very rare. Wild food plants are usually collected on the way back from the field or other activities carried out in the forest, or near the river. When the purpose of the trip is to exclusively gather wild food plants, these are usually gathered near the river, which is at the edge of the village and about 10 min walk from the centre of the village. During each trip, people collect two wild food plants on average, and each food plant typically lasts for 3 meals. The typical meal consists of rice with two or up to three different food plants. Our dataset indicates that each individual (irrespective of age and gender) consumes about 273 g of wild food plants a day.

The analysis does not take into consideration the costs involved in collecting NTFPs. However, these should not be very high, consisting mainly in bamboo baskets where the NTFPs are collected, and knives used to cut the wild food plants.

4.1. Time needed to collect the wild food plants

Since the wild food plants are usually collected while carrying out other activities in the forest, or on the way back to the village, it is very difficult to precisely measure the time people spent gathering NTFPs. To address this problem, instead of looking at the time the gatherers spend in the forest, we looked at the distance between the place where the wild food plants were gathered and the village. The Karen make a distinction between different habitats in what concerns the places in which they gather their wild food plants (Delang, forthcoming). For the sake of this article, these different habitats can be divided as: 1) near the river, 2) in old-growth forests, 3) in the mountain, 4) in the swiddens or fallowed swiddens, 5) everywhere, 6) in a grassland area. The latter is located at some distance from the village and is not included in the present analysis since few individuals take NTFPs there, and only very rarely, when they happen to be there. Some NTFPs are also planted near the house for convenience. These are not included in the analysis, even though the seeds might have been taken from the forest, since I am concerned here with the value of NTFPs gathered in the forest.

Since each of these habitats is spread over a relatively large area, for each habitat I use the average number of minutes spent walking from the village to the habitat, and back to the village (Table 1). Most gatherers are already in the location when they gather the wild food plants. Thus, the method essentially estimates the maximum value of the wild food plants.

Table 1 – Distance in minutes walking from the village to different habitats

Habitat	Minutes
Near the river	20
Near the lake	40
Mountain	40
Old growth forest	40
In the swiddens	70
Everywhere	40

The local wage rate of 80 Baht⁴ a day – paid for the casual agricultural work some Karen engage in – is used to give a monetary value to the time used to gather the wild food plants. For a working day of 8 h, this corresponds to 10 Baht an hour. It is widely recognised by the Karen that work on cash crop fields is much harder and more unpleasant than collecting NTFPs in the forest. Thus, once more my calculation over-estimates the value of the NTFPs extracted.

The results are shown in Table 2. In the case of the old forest, for example, each Karen household extracts 78 plants, making 107 trips a year. If each trip takes approximately 40 min, each household spends on average 4280 min a year extracting NTFPs from old forests. The total value of the NTFPs extracted from that environment is then of 713 Baht per household. According to this technique, the value of the NTFPs consumed for food (excluding fauna) by each Karen household is of approximately 1168 Baht per household per year (Table 2). What this technique essentially calculates is the opportunity cost of time. If each Karen household had worked for a wage during the 7005 min (117 h) a year it spent collecting NTFPs in the forest, it would have earned 1168 Baht.

This approach is now compared to the substitute product value. The economic value of the wild food plants given by the two approaches will then be compared, and lead to a discussion on the economic rationale of wild food consumption.

4.2. Substitute products value

With the help of the Karen, the 134 wild food plants they gather during the year were grouped into six categories: 1) leaves, 2) stems, 3) roots, 4) fruits, 5) flowers, and 6) bamboo shoots. A survey was carried out in the market of Sangkhlaburi, the closest town to the fieldwork area where food plants are sold, and the price of all the food plants sold there was recorded. With the help of Karen informants, the commercial food plants were grouped into the six categories used by the Karen. The average price of each category of commercial food plants was then used to calculate the value of the wild food plants eaten by the Karen.

Stems and leaves are often sold together, and approximately 15 food plants were recorded in this category, with an average price of 25 B/kg. Fruits – which includes such food plants as gourd, cucumber and tomatoes – had an average price of 15 B/kg. Roots – such as taro – had a similar price, and in the calculation I use the same price of 15 B/kg. Bamboo shoots were not sold in the market, and the price varies widely according to the species of bamboo shoots. However, Karen informants estimated that the average price is of 15 B/kg, the same as for fruits. Flowers (which are dried and eaten in curries and other dishes) are more difficult to quantify, because their low weight to volume ratio make their price per kg particularly high. I use 50 B/kg, but this can only be a rough estimate since no food plant was sold in the market that could have been compared to flowers. In any case, in only four cases are flowers extracted alone, for a total of only 1.08 kg a year. So the contribution would likely be very marginal.

For some wild food plants, people eat different parts that are sold at different prices in the market (Table 3). The

⁴ Thai currency. At the time of the fieldwork US\$1=Baht 38.

Table 2 – Number of plants, quantity and value of plants extracted from each habitat (per household per year)

Habitat	No. of plants extracted ^a	Number of trips made to this habitat each year to collect NTFPs	Time per trip (min)	Total no. of minutes used to collect NTFPs	Total value of trips (10 B/hour) (Baht)
Old forest	78	107	40	4280	713
Swidden cycle ^b	24	35	70	2450	408
Mountain	33	66	40	2640	440
Near the river	46	108	20	2160	360
Near the lake	8	19	40	760	127
Everywhere	22	43	40	1720	287
Total ^c	223	189		7005	1168

^a Some plants are extracted in many environments, so the total of this column is 223 rather than 134, which is the total number of wild food plants the Karen eat.

^b Includes all stages of swidden cycle, from burning the fields up to fallow.

^c The total values take into consideration the fact that the Karen gather on average two wild food plants during each trip, and consider each wild food plant to come from the same habitat.

calculation shown in Table 4 takes this into consideration, and includes the actual weight of each part.

The results are summarised in Table 4, per household and per year. In the case of leaves for example, the leaves of 73 wild food plants are eaten, for a total quantity of 176 kg. Using an average value of 25 Baht/kg, I arrive at a total value of 4400 Baht.

Table 4 shows that the Karen gather from the forest wild food plants whose proxy cost 11,505 Baht in the market. With a daily salary of 80 B, the value of the NTFPs gathered in the forest by a household with an average of 5.33 individuals corresponds to the salary that would be paid to an individual who worked for cash for 144 days a year.⁵

5. Discussion and conclusions

The first conclusion that can be drawn from the analysis of the data is that the two techniques give very different values to the NTFPs extracted from the forest. The first technique uses the opportunity cost of time, and concludes that the value of the NTFPs extracted by the 'average' household is of up to 1168 Baht a year. This corresponds to approximately 15 days of work at 80 B/day. The researchers who uses the 'opportunity cost of time' technique would conclude that the wild food plants have a low value, and gathering them could be outlawed with relatively little cost to the Karen (15 days of wage work). However, to make up for the loss of wild food plants, the Karen would have to buy food plants in the market. The (surrogate) market value of the wild food plants that the average household (of 5.33 members) consumes is of 11,505 Baht a year. This much higher value corresponds to approximately 144 days of work at 80 B/day.⁶ Thus, by

⁵ Some (e.g. Bann, 1998: 25) argue that the labour requirements to gather these plants should be deducted from the total value of the plants. For the present analysis, I believe that this is unnecessary.

⁶ The fact that the first technique gives a much lower value is not surprising, because the local wage rate is very low, while the price of the food plants in the market is comparatively high, being related to the prices in Bangkok, and through Bangkok to the world market.

working for 15 days gathering wild food plants, the Karen are able to save the same amount of money that they earn in 144 days.

It seems quite obvious that the forest provides the Karen with a very valuable source of food that can be gathered with relatively little effort. Since the Karen gather wild food plants for (up to a maximum of) 117 h (15 days) a year, whose proxies are sold in the market for 11,505 Baht, the value of each hour 'worked' gathering wild food plants in the forest is worth 98.33 Baht, or a daily wage (considering 8 h of work a day) of at least 786.67 Baht, ten times more than the wage paid locally for much harder work.

The second conclusion that can be made is that the extraction of NTFPs for consumption can – under specific conditions – help save the forest. According to the Karen informants, the 11,505 Baht a year that the household can save by consuming wild food plants is comparable to the average yearly cash expenditure of many households. This means that if the Karen were not extracting wild food plants from the forest, they would need double as much cash incomes to maintain a comparable

Table 3 – Combinations of plant parts consumed

Part of the plant	Frequency
Leaves only	47
Stems only	14
Fruits only	8
Flowers only	4
Bamboo shoots only	4
Roots and tubers only	2
Stems and flowers	8
Leaves and fruits	8
Stems, roots and tubers	7
Stems and leaves	7
Leaves and flowers	2
Stems and fruits	1
Roots, tubers, stems and leaves	6
Stems, leaves and flowers	2
Roots, tubers, stems, leaves and flowers	1

Table 4 – Parts, quantity and value of the plant eaten, per year and per household

Part eaten	No. of wild food plants	Total quantity (kg)	Value per kg (Baht)	Total value (Baht)
Leaves	73	176	25	4400
Stems	47	115	25	2875
Fruits	17	133	15	1995
Flowers	17	18	50	900
Roots and tubers	16	18	15	270
Bamboo shoots	4	71	15	1065
Total ^a	174	531		11,505

^a The total number of cases is more than the 134 wild food plants extracted because of many wild food plants are eaten different parts. See also Table 3.

diet.⁷ This cash would have to be earned either by working for cash in Sangkhlaburi or elsewhere, or by growing cash crops. In the latter case, the Karen would be forced to clear forestland – supposing the RFD allowed them to do so – because non-forested, uncultivated land is not available locally.

Different cash crops give very different incomes, so it is difficult to estimate the size of the land that the Karen would have to farm to earn the extra 11,505 Baht a year. We can try to do this using data from the Sgaw Karen in Chiang Mai province (Delang, 2003), reminding ourselves that the result might not be directly extrapolated to the situation in Thung Yai Naresuan. In the year 2000, the Sgaw Karen among whom I lived in Chiang Mai province earned between 1100 and 2975 B per rai⁸ (Delang, 2003: 202) for the Marigolds they farmed. If the Karen in Thung Yai grew Marigolds to earn 11,505 B, they would have to farm between 3.87 rai (11,505 B/2975 B/rai) and 10.46 rai (11,505 B/1100 B/rai) more than at present. How does this relate to the amount of land that is already being cultivated? According to Buergin (2004: 268) the 2000 people he studied farmed approximately 1625 rai (260 ha) of swiddens in 1997. This corresponds to 0.81 rai per person, and with an average number of 5.53 people per household in 1997 (Buergin, 2004: 190), to 4.49 rai per household. Thus, if the Karen had to buy the wild food plants they now gather in the forest, they would have to farm between roughly 86% (using the higher profit of 2975 B/rai) and 233% (using the lower profit of 1100 B/rai) more land, which they would have to obtain by clearing the forest. It is quite obvious that the extraction of NTFPs for consumption contributes to conserving the standing forest.

In the light of this, it seems that more research should be done on the economic importance of non-marketed NTFPs, and on their potential for the concomitant objectives of poverty reduction and biological conservation. If anything, the consumption of NTFPs from the forest should be encouraged to do away with its image of being simply a food

for the poor, or a reserve food in case of famine (Senaratne et al., 2003). This income in kind should not be ignored or denigrated, simply because it is not accounted for in national statistics, and no taxes are paid. The introduction of a market for NTFPs, as suggested by most researchers and policy makers, does not necessarily result in a higher standard of living. It is quite possible that many people would simply use the money earned with the sale to wild food plants from the forest to purchase domesticated food plants in the market, because of the higher status of domesticated food plants (Ogoye-Ndegwa and Aagaard-Hansen, 2003: 84).

Finally, the extraction of NTFPs raises the value of the forest. If each of the 240 households of the two villages surveyed extracts an average of 11,505 Baht of wild food plants from the forest, the value of the forest that surrounds the villages (after accounting for all the other functions that the forest fulfils) would be raised by 2,761,200 Baht. To this value have to be added the other NTFPs and TFPs that the Karen gather in the forest, and the cultural values associated with gathering these NTFPs and TFPs. The vast traditional knowledge of edible and medicinal plants, which would be lost to future generations if the Karen stopped gathering them from the forest, can also be considered an important asset that should be added to the total economic value of the Thung Yai Naresuan Wildlife Sanctuary.

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⁷ Of course, the diet would be less variable, since in the market are on sale only about 30 food plants, while Karen extract 134 different wild food plants in the forest the during the year.

⁸ Thai unit of measure. 1 rai=0.417 acres, 0.16 ha.

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