Chapter 8

Thailand: food system and nutritional status of indigenous children in a Karen community

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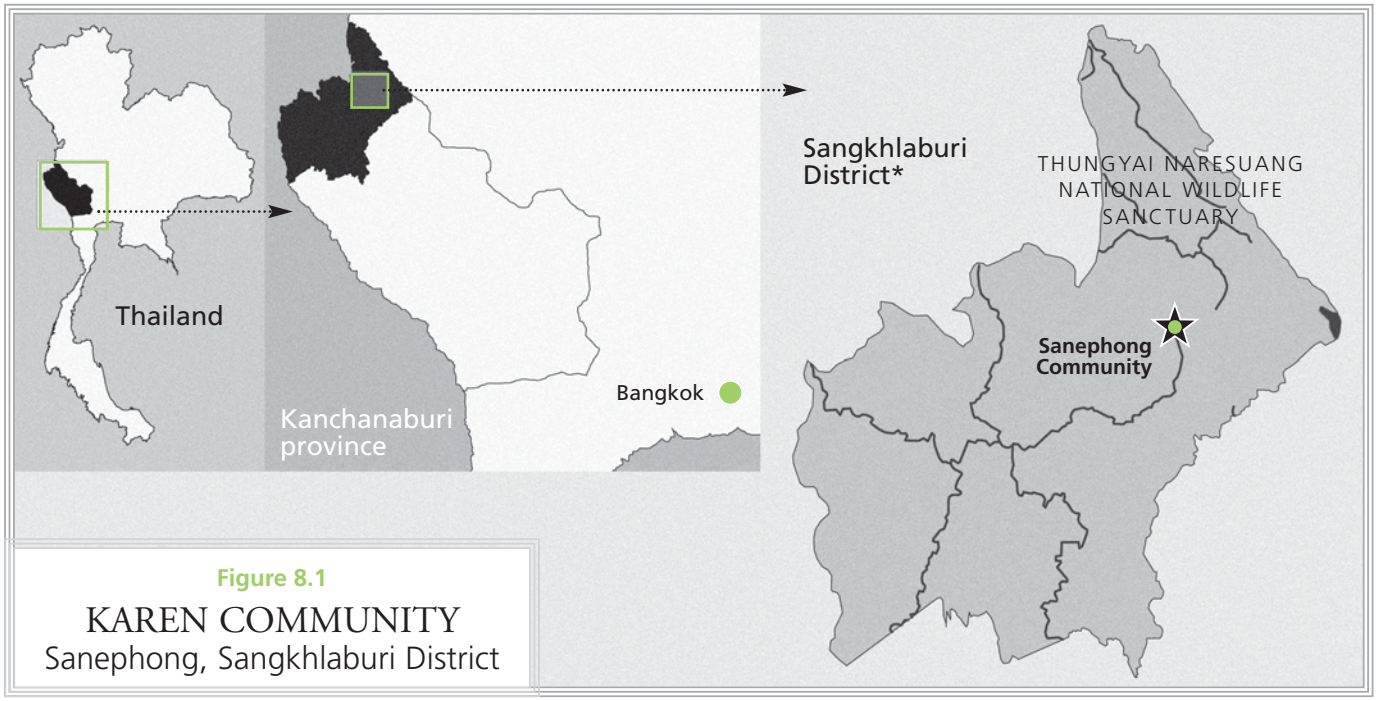

Figure 8.1

KAREN COMMUNITY
Sanephong, Sangkhlaburi District

Data from ESRI Global GIS, 2006.
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> “...All the foods we eat belong to Mother Nature – the Karen are grateful to her...”
>
> **Ye la mong, Karen community leader**

Abstract

To promote nutrition and health among Indigenous Peoples in Thailand and other developing countries, it is essential to understand their food systems and related behaviours and practices. This chapter describes the process and results of a preliminary participatory research between a group of interdisciplinary researchers and community members in Sanephong, a small Karen village in western Thailand.

Many interdisciplinary methods were used, i.e. standard anthropometric methods, biochemical assessments, focused ethnographic study, focus group discussion, in-depth interviews and 24-hour recalls. Key results indicate that the food system was, in general, favourable.

Three hundred and eighty-seven traditional food species were identified. Eight species of those were high in minerals and vitamins, according to portion size consumed. However, an improvement in nutritional status and health was necessary for children and mothers.

The overall nutritional status of children suggested acute and chronic malnutrition problems: 20 percent stunting (n = 37), 14 percent underweight (n = 26), 5 percent thin (n = 9) and 1 percent overweight (n = 2). Mean energy intakes of the children did not meet the Thai Dietary Reference Intake (DRI): 58 percent of the Thai DRI in 6 to 11 months, 50 percent in 1 to 2 years, 56 percent in 2 to 5 years, and 69 percent in 5–12 years. For children 2–12 years, dietary vitamin A, vitamin C and fat intakes were inadequate. Iron intakes were low among most children (mean at 29 percent Thai DRI in 1 to 2 years, 35 percent in 2 to 5 years and 42 percent in 5 to 12 years). Thus, it is recommended that the improvement of nutrition and health in this indigenous community should be built upon their available food sources, with the possible exception of iron-rich foods.

The promotion of available good sources of iron is one strategy to prevent anemia. Iron supplementation can also be used. Promoting culturally appropriate childcare practices, as well as better mother and child interaction, are also essential.

Introduction

Indigenous Peoples in most developing countries are often neglected in development efforts, as they are minority groups in those societies. These Indigenous Peoples are often the poorest of the poor and increasingly at great risk of losing their biological and cultural diversity, which consequently affects their health, nutrition and quality of life now and in the future. To understand indigenous food systems, and to promote food and nutrition security appropriately will assist developing countries in achieving one of the most important Millennium Development Goals: (Goal 1) to reduce poverty and hunger among disadvantaged people (ACC/SCN, 2000). Also, this effort will lead to environ-mental sustainability in those communites – once people learn how local food is good for their health, they will have the incentive for intensive participation for taking care of their environment. This chapter discusses a participatory research study that aimed at understanding the food system in a small Karen community in western Thailand.

Overview of the community

Sanephong is a Karen community in a Laiwo sub-district, the Sangkhlaburi district, Kanchanaburi province. It is located in the Thungyai Naresuan National Wildlife Sanctuary some 336 km northwest of Bangkok adjacent to the Myanmar border, and about 12 km east of Sangkhlaburi municipality (Figure 8.1). This community can be reached only by a four-wheel-drive vehicle or by motorcycle. In the rainy season, however, it can only be reached by trekking along the mountainous and muddy trail.

At the time of the study, there were 126 households in Sanephong. Aside from wooden and bamboo houses, there was a Buddhist temple, a rice mill and a solar panel (energy source). Infrastructures provided by the government included a primary school operated by the Border Patrol Police Department, a childcare centre, a field station of the Division of Hill Tribe Development and Welfare and a community paddy (rice) bank. The community leader's house was located in the centre of the village. There were seven grocery shops. Some of these shops also provided cooked foods including noodles and snacks, such as crispy snacks, candy and beverages – including an orange-flavour syrup –which most children in the village can buy.

The population of Sanephong village at the time of this research was 661 inhabitants with 345 males (52.2 percent) and 316 females (47.8 percent). Most of them were registered with Thai nationality. The target group for this project is children 0–12 years old. There were 225 children less than 13 years old (34.5 percent); 61.1 percent of adults were 13 to 59 years old, and 4.4 percent were 60 years old and above. Fifty percent of participating women were of reproductive age (15 to 49 years old).

Formal leaders are known as *Kamnan* (a sub-district headman) and *Phuyaiban* (a village headman). However, informal leaders, such as monks and respected Elders, are also important leaders in the village. Vernacular Karen is their main language, while Thai is also spoken, especially by the younger generation. Although Buddhism is the official religion, it can be said that most people here still believe in Animism. Thus, Buddhist and Animist ways and practices are often intermingled. When the villagers perform their seasonal festivals, their inspirations are closely related to spirits of nature, i.e. worshiping the "Mother Earth" and the "Rice Mother". Accordingly, all entities, including animals, trees, rocks and rivers possess a spirit. As such, ritual practices to pay respect to the spirits are required to ensure the community's well-being. If such rituals are not fully practised, it is believed that someone could be punished by the spirits in the form of an illness or bad luck. From a practical perspective, the indigenous beliefs and value systems are linked to the way of life – once entities, e.g. animal, tree, rock, river, are included in their mental and cultural models, they are then considered to be a constituent part of the population itself. Therefore, many people believe that to help maintain their beliefs and value system means to help sustain their natural resources. These practices, it is believed, have helped to maintain their traditions and to sustain their natural resources.

At the time of the study, there were four major subsistence bases. Subsistence base in this case means the natural landscape areas from which local people procure food sources by ways of farming and gathering. These were: 1) Sanephong Base (240 hectares), 2) Jakhiphue Base (32 hectares), 3) Thichwe Base (4.8 hectares) and 4) Thupho Base (320 hectares). For this study, data were collected only from the Sanephong Base because local people utilized most resources from this area. Sanephong Base is an alluvial plain valley that lies from east to west. Local people used this area for many purposes, i.e. village settlements, growing wet rice and orchards of bananas, mangos and jackfruits. Many vegetables, including gourds and pumpkins, were commonly planted in household backyards. Fish and aquatic animals were available in the perennial stream (*Kheraw-Khi*) from a surrounding high mountain. Wild plants and vegetables were also available along both sides of the stream.

Subsistence activities

Rice growing was the main subsistence activity in Sanephong. However, only 58 percent of households reported producing enough paddy for household consumption. Animal foods were said to be abundant in the surrounding forest, but big game hunting and catching small animals, such as squirrels, flying foxes, field mice, and birds, were prohibited in this area – regardless of Indigenous Peoples' rights. Most people reportedly survived by fishing and gathering aquatic animals, such as crabs, shells, shrimp and frogs from the streams. Traditionally, sharing food (especially rice), is a strong Karen moral principle, despite the presence of market economy penetration. Thus, they grow rice not only for themselves, but also for others. For this

reason, the local Karen usually divide their paddy into two parts: for their own household consumption and one for their visitors. After harvesting, the Karen also donate paddy to the community Buddhist monastery, and to the community rice bank. The paddy stock is reserved so that families that do not produce enough can borrow paddy. Aside from this, some can borrow paddy from their cousins.

Community development and change

The Karen in Sanephong village have reportedly lived in this area for over 200 years. Originally, they scattered in autonomous and small communities (five to ten households tied by kinship). Their community was isolated and marginalized by the mainstream culture because of its long distance from other communities. According to their history, the local people maintained their own culture for a long period. It was during the reign of Thailand's King Chulalongkorn (1853–1910) that the central Thai government initiated the centralization of national administrative policy that required each autonomous village, including Sanephong, to elect a village headman. This formal leader had to be approved for the position by the state in order to take administrative roles on behalf of the central Thai government. Afterwards, development projects were gradually introduced into Sanephong along with the influx of national policies.

In 1962 the community primary school was founded and since its inception has been operated by the Patrol Border Police Division. It is not operated by the Ministry of Education, like most schools in the country, for security reasons (border and remote area). Modern education has helped young Karen in Sanephong to read and write Thai, the national language. In general, children in Sanephong receive similar educational opportunities as others in Thailand (free of charge until secondary school, grade nine). Nevertheless, most Sanephong children finish only primary education (grades one to six) because their families cannot afford expenses (i.e. transportation, education materials, clothes, etc.) necessary for secondary education outside their community. Many attend informal education programmes that are available nearby.

In 1974 the Thai government declared the National Wildlife Conservation area in Thungyai Naresuan Sanctuary should include the living area of Sanephong. This initiation has had a tremendous impact on the local Karen way of life. For instance, the law prohibits the Karen from cutting down trees and from practising their method of allowing cultivated fields to lie fallow. Therefore, they cannot open new areas for agriculture. Consequently, the planting rotation period had to be shortened and this has occasionally resulted in the inadequate food production that led to starvation in the local area. The law also prohibits them from hunting wild animals in the surrounding forest, even for subsistence purposes. As a result, at the time of the study some of the inhabitants, especially the young, worked for cash outside the village and some chose to grow more cash crops including chili and coffee and/or to domesticate buffalo and oxen. According to the Rural Development Information Centre (2004), the average annual income per capita in Sanephong was 19 789 baht (US$516) compared to the national average at 28 412 baht (US$741).

Water and sanitation

As reported for this study, the local Karen used stream water for laundry and bathing. Stream water (90 percent), rainwater (63 percent), and pipe water (44 percent) were used for drinking (totals are greater than 100 percent because multiple sources were used). Only half of households reported boiling their drinking water. Nevertheless, it was common that lactating mothers and infants in Sanephong drink only boiled water. A community pipe water system was available, but water supplied by this system was not yet sufficient throughout the year. Cesspools were commonly used, especially for households located near the stream. For households further away from the stream, they went into the jungle for sanitary purposes, especially during the dry season. For those living by a stream, water for washing clothes, bathing, and drinking came from the same area, but toilet areas were separate.

Nutrition and health

The community primary school promoted health and nutrition among school children through school gardens

(growing vegetables and a fish pond), a school milk programme (200 ml/child every school day), a daily school lunch programme, and a programme aiming at controlling iodine deficiency disorders (using iodized cooking salt and iodized drinking water), weekly iron supplementation and growth monitoring. The district health office provided annual dental care and parasite examination for school children once a year. At the community child centre, children under the age of five years were provided with lunches (e.g. rice and soup with meat and vegetables or noodles prepared by childcare workers). They were also provided with 200 ml of UHT milk (natural whole milk) every school day (a programme part-funded by the local administration – *Or-Bor-Tor*). The transportation of milk was managed by that local administration.

Ten village health volunteers (three women and seven men) were responsible for primary health care in Sanephong. These volunteers were under the supervision of the district health office. Their responsibilities included: (1) assisting health officers and mid-wives in nutrition, for example, growth monitoring, maternal and childcare, antenatal care, immunization, etc.; (2) health prevention and promotion activities; and (3) providing basic health care services for common local health problems, such as malaria, cold, headache, Thai hemorrhagic fever and diarrhea. Schoolteachers also helped to advise local women during their pregnancies and provide transportation for them to the hospital in the case of an emergency delivery. Resulting from the high prevalence of malaria, the local people had been provided with a blood slide diagnostic service and cared for by the malarial control agency. The district hospital was located about 12 km from the village so during the rainy season travel was particularly challenging, as patients had to be taken along the muddy road across the mountain to the hospital.

The main objective of this study (Phase 1) was to understand traditional food systems and the nutritional status of children in the indigenous Sanephong community. This understanding was to be achieved in order to apply this knowledge to improve the health and nutrition of 0–12 year-old children and their care providers, particularly in respect to micronutrient nutrition, through better utilization of their own foods (Phase 2). The study was descriptive research using quantitative and qualitative methods.

Methodology

This preliminary study commenced in December 2004, and completed in September 2005. Field data collection was conducted only during the dry season (March–June 2005). A participatory research design was followed for this study, which promoted a strong partnership between a group of interdisciplinary researchers and the indigenous community members in Sanephong. The research team also worked in close collaboration with the Centre for Indigenous Peoples' Nutrition and Environment (CINE) in the development of a protocol and research methodology (Kuhnlein *et al.*, 2006).

At the beginning, the research team met several times with the community members as well as local non-governmental organizations (NGOs) in order to create common understandings about the study approach and procedures. All communication between researchers and community members was conducted in both Thai and Karen languages, utilizing interpreters as necessary. Two community representatives participated closely in the development of the research protocols. Participatory processes were especially emphasized in order to help facilitate the work between the community and the research team throughout the project. Ethical approval was granted by the Mahidol University Committee on Human Rights Related to Human Experimentation on 21 January 2005.

Many interdisciplinary methods were used in this study. Standard anthropometric methods (Gibson, 1990) of weight and height measurements were used to assess the nutritional status of children less than 13 years old. Clinical examinations were used to detect the visible sign of goitre, paleness, angular stomatitis and dental caries. These examinations were performed by trained nutritionists from the Institute of Nutrition, Mahidol University (INMU). For morbidity (reported sick), data of children aged 0–12 years old were collected. For those under six years old, mothers were asked whether their children had any sickness within the last

month (i.e. respiratory infection and diarrhea). Children over six years old were asked the same question. An interpreter translated questions and answers from Thai to Karen and from Karen to Thai. Haematocrit levels indicated the iron status of school children. For this phase, the study used secondary data from the Provincial Health Office collected by trained health officers. This task group monitored anaemia of children across the country. Collection of haemoglobin data was planned for the next phase of the study.

To understand Sanephong's infant-feeding practices, mothers with children up to two years of age were interviewed about breastfeeding and complementary food practices in terms of the time of introduction, frequency and amount of each food item. Twenty-four hour dietary recalls of children less than 13 years old were conducted to obtain systematic data on their food intakes – mothers provided information for the children under six years old. For children six to nine years old both children and mothers supplied information. The Institute of Nutrition Mahidol University Food Composition Database (INMUCAL New Database 3.2 [ND 3.2]) (Burlingame, 1996; Coordinating Office-ASEANFOODS, 1996; Health Department-Nutrition Division, 1987; Health Department-Nutrition Division, 1992; INMU, 2005; Puwastien *et al.*, 2000) was used to analyse nutrient content of foods consumed as reported in the recalls. Thai Dietary Reference Intakes (DRI) from 2003 were used as the reference (Changbumrung, 2003). For foods identical or similar to other Thai foods the INMUCAL database was used. For foods not in this database, nutrient composition was imputed from similar foods.

The Focused Ethnographic Study was used to gather information on food use, cultural food beliefs and perceptions on foods rich in micronutrients and other nutrients (Kuhnlein and Pelto, 1997). The suitability of various traditional foods for children and methods of food acquisition in terms of purchase, trade and home growing (including foods collected from natural resources) were also recorded. Additional information was collected on food purchases, the involvement of household heads, women and others in food production and food accessibility, especially with regard to micronutrient-rich food sources. Lists of purchased food items were collected from all seven local shops to determine the communities' intakes and expenses on imported foods. Further, seven-day household expenditure and home garden surveys were conducted.

To obtain a traditional food list of this community, several methods were used. Focus group discussion and in-depth interviews with key informants (both men and women) were employed to document traditional food items. For each food item, details about edible parts, seasonality, name in Karen or Thai, and like or dislike by both mother and child were compiled. This traditional food list was later confirmed by selected community Elders as they were most knowledgeable in this area (Blum *et al.*, 1997). Photographs of traditional foods were also taken.

Plant taxonomists and local Karen collected plant specimens for herbarium records of plant resources. They also identified scientific names, English names and Thai common names (Craib and Kerr, 1951a, 1951b).

In addition, a pile-sorting technique was applied to investigate food perceptions using two sets of cards, one for adult food items and the other for children's food items (37 cards in each set). Each card contained a food name in both the Karen and Thai languages, the food picture, and a number on the reverse side. Only the most common and frequently consumed food items were used. The cards were sorted by respondents into piles describing perceptions of each respondent (Blum *et al.*, 1997). Data on foods normally consumed by children included common names in Thai and English, local names (Karen) as well as scientific names. Among this group, 19 food items were selected for analysis based on their potential nutrient content. Out of the 19 foods items, 3 were fresh fruits, 2 were cooked rice, and 14 were vegetables. Food samples were prepared in the field based on the INMU laboratory protocol. Moreover, qualitative data collection was conducted by means of in-depth interviews using a semi-structured questionnaire and through observation (Yoddumnern-Attig, Sirirassmee and Boonchalaksri, 1998) in order to gain information on knowledge, attitudes and practices

regarding food and nutrition among mothers and children, as well as on their communication patterns. All interviews were conducted by trained researchers in Thai, using interpreters to translate since interviewees spoke and understood Karen.

Results and discussion

Food system in Sanephong

Food procurement

In Sanephong community, food-procurement activities were divided into three categories: (1) foraging (i.e. fishing, hunting and gathering foods from natural habitats); (2) cultivation of food crops and rearing of fish and animals, requiring intensive labour and technological investment (i.e. growing orchards, vegetables [83.6 percent of households], dry and wet rice cultivation, livestock and fish husbandry); and (3) purchasing fresh (meat, fish, vegetables and fruits) and dry (snack, sweet and candy, beverage, fat and oil, canned fish, flour, sugar, etc.) food items and condiments (fish sauce, salt, shrimp paste, pepper, monosodium glutamate, etc.).

In general, local village Karen still depended on foraging and domestication for their foods. Food purchasing, however, has increased over the years because of decreased availability of certain foods as well as the initiation of a new market economy in the community. More recently, the number of small shops increased to seven from only a few, where local food items were sold for cash. Local Karen indicated decreased yield and environmental change as major contributing factors to the decreased availability.

Table 8.1 Percentage of energy supplied from locally produced and market foods for children in Sanephong

Source of food energy	*Energy (%)*			
	Total children n = 86	*Children 1<2 years n = 11*	*Children 2<5 years n = 27*	*Children ≥5 n = 48*
Locally produced (traditional)	63.5	69.2	59.1	64.8
Market (imported)	36.5	30.8	40.9	35.2

In June 2005, the total weekly household expenditure in Sanephong was 237 baht or US$6.2, of which 60 percent (139 baht or US$3.6) was spent on food. Excluding six households (10 percent) with unusual expenses (transportation and debt), the total household expenditure in this community amounted to only 153 baht (US$4) and their food expenditure increased to 75 percent (115 baht or US$3). Therefore, the average monthly household expenditure for food in Sanephong was around 460 baht (US$12) which was still much less than the country average of 3 769 baht (US$98.3) per month in the same year.

Data from the seven community shops indicated that local Karen spent more on animal protein foods (i.e. pork, chicken, egg), totaling 1 682 baht (US$44) per day and fish (including aquatics) at 794 baht (US$20.7) per day. Sales of vegetables, fruits, cereal, fat, oil and condiments ranged from 346–405 baht (US$9 to 10.5) per day. Overall, rice (most of which was produced locally) was still the main source of energy. Table 8.1 shows the percentage of energy derived from locally produced and market foods for children in the community. In general, adults and children obtained the majority of dietary energy from local sources, and some of these were purchased from local farmers. Also, it was noted that importing of rice from other areas of Thailand was necessary. Therefore, it was estimated that approximately 85 percent of adult dietary energy came from local Karen food sources.

Food availability

Overall, the Karen people of Sanephong had abundant food sources for their subsistence. Of foods that were foraged or domesticated, 387 traditional food species/varieties were identified (17 percent animals and 83 percent plants) during the summer of 2005. Out of the 66 animal species/varieties, 5 were reared domestically (duck, cow, buffalo and goat). Only chicken eggs and pork, however, were available for purchase at the small local shops. Of 321 identified plant species/varieties, 177 (51 rice and roots, 89 vegetables, 37 fruits) were cultivated, 126 (108 vegetables, 18 fruits) were wild and 17 were both cultivated and wild (11 vegetables,

Table 8.2 Karen traditional food *(387 species/varieties)*

	Scientific name	*English/common name*	*Karen name*	*Seasonality**	*Food source*		
					Cultivated	*Wild*	*Cultivated/wild*
	Cereals, grains and seeds						
1	*Oryza sativa* L. (17 var.)	Rice	beu-awng-jer, beu-bawng-khu-kli, beu-bawng-yu-ye, beu-bawng-zawng, beu-bi-khi, beu-bo-kaing, beu-er-uan, beu-l-klaing, beu-l-wung-bawng, beu-l-wung-pha-du, beu-l-wung-zer-nu, beu-le-daing, beu-phu-kaing, beu-ther, beu-tho-khawng, beu-ua-phu, beu-yawng-hai	Oct.–Dec.	X		
2	*Oryza sativa* L. (10 var.)	Glutinous rice	aing-khawng-ler, aing-khi-bawng, aing-liaw, aing-pher-chaing, aing-sher-gu, aing-ter-yaing-the, aing-wow-baeng, aing-ya-phi, aing-zer, aing-zer-bung-zer-la	Nov.–Dec.	X		
3	*Sesamum indicum* L.	Sesame	de-zer	Dec.–Jan.	X		
4	*Zea mays L.* (7 var.)	Corn	beu-khe-aing, beu-khe-beu, beu-khe-cher, beu-khe-king-kaing, beu-khe-zer, beu-khe-ker-zi, beu-khe-xer	Jan. June–July, Nov.–Dec.	X		
5	–	–	nawng	Nov.–Dec.	X		
6	–	–	phe-che-za	Jan.	X		
7	–	–	zuy	Dec.–Jan.	X		
	Roots and tubers						
1	*Colocasia esculenta* (L.) Schott (2 var.)	Taro	khu-tho-zer, ku-bawng,	Sept.–Dec.	X		
2	*Dioscorea alata* L.	–	ne-thing	Nov.	X		
3	*Dioscorea esculenta* (Lour.) Burkill	–	ter-khu-thi	Dec.–Jan.	X		
4	*Ipomoea batatas* (L.) Poir.	Sweet potato	cher-thi-ya-bawng-thai	Oct.–Nov.	X		
5	*Manihot esculenta* (Lour.) Burk.	Cassava	bo-kaing-du / ker-bawng-kaing-thing	Jan.–Dec.	X		
6	–	–	khu-a-di	Sept.–Dec.	X		
7	–	–	ku-cher-bawng-ner	Sept.–Dec.	X		
8	–	–	khu-pha-du	Jan.–Aug.	X		
9	–	–	khu-phlo-za	Sept.–Dec.	X		
10	–	–	khu-tho-bung-baing	Sept.–Dec.	X		
11	–	–	khu-tho-ju-khaing	Sept.–Dec.	X		
12	–	–	ku-wa	Sept.–Dec.	X		
	Fish and seafood						
1	*Channa limbata*	Snakehead	ya-li	Jan.–Dec.		X	
2	*Cyclocheilichthys apogon*	–	ya-sai-tawng-kaw	Jan.–Dec.		X	
3	*Dangila siamensis*	–	ya-sai-a-i	Jan.–Dec.		X	
4	*Garra fuliginosa* (2 var.)	–	ya-lung, ya-thei	Jan.–Dec.		X	
5	*Hemibagrus nemurus*	Yellow mystus	ya-chu	Jan.–Dec.		X	
6	*Lobocheilos quadrilineatus*	–	ya-ka-tawng-yu	Jan.–Dec.		X	
7	*Mystacoleucus marginatus*	–	ya-ber-za	Jan.–Dec.		X	

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	*English/common name*	*Karen name*	*Seasonality**	*Food source*		
					Cultivated	*Wild*	*Cultivated/wild*
8	*Pseudomystus siamensis*	Bumblebee catfish	ya-ko-ke	Jan.–Dec.		X	
9	*Puntioplites proctozysron*	Smith's barb	ya-khlow-la	Jan.–Dec.		X	
10	*Syncrossus beauforti*	–	ya-ki	Jan.–Dec.		X	
11	*Tor* sp.	–	ya-mung	Jan.–Dec.		X	
12	–	–	ya-phawng	Jan.–Dec.		X	
13	–	–	ya-phla	Jan.–Dec.		X	
14	–	–	ya-phlawng-nga	Jan.–Dec.		X	
15	–	–	ya-ta-ku	Jan.–Dec.		X	
16	–	–	ya-to-taw	Jan.–Dec.		X	
17	–	–	ya-xu-wu	Jan.–Dec.		X	
18	–	–	ya-zei-muing-ker	Jan.–Dec.		X	
19	–	–	ya-zer-mi	Jan.–Dec.		X	
	Shellfish						
1	– (3 var.)	Crab	chu-ae-kawng-la, chu-ae-lai, chu-ae-wo	Jan.–Dec.		X	
	Shrimp/snail						
1	*Macrobrachium hirsutimanus*	Haingclaw shrimp	zer-dawng	Jan.–Dec.		X	
2	–	–	khlu-mi	Jan.–Dec.		X	
3	–	–	khlu-mi-thung	Jan.–Dec.		X	
	Amphibian						
1	*Kaloula pulchra*	Painted bullfrog, Painted burrowingfrog	di-ow-awng	May–Aug.		X	
2	–	–	di-e	Jan.–Dec.		X	
3	–	–	di-muing	Jan.–Dec.		X	
4	–	–	di-nawng-thai	Jan.–Dec.		X	
5	–	–	tha-bawng	March		X	
	Animals, birds, eggs, insects						
1	*Atherurus macrourus*	Bush-tailed porcupine	zer-ba	Jan.–Dec.		X	
2	*Bos taurus*	Domestic cattle	cha-ner	Jan.–Dec.	X		
3	*Bubalus bubalis*	Domestic water buffalo	per-na	Jan.–Dec.	X		
4	*Capra hircus*	Domestic goat	bi	Jan.–Dec.	X		
5	*Hystrix brachyura*	Malayan porcupine	cher-wu-chu	Jan.–Dec.		X	
6	*Macaca* sp.	Macaque	cha-aw	Jan.–Dec.		X	
7	*Naemorhedus sumatraensis*	Serow	cher-pha	Jan.–Dec.		X	
8	*Sus scofra*	Wild boar	thu-mei	Jan.–Dec.		X	
9	*Tupaia glis*	Common treeshew	nung-khwe	Jan.–Dec.		X	
10	–	–	ling-bawng	Jan.–Dec.		X	
11	–	–	ling-le	Jan.–Dec.		X	
12	–	–	ling-lung	Jan.–Dec.		X	
13	–	–	sa-bu	Jan.–Dec.		X	

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	*English/common name*	*Karen name*	*Seasonality**	*Food source*		
					Cultivated	*Wild*	*Cultivated/wild*
14	–	–	sher-phu	Jan.–Dec.		X	
15	–	–	wa-xa	Jan.–Dec.		X	
16	–	–	wa-xa-ua-khu	Jan.–Dec.		X	
17	–	–	wuy	Jan.–Dec.		X	
18	–	–	wuy-zer	Jan.–Dec.		X	
	Reptile						
1	*Varanus bengalensis*	Bengal monitor	xaw	Jan.–Dec.		X	
2	*Varanus salvator*	Water monitor	kei	Jan.–Dec.		X	
3	–	–	khlaeng-cha	Jan.–Dec.		X	
4	–	–	khlaeng-sawng	Jan.–Dec.		X	
5	–	–	khlaeng-zo	Jan.–Dec.		X	
	Fowl						
1	*Ahas boschas domesticus*	–	thu-tha	Jan.–Dec.	X		
2	*Centropus* sp.	Coucal	thu-phawng-nawng	Jan.–Dec.		X	
3	*Gallus gallus*	Red jungle fowl	chawng-meng	Jan.–Dec.		X	
4	*Anthracoceros albirostis*	Oriental pied horn bill	thu-khaing	Jan.–Dec.		X	
5	*Psittacula* sp.	Parakeet	thu-dai-ya-ka	Jan.–Dec.		X	
6	–	–	hei-za	Jan.–Dec.	X		
7	–	–	thu-bawng-ji-lu	Jan.–Dec.		X	
8	–	–	thu-lai	Jan.–Dec.		X	
9	–	–	thu-luy	Jan.–Dec.		X	
10	–	–	thu-shawng-chi	Jan.–Dec.		X	
	Insects						
1	*Gryllus bimaculatus degeer*	–	xer-lai-zu-wa	Nov.		X	
2	–	–	zawng-ri	Feb.		X	
	Vegetables						
1	*Abelmoschus esculentus* Moench. (2 var.)	Okra, Lady's finger	buay-ker-tia, che-pong-ua	Jan.–Dec.	X		
2	*Acacia pennata* Wild. subsp. *insuavis* Nielson	–	phu-zei-du	April	X		
3	*Acacia rugata*	–	pher-chaing-du	Jan.–Dec.	X		
4	*Aegle marmelos* (L.) Corr.	Bael fruit tree, Bengal quince	ping-la	Apr.–May	X		
5	*Allium fistulosum* L.	Welsh onion	zer-khu-za-wow / e-krer	Jan.–Dec.	X		
6	*Alpinia galanga* (L.) Wild	Greater galangal	e-chaing	Jan.–Dec.	X		
7	*Alpinia* sp.	–	phu-zua-khawng	Jan.–Dec.		X	
8	*Amaranthus* sp.	–	ma-kha-du	May–June		X	
9	*Anacardia occidentale* L.	Cashew nut tree	xu-zai-xeu-za	May–Sept.	X		
10	*Ananas comosus* L. Merr.	Pineapple	na-ra-za	Jan.–Dec.	X		

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	English/common name	Karen name	Seasonality*	Food source		
					Cultivated	Wild	Cultivated/wild
11	*Archidendron jiringa* Nielsen	–	zer-nai-za	Jan.–Dec.			
12	*Artocarpus heterophyllus* Lamarck	Jack fruit	nuay-la-bawng	Jan.–Dec.	X		
13	*Auricularia polytricha* Sacc.	Jew' s ear, Tree ear	xer-bla-ble	May–June		X	
14	*Baccaurea ramiflora* L.	–	sa-shu-la	Feb.–May		X	
15	*Bambusa affinis* Munro.	–	wa-puang	May–Aug.		X	
16	*Bambusa bambos* (L.) Voss (2 var.)	–	wa-bawng, wa-zu	July–Aug.		X	
17	*Bambusa* sp.	–	wa-kluing	July–Aug.		X	
18	*Basella alba* L.	–	phlow-phli-du	July–Oct.	X		
19	*Benincasa hispida* (Thumb.) Cogn.	Wax gourd	ler-za	Jan.–Dec.	X		
20	*Boesenbergia rotunda* (L.) Mansf.	–	sa-ro	Jan.–Dec.			X
21	*Brassaiopsis ficifolia* Dunn.	–	nawng-ner-khi-ua] / ka-phlu-tai	Jan.–Dec.	X		
22	*Brassica alboglabra* Bailey	Chinese kale	ba-du-phow-muing- lawng	Jan.–Dec.	X		
23	*Brassica chinensis* Jusl. var. *parachinensis* (Bailey)	Flowering white cabbage, Chinese cabbage	ba-du	Sept.	X		
24	*Brassica pekinensis* (Lour.) Rupr. var. *cylindrica*	Celery cabbage	ba-du-ua	July–Aug.	X		
25	*Caesalpinia mimosoides* Lam.	–	phlaing-du	Jan.–Dec.		X	
26	*Cajanus cajans* (L.) Millsp.	Pigeon pea, Angola pea, Congo pea	beu-kli-za	Nov.–Dec.	X		
27	*Canavalia gladiata* (Jacq.) Dc.	–	mi-za	Dec.		X	
28	*Canna edulis* Ker-Gawl.	Australian arrowroot	bo-da-thing	Oct.–Apr.	X		
29	*Capsicum annuum* L. var. *Annuum*	Chili	cher-khe-pha-du	Jan.–Dec.	X		
30	*Capsicum frutescens* L. var. Frutescens	Bird pepper	cher-khe-yu-i	Sept.	X		
31	*Capsicum frutescens* L. var. *Frutescens*	Chili	cher-khe-za	Nov.	X		
32	*Capsicum* sp. (3 var.)	Chili	cher-khe-chawng-shaw, cher-khe-kha-derw-waing-za, cher-khe-ua,	Jan.–Dec.	X		
33	*Carica papaya* L.	Papaya	klo-ji-la	Nov.–Mar.	X		
34	*Centella asiatica* (L.) Urb.	Asiatic pennywort	wawng-xawng-du	Jan.–Dec.			X
35	*Citrus aurantifolia* (Christm. & Panz.) Swingle	Common lime	per-no-klai-za	June	X		
36	*Citrus medica* L. var. *medica*	Citron	sa-zui-la	Jan.–Dec.	X		
37	*Citrus* sp.	–	ma-klaw-za	May –Aug.	X		
38	*Cleome gynandra* L.	Bastard mustard	pha-chiang-du	May	X		
39	*Coccinia grandis* (L.) Voigt	Ivy gourd	ser-mler-du	Jan.–Dec.			X

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	English/common name	Karen name	Seasonality*	Food source		
					Cultivated	Wild	Cultivated/wild
40	*Coffea* sp.	–	kha-fae-du	Jan.–Dec.	X		
41	*Coriandrum sativum* L.	Chinese parsley	pha-ka-chi-zaing	Oct.	X		
42	*Costus speciosus* (Koen.) Sm.	–	shui-laing-du	Mar.		X	
43	*Crateva magna* Dc.	–	kawng-tha-du	Jan.–May		X	
44	*Cucumis melo* L.	Melon	thi-muing-za	July–Aug.	X		
45	*Cucumis sativus* L. (2 var.)	Cucumber, Sour cucumber	thi-muing, thi-chaing-za	Sept.–Dec.	X		
46	*Cucumis* sp.	–	thi-khwa	Sept.–Oct.	X		
47	*Cucurbita moschata* (Buch.) Poir.	Pumpkin	ler-khe-za	Jan.–Dec.	X		
48	*Curcuma parviflora* Wall. (2 var.)	–	mai-ta-raw-thing, phu-ya-bawng	Jan.–Dec.			X
49	*Cymbopogon citratus* (Dc.) Stapf	Lemon grass	guang-yi	Jan.–Dec.	X		
50	*Dendrocalamus asper* (Roem. & Schlt) Backer ex Heyne	–	wa-kli-zerng	July–Sept.		X	
51	*Dillenia indica* L. (2 var.)	–	khong-za, sa-phlu-za	Apr.–July		X	
52	*Diplazium esculentum* (Retz.) Sw.	–	kai-khu-du	Jan.–Dec.		X	
53	*Dracaena* sp.	–	mi-beu-zawng-thi	Mar.–June		X	
54	*Eichhornia crassipes* (C. Mart.) Solms	Water hyacinth	chuay-thaing-du	Aug.–Sept.	X		
55	*Entada* sp.	–	be-ke-du	Apr.–May		X	
56	*Eryngium fortidum* L.	Stink weed	phla-ker-chi	Jan.–Dec.	X		
57	*Erythropalm scandens* Blume	–	gawng-chu-na-du	Feb.–Apr.		X	
58	*Gnetum gnemon* L. var. *tenerum* Markr.	–	le-khawng-du	Jan.–Dec.		X	
59	*Hibiscus sabdariffa* L. var. *sabdariffa*	Roselle, Red sorrel	che-pong-wo	July–Oct.	X		
60	*Hydrocotyle umbellata* L.	–	sa-nawng-wa-du	Jan.–Dec.		X	
61	*Ipomoea aquatica* Forsk.	Water spinach, Water convolvulus	sa-ni-wo-du	Jan.–Dec.	X		
62	*Kaemferia* sp.	–	phu-bawng-thing	Jan.–Dec.		X	
63	*Lagenaria siceraria* (Molina) Stanley	Bottle gourd	thi-lui-za	Mar.–Sept.	X		
64	*Lasia spinosa* Thw.	–	kawng-khuy-khu-du	Jan.–Dec.		X	
65	*Lemmaphyllum carnosum* (J. Sm. Ex Hook.) C. Presl	–	kawng-thaing-du	Jan.–Dec.		X	
66	*Luffa acutangula* (L.) Roxb.	Angle loofah	dei-lei-za	July	X		
67	*Luffa cylindrica* (L.) M. Roem	–	ther-khu-mai-du	May–June		X	
68	*Lycopersicon esculentum* Mill. (4 var.)	Tomato, Wild tomato	yawng-chaing-za, kha-derw-waing-pa-du, kha-derw-waing-phu, kha-derw-waing-za	Sept.–Oct.	X		

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	English/common name	Karen name	Seasonality*	Food source		
					Cultivated	Wild	Cultivated/wild
69	*Lygodium flexuosum* (L.) Sw.	–	thu-kaing-khu-du	Apr.–May		X	
70	*Mangifera indica* L.	Mango	xu-la-bawng	Mar–Apr.		X	
71	*Marantha* sp.	–	mer-row-thaing	Oct.–Apr.	X		
72	*Marsilea crenata* Presl.	–	chawng-khu-pei-du	Jan.–Dec.		X	
73	*Melientha suavis* Pierre	–	ze-la-phu-me-la-kla	Apr.-May			X
74	*Mentha cordifolia* Opiz	Mint, Kitchen mint	sho-rer-ni-du	Jan.–Dec.	X		
75	*Morinda citrifolia* L.	Noni	yi-yu-la	Jan.–Dec.	X		
76	*Moringa oleifera* Lamk.	Horse radish tree	ka-maing-der-du	Jan.–Dec.	X		
77	*Mormodica charantia* L.	Balsam pear, Bitter cucumber	mawng-ka-la-du	Jan.–Dec.		X	
78	*Mormodica chochinchinensis* Spreng.	–	bai-khai-du	Jan.–Dec.		X	
79	*Musa* sp.	–	sa-kuy-ya-mei	Jan.–Dec.		X	
80	*Ocimum americanum* L.	Sweet basil	wawng-zai-du	Jan.–Dec.	X		
81	*Ocimum sanctum* L. (2 var.)	Holy basil	waing-ker-phlo, waing-ker-phlo-wo	Jan.–Dec.	X		
82	*Passiflora foetida* L.	–	nawng-thaing-xa-za	Jan.–Dec.		X	
83	*Piper sarmentosum* Roxb.	–	pu-le-la	Jan.–Dec.		X	
84	*Pisum sativum* L.	Sugar pea, Garden pea	bawng-ba-za	Nov. –June	X		
85	*Psophocarpus tetragonolobus* (L.) Dc.	Four-angleed bean	buay-ker-lu-za	Sept.–Oct.	X		
86	*Raphanus sativus* L. var. *hortensis* Baker	Chinese radish	ba-du-thing	July–Aug.	X		
87	*Sauropus androgynus* (L.) Merr.	–	ze-la-phu-du	Jan.–Dec.			X
88	*Solanum melongena* L. (3 var.)	Brinjal, Eggplant	yawng-ju-za, yawng-mu-lai-za, yawng-jiw-za	Jan.–Dec.	X		
89	*Solanum torvum* Sw.	–	yawng-kha-zei-za	Jan.–Dec.	X		
90	*Sphaeranthus africanus* L.	–	kawng-ther-du	Aug.–Sept.			X
91	*Spondias pinnata* Kurz.	–	phai-yu	Jan.–Dec.		X	
92	*Tamarindus indica* L.	Tamarind	mawng-khlong-du	May–June/ Aug./Feb.	X		
93	*Vigna unguiculata* (L.) Walp. Subsp. Unguiculata (4 var.)	Black soya bean, Cow pea, Yard long bean, Asparagus bean	thu-zer, thu-bu-beu, thu-phlaing, thi-kli-zer	Nov.–Dec.	X		
94	–	–	ba-du-gha	July–Aug.	X		
95	–	–	baing-mei-muing	Aug./Nov.–Dec.		X	
96	–	–	baing-za	Nov.	X		
97	–	–	bo-ter-lerw	Jan.–Dec.		X	
98	–	–	chawng-li-la	Jan.–Dec.		X	
99	–	–	chaw-xer-lia-du	Mar.–May		X	
100	–	–	cher-nge-phlo	Sept.–May	X		

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	English/common name	Karen name	Seasonality*	Food source		
					Cultivated	Wild	Cultivated/wild
101	–	–	cher-nge-waing- thawng-ther	Sept.–May	X		
102	–	–	da-bawng-meu, da-bawng-yu	June–Aug.		X	
103	–	–	di-khawng-du	May–Oct.		X	
104	–	–	jawng-ping-thing-du	Jan.–Dec.		X	
105	–	–	jerw-mei-du	June–July/ Feb.–Apr.			X
106	–	–	kawng-ther-me	May–June		X	
107	–	–	kawng-zong-za	Jan.–Dec.			X
108	–	–	kher-daw-pow	Mar.–May		X	
109	–	–	kher-ta-phae	Feb.–May		X	
110	–	–	khu-khu-la	Nov.	X		
111	–	–	khu-thi-phow	July–Aug.		X	
112	–	–	khwe-bai-za	Mar.–Apr.		X	
113	–	–	khwe-wai	Feb.–Apr.		X	
114	–	–	klu-pho	Nov.		X	
115	–	–	kre-neng-za	Oct.–Nov.	X		
116	–	–	ku-bawng-du	Mar.–July		X	
117	–	–	kwa-jawng-kung	May–Sept.		X	
118	–	–	kwa-phu-chaing	Jan.–Dec.		X	
119	–	–	la-phlow	Nov.	X		
120	–	–	la-zu-za	Nov.	X		
121	–	–	le-kha-la	Jan.–Dec.	X		
122	–	–	li-wo-du	Feb.–June		X	
123	–	–	ma-pho	Feb.–June		X	
124	–	–	mawng-pho-du	Jan.–Dec.		X	
125	–	–	me-gawng-muing	Feb.–Apr.		X	
126	–	–	mia-pher-la-du	Apr.–May		X	
127	–	–	mi-du-zawng	Mar.–Apr.		X	
128	–	–	ming-beu-zawng-laing	Jan.–Dec.		X	
129	–	–	na-ker-wawng	July–Nov.	X		
130	–	–	nawng-kha-du	May–Sept.		X	
131	–	–	nawng-ner-khi-wow	Jan.–Dec.	X		
132	–	–	nawng-thu-I-yu	Jan.–Dec.		X	
133	–	–	nawng-thu-lui	Feb.-Mar.		X	
134	–	–	nawng-wai-du	Apr.–May		X	
135	–	–	nawng-za	June–July/Sept.		X	
136	–	–	ne-dong-phaing-thing	Feb.–Mar.	X		
137	–	–	pher-cha-chai-du	Jan.–Dec.		X	
138	–	–	pher-ki-mu	Jan.–Dec.	X		

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	English/common name	Karen name	Seasonality*	Food source		
					Cultivated	Wild	Cultivated/wild
139	–	–	phlaeng-ker-daing-du	June–Aug.		X	
140	–	–	phle-khu-zer	Feb.–Apr.	X		
141	–	–	pho-ke	May–Oct.	X		
142	–	–	phu-du	Jan.–Dec.		X	
143	–	–	phu-jer-du	Jan.–Dec.		X	
144	–	–	phu-jer-pho	Jan.–Dec.		X	
145	–	–	phu-ju-khai	June–Feb.		X	
146	–	–	phu-pheng-du	June–Aug.		X	
147	–	–	phu-yu-eng	Jan.–Dec.		X	
148	–	–	phu-ze-ze-du	Jan.–Dec.	X		
149	–	–	sa-na-sa-rai-du	Jan.–Dec.		X	
150	–	–	sa-ni-wa-du	Jan.–Dec.		X	
151	–	–	sa-zuay	Jan.–Dec.		X	
152	–	–	sa-zuay-la	June–July		X	
153	–	–	sa-zung-du	Jan.–Dec.	X		
154	–	–	shaw-ai-du	May–June		X	
155	–	–	show-shuay-du	Jan.–Dec.		X	
156	–	–	soy-pha-ku	Jan.–Dec.		X	
157	–	–	tawng-za	Mar.–June		X	
158	–	–	ter-pow-ter-na-du	Mar.–May		X	
159	–	–	thaing-laing-dong-za	Aug.–Nov.		X	
160	–	–	tha-thaw	Jan.–Dec.		X	
161	–	–	ther-du	Jan.–Dec.	X		
162	–	–	ther-ku-za	Nov.	X		
163	–	–	thi-du	Jan.–Dec.		X	
164	–	–	thu-lu-khaing-meung	Jan.–Dec.		X	
165	–	–	thu-pho-muing-chaing	Jan.–Dec.		X	
166	–	–	thu-taw-hawng	Nov.–Mar.	X		
167	–	–	ua-khu-du	Feb.–Apr.		X	
168	–	–	wa-kli	July–Aug.		X	
169	–	–	wa-mi	July–Aug.		X	
170	–	–	xa-di-du	Apr.–May		X	
171	–	–	xa-zing-du	Jan.–Dec.		X	
172	–	–	xer-ai	July		X	
173	–	–	xer-beu-phong	July		X	
174	–	–	xer-cha	May		X	
175	–	–	xer-chong	May		X	
176	–	–	xer-ka-chawng-zer	Sept.		X	

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	English/common name	Karen name	Seasonality*	Food source		
					Cultivated	Wild	Cultivated/wild
177	–	–	xer-khi-bawng	July		X	
178	–	–	xer-ku-bawng	June		X	
179	–	–	xer-maing-du	May–July		X	
180	–	–	xer-pher	July		X	
181	–	–	xer-phlong	June		X	
182	–	–	xer-thu-xwe	June		X	
183	–	–	xer-wa-khu	Sept.		X	
184	–	–	xer-wing-za	Oct.–Nov.	X		
185	–	–	xer-za	July–Aug.		X	
186	–	–	zaing-ner-mer	Jan.–Dec.		X	
187	–	–	zer-baw-du	Jan.–Dec.		X	
188	–	–	zer-khu-za-wo-bung	Jan.–Dec.	X		
189	–	–	zer-na-za	Jan.–Feb.		X	
190	–	–	ze-yawng-kha	May–June		X	
191	–	–	zi-khwai-du	May–June		X	
	Fruits						
1	*Aegle marmelos* (L.) Corr.	Bael fruit	ping-za	Mar.–May	X		
2	*Anacardium occidentale* L.	Cashew nut	xu-zei-kheu-za	Mar.–May	X		
3	*Annanas comosus* (L.) Merr.	Pineapple	na-ra-za	Jan.–June	X		
4	*Artocarpus heterophyllus* Lamarck (2 var.)	Jackfruit	nuay-xu-za, nuay-phlae	Apr.–May	X		
5	*Artocarpus* sp.	–	nuay-pha-za	May–July		X	
6	*Averrhoa carambola* L.	Carambola	khaing-khong-za	Jan.–Dec.	X		
7	*Baccorea ramiflora* Lour.	Burmese grape	sa-chu-za	Apr.–May		X	
8	*Bouea macrophylla* Griff.	–	xawng-za	Mar.–May	X		
9	*Carica papaya* L.	Papaya	klerw-ji-za	Jan.–Dec.	X		
10	*Castanopsis diversifolia* DC.	–	zi-za	May–July		X	
11	*Citrus grandis* (L.) Osbeck	Pomelo, Shaddock	zong-u-za	June–July/ Sept.–Dec.	X		
12	*Citrus reticulata* Blanco	Tangerine, Sour mandarin	to-za	Sept.–Oct.	X		
13	*Citrus sinensis* (L.) Osb.	Acidless sweet orange	li-mung-za	Sept.–Oct.	X		
14	*Clerodendrum infortunatum* L.	–	kwa-phu-chaing	July–Aug.		X	
15	*Cocos nucifera* L.	Coconut	phlo-za	Jan –Dec.	X		
16	*Cucumis melo* L.	Melon	thi-muing-za	Aug.–Sept.	X		
17	*Durio zibethinus* L.	Durian	tu-re-za	May–Sept.	X		
18	*Elaeagnus latifolia* L.	–	thong-za	Mar.–Apr.			X
19	*Ficus chartacea* Wall. Ex King var. *torulosa* wall.	–	ding-za	Jan.–Dec.		X	

Continued

Table 8.2 *(continued)* **Karen traditional food** *(387 species/varieties)*

	Scientific name	*English/common name*	*Karen name*	*Seasonality**	*Food source*		
					Cultivated	*Wild*	*Cultivated/wild*
20	*Ficus* sp. (2 var.)	–	ku-na-l-za, ku-ye	Jan.–Dec.		X	
21	*Flueggea virosa* (Roxb. Ex Wild.) Voigt.	–	ming-thawng-phla-za	May–July		X	
22	*Litchi chinensis* L.	Litchi	phong-mi-za	Apr.–June			X
23	*Mangifera indica* L. (6 var.)	Mango	xu-daing-ya-za, xu-dow-za, xu-eu-paw, xu-perw-lerw, xu-thi-khaw-za, xu-tawng-phaing	Mar.–May	X		
24	*Musa sapientum* L. (13 var.)	Banana	sa-kuy-phla-l-ji-awng, sa-kuy-phla-phri, sa-kuy-pi-la, sa-kuy-thong, sa-kuy-thung-lung-za, sa-kuy-xwa, sa-kuy-yawng-kerw, sa-kuy-daing-to, sa-kuy-phla-kwa, sa-kuy-xlae, sa-kuy-ya-chaing, sa-kuy-ya-wo, sa-kuy-phla-pher-taing	Jan.–Dec.	X		
25	*Nephelium lappaceum* L. (2 var.)	Rambutan	phong-zu-me, phong-zu-za	April–June			X
26	*Passiflora foetida* L.	–	nawng-thaing-xa-za	May–Aug.		X	
27	*Phyllanthus acidus* (L.) Skeels.	Star gooseberry	ma-yom	Jan.–Dec.	X		
28	*Physalis angulata* L.	Ground cherry	yawng-shi-pong	Feb.–Apr.		X	
29	*Psidium guajava* L. (2 var.)	Guava	lia-awng-ka-wo-za, lia-awng-ka-za	Mar.–May	X		
30	*Saccharum officinarum* L.	Sugar cane	chi-phu	Jan.–Dec.	X		
31	*Salacca wallichiana* C. Mart.	–	khong-za	Mar.–June			X
32	*Sandoricum koetjape* (Burm. F.) Merr.	Santol	du-za	June–July		X	
33	*Schleicheraoleosa* Oken.	Ceylon oak	ker-zong-za	June–July		X	
34	*Syzygium* sp.	–	ming-za	Mar.–Apr.		X	
35	*Ziziphus* sp.	–	laing-ju-mi-za	May		X	
36	–	–	ku-maw-puay-chaw	Jan.–Dec.		X	
37	–	–	kwa-jawng-kong	May		X	
38	–	–	nawng-za	Sept.		X	
39	–	–	per-thu-za	June–July		X	
40	–	–	phi-za	July–Aug.		X	
41	–	–	pi-laew	June		X	
42	–	–	yawng-mua	June			X

* Seasonality varies with variety.
– No data.

6 fruits). All the traditional foods – local species or foods which were available in the village, cooked in traditional ways and accepted by local people (Kuhnlein and Receveur, 1996) – can be identified in the Karen language, 258 species/varieties of which could be identified by their Thai names, 233 species/varieties by their scientific names, and 141 species/varieties by their English names. Of these, 108 species/varieties have basic nutrient and micronutrient information available. Table 8.2 presents the list, as complete as possible, for the Sanephong Karen food system. It is important to note that many food species do not have scientific identifications or English names. There is an obvious abundance of diversity of foods within traditional Karen knowledge in the region, but much scientific work remains to be done.

Seasonality

Carbohydrate food sources were plentiful and available throughout the year in Sanephong. Harvesting rice and other carbohydrate sources (45 varieties, i.e. corn, potato and taro) usually took place during the cool season (October–January). Most households store these foods for year-round consumption. Because of several factors, including land control, intensive labour, technological investment and inadequate rainfall, rice production increasingly became a complex issue for the local people since there were many households that no longer produced enough rice for their own consumption.

Vegetables (leaves, shoots and flowers) were also abundant in Sanephong, with 57 species/varieties reportedly available year-round, 86 species/varieties in the dry season, 108 species/varieties in the wet season and 75 species/varieties in the cool season. Fruits (21 species/varieties), such as banana, papaya, star fruit and coconut, were available year-round. Only during the dry season vitamin-rich fruits (23 species/varieties), including mango, guava and jackfruit, were available. Fruits (17 species/varieties), such as santol, wild rambutan and durian, were found in the wet season, both wild and cultivated.

Fish, snails, shrimp, crabs, frogs and other aquatics animals (31 species/varieties) were found naturally throughout the year and were commonly eaten in Sanephong. During the wet season (June to September), there were more varieties and greater quantities available. Fish was the most important protein source for the locals. Domesticated fowls, wild insects, goats and wild animals were also available and consumed in this community.

Food processing, preservation and cooking methods

Home-pounded rice was more common than milled rice. Boiling and then rinsing was the method used for cooking rice. Sticky rice was commonly used for dessert, usually steamed or boiled with coconut milk. Karen preferred to eat fresh or boiled vegetables rather than stir-fried vegetables. In general, vegetables were not preserved because of the fact that there were plenty of them available. Some vegetables like *pak-koom* (crataeva leaves) and *pak-sian* (bastard mustard leaves) were preserved using a salting technique. Sun-dried chili is also popular among the locals. Occasionally, fruits such as banana and *ma-prang* (gandaria, marian plum) were sun dried, but otherwise fruits were mainly eaten fresh. However, for fish and other meats preservation, such as sun drying, salting and souring fermentation, were common in the village. Fermentation was also used for preserving some varieties of beans, such as *bai-sa*.

Food consumption

In Sanephong, most people ate two or three meals a day. Family members usually ate together with each person having his/her own individual rice plate. They shared two or three main dishes, for example, fresh or boiled vegetables and *nam-prick* or *prick-tum* (chili, salt, monosodium glutamate) and a bowl of soup (left-over water from boiling vegetables with a small amount of salt and/or monosodium glutamate). Thus, the food consumption pattern in Sanephong was generally monotonous with a large amount of rice, vegetables and chili as major ingredients in local menus. Animal protein sources were available but not plentiful. When available, the local people liked to cook spicy fish soup (water, fish, red onion, garlic, chili and vegetables). Fat and oil were used less in their cooking. Some

Table 8.3 New nutrient data of Karen foods and potential dietary contributions

	English name	Karen name	Scientific name	Serving size*	Nutrients per serving (% Thai RDI)									
					Iron		Ca		Vitamin A Equivalent**		Vitamin C		Folate	
				g	mg		mg		µg		mg		µg	
1	Shellfish	Khlu-mi	Unidentified	35	5.8	(39)	112	(14)	–	–	–	–	–	–
2	–	Pak-man-mu or Le-khawng-du	*Gnetum nemon* L. var. *tenerum* Markr.	50	0.7	(5)	26	(3)	92	(15)	25	(42)	35.5	(18)
3	–	Kawng-thaing-du	*Lemmaphyllum carnosum* (J. Sm. Ex Hook.) C. Presl	50	1.35	(9)	46	(6)	61	(10)	2	(3)	18	(9)
4	–	Sa-ni-wa-du	Unidentified	50	1.1	(7)	124	(16)	19	(3)	2.5	(4)	8	(4)
5	–	Yawd-fak-kao or Bai-khai-du	*Mormodica chochinchinensis* Spreng.	50	0.45	(3)	57	(7)	77	(13)	73.5	(123)	86.5	(43)
6	–	Ther-khu-mai-du	*Luffa cylindrica* (L.) M. Roem.	50	1.1	(7)	65.5	(8)	62	(10)	2.5	(4)	32	(16)
7	Citron	Bai-ma-ngua or Sa-zui-la	*Citrus medica* L. var. medica	50	2.1	(14)	373.5	(47)	49	(8)	37.5	(60)	37	(19)
8	–	Gawng-chu-na-du	*Erythropalm scandens* Blume	50	0.75	(5)	79	(10)	39	(7)	2	(3)	28	(14)

– No data.
* Serving size derived from 24 hour dietary recall method.
** Beta-carotene 12 µg = 1 µg Vitamin A (IVACG, 2004).
Note 1: Thai Recommended Daily Intakes (Thai RDI) for children six or more years of age (Food Control Division, 1998).
Note 2: Food item is considered a good source of a nutrient if one serving meets 10-19% of the Thai RDI and excellent source if one serving meets ≥20% of the Thai RDI.

popular fried dishes included fried fish, fried egg and stir-fried vegetables, i.e. fern or *kai-khu-du* (*Diplazium esculentum* [Retz.] Sw.), *pak-man-mu* (*Gnetum gnemor* L. var. tenerum Markr.) (dark green leaves), bamboo shoot, banana flower, etc. Coconuts were grown in the village, and coconut milk was commonly used in dessert recipes (i.e. steamed sticky rice with coconut milk and durian cooked with coconut milk). Traditional dishes, such as *kanom-jene-nam-ya* (rice noodle with spicy soup) and *ka-bong-jo* (fried bamboo shoots mixed with curry paste and rice flour), were still popular in Sanephong.

Traditional foods with high potential

Rice, corn, taro, potato, fish, coconut milk and oil were key traditional foods providing macronutrients (carbohydrate, animal protein and fat). As for key micronutrients, the main sources were vegetables (208 species/varieties) and fruits (62 species/varieties). For example, vitamin A and vitamin C were found to be high in young papaya leaves, young bitter gourd leaves, cassava leaves, ivy gourd, swamp cabbage, noni leaves, Chinese cabbage and pumpkin. Mango, ripe papaya, guava, star fruit, ripe banana and pomelo were also rich in beta-carotene (vitamin A equivalent) and vitamin C. Iron and calcium-rich foods included wild game, green frogs and crickets (Puwastien *et al.*, 1999).

From these food items, 19 animal and plant species/varieties were submitted for nutrient analysis. Results indicated that eight species are high in minerals and vitamins when considering both nutrient density and portion size consumed compared against the Thai Recommended Daily Intakes (Thai RDI – Food and Drug Adminstration of Thailand, Food Control Division, 1998). *Khlu-mi* (a kind of snail) was found to be high in iron (≥20 percent Thai RDI) and calcium (10–19 percent Thai RDI). *Pak-man-mu* was found to be high in vitamin C and is a good source of beta-carotene and folate. *Yawd-fak-kao* (*Momordica chochinchinensis* Spreng) (young leaves) is also high

in vitamin C and folate and is a good source of beta-carotene. *Bai-ma-ngua* (*Citrus medica* L. var. *medica*) (dark green leaves) is high in vitamin C and calcium, and is also a good source of iron and folate. *Ther-khu-mai-du* (*Luffa cylindrica* [L.] M. Roem) is a good source of vitamin A and folate. *Gawng-chu-na-du* (*Erythropalm scandens* Blume) is a good source of calcium and folate. *Kawng-thaing-du* (*Lemmaphyllum carnosum* [J. Sm. Ex Hook.] C. Presl) is a good source of vitamin A. *Sa-ni-wa-du* (dark green leaves) is a good source of calcium (Table 8.3).

Little used or currently unused traditional Karen food items

The Sanephong Karen identified five traditional foods as being little used or unused food items in their community. They mentioned that *bai-sa* (a kind of bean) was one of the neglected items. Sesame was commonly used for cooking oil previously, but most people used palm oil instead at the time of this study. In addition, they mentioned that some varieties of bananas were disappearing. A kind of traditional cereal was no longer available because of drought. Some varieties of wild birds, such as *nok-tu-kai*, were rarely found in the surrounding forest.

Understanding food-use patterns

Infant-feeding and infant foods

In summer 2005, all infants (n = 24) were reportedly breastfed from birth up to two months. Eighteen of these infants (75 percent) were reportedly given colostrum. At six months, 22 infants (92 percent) were still breastfed. No underweight (weight for age) was found in infants less than seven months old. Twenty-one children over one year old (87 percent) were breastfed. Since breastmilk alone was no longer adequate after six months, one child younger than one year old (8 percent) and nine children between one and two years (36 percent) were found to be underweight.

Complementary food

Half of the infants in this study received complementary food rather late. Moreover, they received mainly rice mixed with watery soup (from boiling vegetables). The other cohort of infants also received complementary food that was low in both amount and frequency. Therefore, complementary food practices in this community need improvement in both quality and quantity, especially among children between one and two years old.

Dietary intakes of children

Mean energy intakes of Sanephong children did not meet the Thai DRI (58 percent of Thai DRI for children 6–11 months, 50 percent for one to two years, 56 percent for two to five years and 69 percent for 5–12 years). Carbohydrate intakes comprised more than 70 percent of the total energy intake among children over one year old. Protein intakes were inadequate among children one to two years old (mean intake at 48 percent Thai DRI), but were adequate in other groups (70 percent of Thai DRI for 6–11 months, 72 percent for two to five years and 78 percent for 5–12 years). Most of the protein consumed by the children zero to two years old came from breastmilk. Children over two years of age reportedly received more protein from plant sources than from animal sources (more than two times/week); their fat intakes were low as well, at 15–20 percent of energy.

Vitamin A intakes were found to be adequate in children between six months and two years old because of their intake of breastmilk (mean intake at 103 percent Thai DRI for 6–11 months, 76 percent Thai DRI for one to two years). For children 2–12 years old, vitamin A intakes were found to be extremely low during the dry season (mean intake at 13 percent Thai DRI for two to five years, 16 percent for 5–12 years). These low vitamin A intakes, together with low fat intakes, indicated that sub-clinical vitamin A deficiency might exist among many children over two years of age in this community. Also, vitamin C intakes were found to be adequate in children under two years old, again due to breastmilk (mean intake at 99 percent Thai DRI for 6–11 months, 78 percent for one to two years), but very low in children over two years of age (28 percent Thai DRI for two to five years, and 52 percent for 5–12 years).

Iron intakes were undoubtedly inadequate among the children (mean intake at 29 percent Thai DRI for one to two years, 35 percent for two to five years, 42 percent for 5–12 years). Moreover, most of the iron came from plant sources, such as rice and vegetables. Calcium intakes were extremely low (mean intake at 22 percent Thai DRI for one to two years, 8–9 percent for 2–12 years). Nevertheless, large amounts of rice contributed to adequate thiamine intakes in children of 5–12 years old (mean intake at 80 percent Thai DRI).

Children's nutritional and health status

Overall nutritional status of children suggested chronic and acute malnutrition problems: 20 percent stunting (n = 37), 14 percent underweight (n = 26), 5 percent thin (n = 9), with only 1 percent overweight (n = 2) in the village (Table 8.4). Children under one year of age were fine in both terms of nutrition and health status. No underweight was found among infants (under 12 months old); however, three infants less than 11 months old were stunted and one infant was overweight at 11 months old. For children between one and two years old, 27 percent were underweight, 5 percent were stunted and 50 percent reported sick. For pre-schoolers (two to five years old), 18 percent were underweight and 24 percent were stunted and there was a morbidity (reported sick) rate of 45 percent. Among school children (5–12 years old), 11 percent were underweight, 21 percent were stunted and there was a 32 percent morbidity rate. Physical examination among these children indicated 11 percent anemia, 0.5 percent visible goitre, 0.7 percent night blindness, 3 percent angular stomatitis, 65 percent dental carries and 6 percent gum bleeding.

Food perceptions and beliefs

The interviews and the card pile sort exercise showed that Karen women were found to believe white rice to be an important and healthy food, especially for pregnant and lactating mothers and young children, and fish was seen to be important for healthy brain development. A kind of soup, *kang-leang-hua-plee* (made with banana flower, fish, pepper and plenty of water), was reported to increase breastmilk during lactation. Vegetables, such as fern, ivy gourd, *bai-ma-ngu* (*Citrus medica* L. var. *medica*), *pak-man-mu* (*Gnetum nemon* L.var. *tenerum* Markr.), rosella leaves and *sa-ni-wa-du* (a kind of dark green leaves), were considered good for health. Fruits such as pineapple, banana, ripe papaya,

Table 8.4 Health and nutritional status of 0–12 year old children in Sanephong village

	No. cases *(% within total sample)*		***No. cases*** *(% within age category)*							
			< 1 yr		***1 < 2 yr***		***2 < 5 yr***		***≥ 5 yr***	
Total sample	***185***	***(100)***	***12***	***(100)***	***22***	***(100)***	***51***	***(100)***	***100***	***(100)***
Underweight	26	(14)	0	(0)	6	(27)	9	(18)	11	(11)
Stunting	37	(20)	3	(25)	1	(5)	12	(24)	21	(21)
Thin	9	(5)	0	(0)	1	(5)	4	(8)	4	(4)
Overweight	2	(1)	1	(8)	0	(0)	0	(0)	1	(1)
Visible goiter	1	(0.5)	0	(0)	0	(0)	0	(0)	1	(1)
Angular stomatitis	5	(3)	0	(0)	0	(0)	0	(0)	5	(5)
Reported sick	69	(37)	3	(25)	11	(50)	23	(45)	32	(32)
Anaemia (n=47)*	5	(11)	0	(0)	0	(0)	0	(0)	5	(5)
Reported night blindness (n=145)*	1	(0.7)	0	(0)	0	(0)	0	(0)	1	(1)
Reported gum bleeding (n=182)*	10	(6)	0	(0)	0	(0)	0	(0)	10	(10)
Dental caries (n=179)*	116	(65)	1	(17)	3	(14)	26	(51)	86	(86)

* Number of children examined for this parameter; otherwise n = 185.

ripe mango, guava, young coconut, salak palm, star fruit and pomelo, were also reported as being good for health. However, too many fruits were known to cause abdominal discomfort in adults and diarrhea in infants. There were also taboos connected to giving fruits to young children with fever and malaria.

It was felt that lactating mothers and young children should not eat too much starchy food, such as corn, taro, potato and pumpkin, which can cause abdominal discomfort and/or diarrhea. Further, if lactating mothers ate some young leaves like mango leaves, *yawd-ma-kok* (*Spondias pinnata* Kurs) and noni leaves, their infants might become ill. It was reported that pregnant and lactating women, as well as young children, should avoid wild animals, i.e. reptiles, insects and aquatic animals (like frogs, turtles, crabs and snails). Nevertheless, many mentioned that food taboos should not apply generally since it also depends on each individual; for example, they said that some got ill while some did not by consuming the same foods.

From pregnant mothers' points of view, white rice, fish, pork, chicken, eggs, milk and some vegetables, such as fern or *kai-khu-du* (*Diplazium esculentum* [Retz.] Sw.), *pak-man-mu* and rosella leaves were good foods. Fruits, including banana and ripe papaya were mentioned as good for infants and mothers to keep them healthy and strong. Some mothers also said that corn, taro, potato and pineapple should not be eaten, as they can cause indigestion, abdominal pain and diarrhea. Wild animal meats were noted as being harmful to both infants and pregnant women.

Mothers of pre-school children suggested that white rice, pork, ripe papaya, guava and *pla-seou* made their children healthy and strong. *Pla-tid-hae* or *ya-ber-za* (*Mystacoleucus marginatus*), *pla-tong-na* or *ya-sai-tawng-kaw* (*Cyclocheilichthys apogon*), *pla-seou or ya-sai-a-i* (*Dangila siamensis)*, *pla-vien* or *ya-mung* (*Tor* sp.), *pla-kod* or *ya-chu* (Yellow mystus, *Hemibagrus nemurus*) (types of fish), ivy gourd, fern or *kai-khu-du* (*Diplazium esculentum* (Retz.) Sw.), *yawd-buab-pa* or t*her-khu-mai-du* (*Luffa cylindrical* (L.) M. Roem.), cabbage, cucumber and Chinese cabbage were food items that pre-school children preferred. Banana, ripe mango, papaya, pineapple, pomelo, wild pig and wild chicken were important food taboo items not to be consumed during fever and malaria. For healthy adults, white rice, fish such as *pla-vien*, *pla-kod*, *pla-tong-na*, *pla-seou*, *pla-kung* or *snakehead* (*Channa limbata*), egg, fern, ivy gourd, ripe papaya and young coconut were important foods.

Understanding food practices, behaviours and other related issues

Pregnant women

Most pregnant women in Sanephong received prenatal services at the district hospital. However, they did not often practise the hospital's recommendations, especially regarding diets. Most women reportedly ate as usual during their pregnancies (low in both protein and energy). Food beliefs and food taboos did not generally exert much power among these mothers, reflected in such comments as, "I eat whatever I feel like." They presented as having positive attitudes toward certain foods, especially dark green leafy vegetables. Compliance in taking iron supplements was also low. Some women had negative attitudes toward the supplementation because of side effects (reportedly dark coloured faeces and vomiting). Some mothers said how they would like their babies to be healthy and strong but admitted that they did not know how to achieve this.

Lactating mothers

Food beliefs appeared to be stronger among this group, especially on foods that they believed will help increase breastmilk. Mothers tended to eat more (i.e. rice, fish and other meats, except wild animal meats) during this period. A few days after delivery, mothers drank "spirit water" to reduce abdominal discomfort. Herbal medicine was said to be helpful for strength and blood, especially for those who were considered weak. Most mothers still believed that "heat" was important for their bodies and future health, so they usually practised a tradition called *U Fai* for one to two weeks after delivery. During *U Fai*, a small fire would be kept burning continually under the bed of the mother. She would rest on the bed allowing the heat from the fire to heal her internally. During this period, many women normally took only

warm water and rice with salt. Traditional midwives and herbal medicine practitioners were influential among these mothers.

Children zero to four months old

All mothers gave colostrum to their children. Most mothers gave only breastmilk until their children were about three months old. Some mothers were already giving mashed rice with banana or salt or clear soup to their children at this age, and comments such as, "With a full stomach, babies will have sound sleep. These children are easy to raise", reflect their approach.

Children 5–12 months old

Most mothers gave mashed rice with salt, clear vegetable soup or banana to children at this age. Sometimes, they gave ripe papaya or mango as well. Usually, children were given two meals a day. Many mothers seemed not to put much effort into raising their children at this stage.

Children one to five years old

When children were about one year old, their mothers often allowed them to join family meals. They would not allow the children to eat spicy dishes until the age of three, when children often ate boiled eggs, vegetable soup, pork and fish. Vegetable soup with fish or egg was observed to be the favourite dish of children between one and three years old. Though some mothers prepared food for their children, most children after three years of age in Sanephong made their own food choices. Moreover, many children asked their mothers to buy snack foods (i.e. rice crackers, jelly, potato chips, etc.) for them. Mothers reportedly purchased these foods from small shops in the community because "children like these snack foods".

Children 6–12 years old

From six years old onward, Sanephong children ate like adults at their family meals. They enjoyed more varieties of foods and tended to eat more than those of a younger age. In school, more nutritious recipes, such as noodles, iron-rich soups, etc., were introduced. Milk was also provided to all students; however, it was mentioned that a number of children did not like to drink the school milk. Some children reportedly vomited or got diarrhea after drinking the milk. Snack foods were still significant food items for the children. At this age, they seemed to prefer fried and stir-fried food items as well.

Conclusion and recommendations

Based on these preliminary results, it is necessary that children and mothers in Sanephong improve their diets to promote better nutrition and health. This improvement can certainly be built upon the community's available food sources, with the possible exception of iron-rich food. Moreover, it will be essential to promote culturally appropriate childcare practices among community mothers and/or caretakers. Mother and child interaction is considered most critical, as this relates directly to quality of snack consumption among the children. In the short term, school intervention with an emphasis on nutritious local and modified traditional dishes should be most feasible. These interventions should be participatory and educational by design, with a strong emphasis on promoting strong involvement of the locals in all stages of the intervention.

Community-wide intervention is necessary as the second step. However, this intervention will not be possible without increased participation of local Karen, especially their leaders. Unlike Indigenous Peoples in developed nations, the Karen in Sanephong have been living with high food insecurity for many years, especially after the Thai government established the Thung Yai Naresuan National Park in order to preserve wildlife and natural resources. Throughout the years, there has been constant tension between the community and local forest officers because the Karen did not agree to move to a newly established location as suggested. This situation makes it difficult for the Sanephong Karen to trust outsiders (including those working for Karen well-being, such as the research team). Continuous migration of the Karen across the border from Myanmar through this community has also put the local government

on high alert for security reasons. Thus, community-wide intervention can be complicated and should proceed only when the community is ready.

At a workshop where the research team presented preliminary research results, Sanephong representatives showed their willingness to support further intervention. However, it was also obvious from the discussion that a deeper understanding of their culture and ways of thinking are necessary for future successful collaboration. More insight into these aspects is essential if appropriate and useful development is to be achieved in this community. During this preliminary study, it was not possible to explore this further because significant time would be required to build trust in this context. Without these insights, it is unlikely that any community interventions could result in any significant improvement for the Karen people.

From a long-term perspective, it can be said that Sanephong is indeed faced with many "silent" challenges. According to community leaders, they foresee that food insecurity will be a significant problem within the next 20 years if the population in their community continues to increase at its current rate, and if current farming methods are continued in their present form. In the past, Sanephong was an autonomous community, in that the people's ways of life were mostly separated from the mainstream culture because of the distance to other communities. At the time of the study, the situation was changing rather dramatically as more and more people, especially the young, worked for cash outside their community. Thus, community leaders not only expressed their ongoing concern about their land and environment sustainability, but also about their culture and tradition, their self-reliance, their food diversity and security, and especially about the existing strong bond within their community. With this perspective, a holistic developmental approach addressing all these concerns, together with a strong emphasis on appropriate cultural development, is most certainly urgently needed for the Karen in Sanephong village, Kanchanaburi province in western Thailand.

Acknowledgements

This paper is part of the research project: "Process and methods towards the improvement of health and nutritional well being of indigenous children and their care providers in Sanephong community, Thailand", supported by the United States Agency for International Development (USAID) through the Micronutrient Global Leadership Program 2004–2005 (Smitasiri, 2005). The authors are grateful for the skilled expertise of other research team members and their participating institutes:

- Sanephong Community: Sompop Sangkhachalatarn, Benchamas Chumvaratayee, Suaijeemong Sangkhawimol, Mailong-ong Sangkhachalatarn and Suwatchai Saisangkhachawarit.
- Mahidol University: Chaveevarn Boonchuyar, Prapasri Puwastien, Orapin Banjong, Pongtorn Sungpuag, Kunchit Judprasong, Souwalak Kusontaramas, Chujai Sahassdee, Prapa Kongpunya and Warakorn Khotchakrai.
- Ministry of Agriculture and Cooperatives: Tippan Sadakorn, Winai Somprasong and Pranai Phenchit.
- McGill University, Centre for Indigenous Peoples' Nutrition and Environment: Harriet Kuhnlein.

The entire research team would like to express sincere thanks to Sanephong community, especially Anon Setaphan (community leader), Pol. Capt. Narong Humkao (school headmaster) as well as our community coordinators and research assistants. Thanks to Gene Charoonrak, Amy Levendusky, Sompong Ondej, Harold C.Furr, and Kitti Sranacharoenpong for their editorial support, and Biplab Nandi of Regional Office for Asia and the Pacific, Food and Agriculture Organization who took the initiative to support our work in this area. Last but not least, thanks to Frances Davidson at Global Health Bureau, USAID and Srisin Khusmith of Mahidol University. Without their support, the project would not have materialized.

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