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NON-DOMESTICATED FOOD RESOURCES IN THE MARKETPLACE AND MARKETING SYSTEM OF NORTHEASTERN THAILAND

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ABSTRACT.-Non-domesticated and semi-domesticated food resources are an important part of the traditional lifestyle in northeastern Thailand. These plants and animals, gathered for a wide variety of purposes, are increasingly being sold in the local markets and becoming a part of the commercial exchange system. Early morning markets in this region were surveyed throughout the year in order to: 1) document the prevalence and seasonal variation of non-domesticated food resources; 2) determine which non-domesticated food resources are important sources of income for the local people; and 3) identify factors that impact the marketing of these items. We found that a wide variety of non-domesticates were sold at the markets including plants, mushrooms, algae, fish, insects, birds, mammals, reptiles, amphibians, and crustaceans. Seasonal variation in availability and diversity was found. Plants, insects, amphibians, and crustaceans were most common and diverse during the hot season, while fish diversity and abundance was highest during the rainy season. Very few species were found to predominate and

market variability was high. Cultural and social changes that are related to the use of non-domesticates as sources of income are also discussed.

RESUMEN.- Los recursos alimenticios no domesticados y semidomesticados son parte importante de la vida tradicional en el noreste de Tailandia. Estas plantas y animales, recolectados para una amplia variedad de propositos, están siendo puestos en venta con creciente frecuencia en los mercados locales y están convirtiendose en parte del sistema de intercambio comercial. Los mercados que operan temprano en la manana en esta region fueron estudiados a 10 largo del año con el fin de: 1) documentar la frequencia y variacion estacional de recursos alimenticios no domesticados; 2) determinar cuáles recursos alimenticios no domesticados son fuente important de ingresos para la poblacion local; y 3) identificar factores que tienen un impacto sobre el mercadeo de estos artfculos. Encontramos que una amplia variedad de recursos no domesticados eran vendidos en los mercados, incluyendo plantas, hongos, algas, peces, insectos, aves, mamfferos, reptiles, anfibios y crustáceos. Se encontro variacion estacional en la disponsibilidad y diversidad. Las plantas, insectos, anfibios y crustaceos fueron más comunes y diversos durante la temporada de calor, mientras que la diversidad y abundancia de peces fue mayor durante la época de lluvias. Se encontraron muy pocas especies que predominaran y la variabilidad en el mercado fue alta. Los cambios culturales y sociales que están relacionados con el uso de los recursos no domesticados como fuente de ingreso son tambien abordados.

RÉSUMÉ.—Les ressources alimentaires sauvages et à demi sauvages jouent un role important dans la vie traditionnelle du Nord-Est de la Thai'lande. Ces plantes et ces animaux, récoltés pour de multiples raisons, sont de plus en plus vendus sur les marches locaux et sont en train de devenir partie integrante du systeme d'echange commercial. Nous avons étudié pendant une année les marches du matin dans cette region afin de 1) faire l'inventaire des ressources alimentaires sauvages en tenant compte des variations saisonnieres, 2) determiner quels produits alimentaires sauvages pouvaient constituer une source de revenu importante pour les comrnunautes locales, et 3) identifier les facteurs qui pouvaient influencer le mise en vente des mêmes produits. Nous avons ainsi constate qu'une grande variété de produits sauvages etaient vendus sur les marchés dont des plantes, des champignons, des algues, des poissons, des insectes, des oiseaux, des mammiferes, des reptiles, des batraciens et des crustaces. La disponibilite et la diversite des produits variaient egalement selon les saisons. Les plantes, les insectes, les batraciens et les crustaces etaient plus communs et diversifies durant la saison sèche tandis que les poissons etaient plus abondants et diversifies durant la saison des pluies. Malgre la diversite des produits vendus, il y avait très peu d'especes predominantes et la variabilite était très grande sur les marchés. Les changements culturels et sociaux liés à l'utilisation des produits sauvages en tant que source de revenu sont aussi commentes.

INTRODUCTION

Non-domesticated[1] plants and animals *have* significant cultural, biological, and economic value at local, regional, and national levels. People who utilize non-domesticated resources to meet these needs often rely on organized exchange sys-

tems to obtain them (Dhanamitta *et al.* 1988; De Beer and McDermott 1989; Moreno-Black 1991, 1994; Moreno-Black and Price 1993; Ngamsomsuke *et al.* 1987; Ngarmsak 1987; Scoones *et al.* 1992). An important aspect of recent ethnobiological studies has been the focus on how resources are defined, appropriated, and distributed.

Most subsistence-based communities are linked to larger economic and political systems through markets. Consequently, markets are a valuable arena for gathering information on people-resource relationships. Recent marketplace studies have shown the importance of this domain for monitoring changing selection pressures on specific resources, i.e., selection by people because of culturally defined qualities of the items (Bye and Linares 1983, 1990; Jacquat 1990; Johnson and Johnson 1976; Pei 1987, 1988; Schlage 1969; Scoones *et al.* 1992; Wester and Chuensanguansat 1994; Wanatabe and Satrawaha 1984; Whitaker and Cutler 1966). The sale of non-domesticated resources in the market can lead to more intensified interactions with the environment, modification of habitats, selection and maintenance of certain plants, and changes in how individuals exert control over each other for the use of these resource areas.

This paper is based on research conducted in northeastern Thailand from 1990 through 1992. We examined the occurrence of non-domesticated plants and animals in a group of markets in northeastern Thailand as part of a larger investigation of the use of non-domesticated food resources. We aim to contextualize how non-domesticated resources are utilized on the local level. We are particularly interested in the process of transformation by which biological resources used for home consumption become tradeable commodities.

Our specific objectives in surveying the markets were as follows: 1) document the prevalence of non-domesticated foods in the marketplace; 2) evaluate variation in the availability of these items; 3) determine the types of non-domesticated foods that are important income generators for the people of northeastern Thailand, and 4) identify factors that lead to these resources being selected for market sale as well as home consumption. In this selection process we see some of the cultural and social factors involved in this transformation.

Northeast Thailand: Its environment, people, and markets.-The northeastern part of Thailand, called Isan, is the largest of the country's four major geographic regions. Isan is characterized by a distinctive language and culture similar to those of neighboring Laos. It contains one third of the nation's population and is usually considered the poorest and least economically developed region of the country. This region has been inhabited for a long time. Archaeological sites with some of the earliest evidence in Asia of agriculture, pottery, and bronze work are located in the Northeast (Higham 1982; Solheim 1986).

Isan is characterized by a gently sloping plateau of undulating mini-watersheds and flood plains, but also includes a zone of hills and upland areas in the west and the south (Hafner 1990). These hills-which and extract moisture from airstreams during monsoon periods-are most pronounced in the western and southern part of the region. While contributing to the biodiversity of the region, they also create a rain-shadow, making the area more susceptible to droughts. The climate is usually differentiated into three seasons: 1) the "cool" season from November to February, 2) the "hot" season from March to mid-May, and 3) the "wet"

season from mid-May to October.

The semi-arid environment greatly influenced the traditional subsistence system and other adaptations to the habitat. Traditionally, the people in the Northeast adjusted to variability in these habitat factors through the development of a combined subsistence system, in which they complemented their reliance on the staple rice and other subsistence crops with a large input from wild food (Moreno-Black 1991, 1994; Pradipasen *et al.* 1985; Somnasang *et al.* 1988; Tontisirin *et al.* 1986).

The rich flora and fauna in the Northeast provide an array of edible and useful plants and animals that are gathered for a wide variety of purposes, including foods, building materials, crafts, medicinal uses, and religious activities. These indigenous practices and the knowledge that they represent have been developed over many generations and are deeply ingrained in regional Thai culture (PhithakpoI1990). The diet-eharacterized by a staple core of glutinous rice, fish, and fish products-is embellished with a variety of local wild and semi-domesticated plants and animals (Moreno-Black 1991, 1994; Ngamsomsuke *et al. 1987;* Ngarmsak 1987; Pradipasen *et al.* 1985; Somnasang *et al.* 1988). These important items-eoJlected from forests, upland fields, rice paddies, gardens, house areas, canals, ponds, swamps, rivers, and dam areas-eontribute valuable nutrients. Coupled with a variety of cooking methods, they add diversity to an otherwise monotonous diet (Moreno-Black 1991; Somnasang *et al. 1988).*

These food items have more recently become an important source of income for Isan villagers. In the early 1960s life in !san changed considerably. This marked the beginning of the government's focus on development, introduced with the first "National Economic Development Plan." National government involvement in the local market system began in the early 1950s with the keeping of official records. Government involvement in the markets increased with construction of permanent structures and other physical improvements and maintenance of these facilities. Today markets are maintained through users' fees collected daily by a government office or a private company on contract to the government.

Road development also greatly influenced the Northeast in the 1960s. Roads provided easy access to nearby towns, and local markets flourished as they were more closely integrated into the wider market system. As large numbers of villagers in the Northeast for the first time entered the market-oriented economic system, items traditionally collected for local consumption from local forests, rivers, and other resource areas, as well as village agricultural products, were rapidly incorporated into the growing economic system. Today it is increasingly common to find gathered, non-domesticated, and semi-domesticated plants and animals being sold in the local market system Oacquat 1990; Levin 1992; Wester and Chuensanguansat 1994). These markets now represent a place of intense interaction between people and their food resources (Pei 1988).

METHODS

The market system in northeastern Thailand includes several types of markets. First are the early-morning markets, primarily active between four a.m. and eight or nine a.m. Second are the all-day markets, where activity may begin as

early as six a.m. and continue throughout the day. Third are the late afternoon or early evening markets. Fourth are the night markets, predominantly oriented to the selling of cooked food. Our study was conducted only at the early morning markets since these are the predominant locus of market activity for rural village farmers. The sample included markets located in rural areas as well as near and within cities (Figure 1). Market size varied with location and season (Table 1). The smallest, and most ruraL varied from 93 vendors in the hot season to 68 in the cool. The largest market, centrally located near three towns and a large rural population varied from 312 vendors in the cool season and 353 in the rainy season. We consulted with district offices and found their records of market size and variation, based on daily fee collection, to be similar to ours.

TABLE I.-Number of vendors per market by season.

Markets	KM	CP	HP	WP	Bor	TK	TN	BF	SEL	RE	CY	Total
Hot	218	226	146	211	183	216	216	92	347	221	163	2,239
Rainy	119	124	140	145	98	120	238	93	353	174	135	1,739
Cool	178	151	179	102	167	162	277	68	312	225	110	1,931
Total	515	501	465	458	448	498	731	253	1012	620	408	5,909

*Legend for Markets***

KM	Kamalasai (Pu)	TN	Tuenj-Nathom (T)
CP	Chaturaphak Phiman (Pu)	BF	Ban Fang (R)
HP	Hui Phung (R)	Sel	Selaphum (R)
WP	Wapi Pathum (T)	RE	Roi Et (T)
Bar	Borabu (T)	CY	Chiang Yun (Pu)
TI<	Talaat Kaset (T)		

'Species diversity was greatest during the hot season ($F = 32.89$, $df = 20, 2$; $P < .001$)
**Pu = Peri-urban, T = Town, R = Rural

We surveyed 11 markets during the annual climatic cycle, characterized by cooL hot, and wet seasons. Within the markets information was obtained both through surveying the market and interviewing vendors. In addition we obtained information concerning marketing practices and resource utilization in one village over a two-year period.

The market survey.—At each market we utilized a "continuous survey method." We worked in pairs. Walking through a designated section of the market, we recorded all of the items being sold by each vendor, the gender of the vendor, and the number of vendors per "stalL" When we were unfamiliar with particular items, we briefly questioned the vendors about the item.[2]

The vendor suroey.-Vendors at each of the markets were interviewed to obtain information about items they were selling, their gathering practices, and their marketing habits.[3] We chose vendors for the interview based on the items they were selling. We gave first priority to interviewing vendors who were selling items that had not previously been recorded. The open-ended interview included 1) brief

FIGURE I.-Map of northeastern Thailand with the location of the eleven markets.

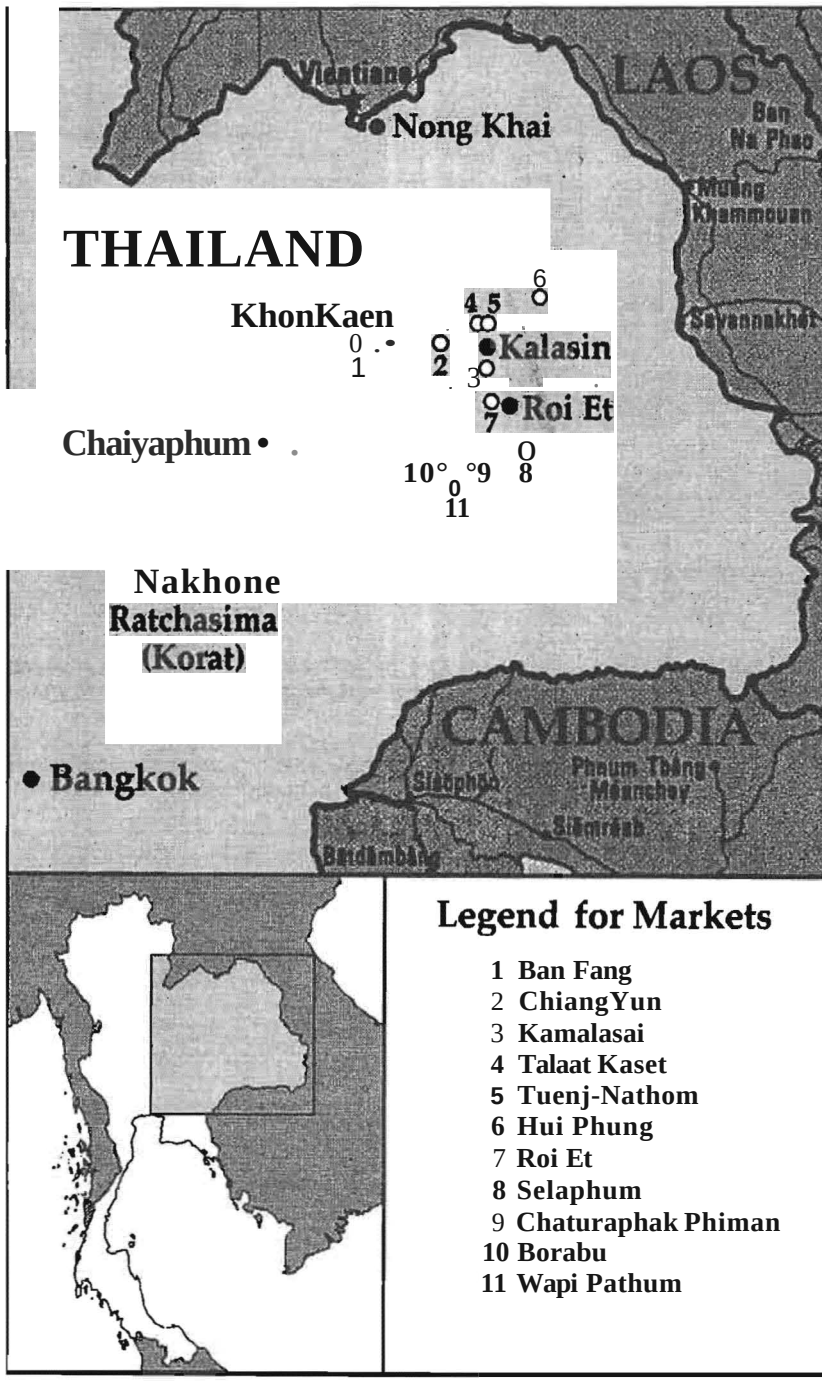

Figure 1. Location of study sites

demographic information on the vendor; 2) item name; 3) price per unit of purchase; 4) collection site and resource-area status (e.g., public or private); 5) collection methods, including whether permission was needed to collect the item and whether this differed when gathering for home consumption or for selling; 6) management and propagation practices; 7) uses; and 8) methods of cooking or preparation.

The samples.-Raw plant and animal samples were purchased, usually in the units in which they were sold. Color slide photographs were taken of most of the items that were the focus of the interviews. The photographs were used for identification purposes as well as in the focus village to confirm or expand the survey information. Plant specimens appropriate for preservation or propagation were collected and deposited with the Herbarium at Khon Kaen University.

Ethnographic data-During the course of the market survey, we collected data in one village in Kalasin Province. We participated in gathering activities and interviewed villagers using both semi-structured and focus-group interviews. The interview questionnaire included topics concerning gathering practices and knowledge of wild foods and their habitats, use of gathered foods, and women's plant-management practices. The focus-group interviews centered on gathering and marketing practices and use of non-domesticated food.

RESULTS

How prevalent are non-domesticated resources in the marketplace and which resources are being utilized as income generators?-One of our original objectives was to evaluate the prevalence of non-domesticated resources in the marketplace and to identify which species are becoming important sources of income. We believed that documenting these resources would provide baseline data, since little information currently exists on the extent to which these resources are being utilized to generate cash. As is common in any marketplace, a wide array of items were sold at the 11 markets in the survey. We observed raw food; cooked foods, which included snacks as well as composite dishes to be purchased and eaten later at home; clothing; dry goods; cutlery; firewood; charcoal; and numerous other items. Although no large domesticated animals such as pigs, cattle, or buffalo were ever observed for sale, occasionally a vendor did have live chickens.

During the course of the survey of the 11 markets, we recorded a total of 15,789 items being sold by 5,909 vendors (Table 1). We found that of the 5,909 vendors we recorded, 94% were women, 4% were men, and 2% were men and women working together. The number and percent of the different types of domestic and non-domestic raw foods recorded at the markets are shown in Table 2. Plants represented the largest category, and a total of 110 non-domesticated and 130 domesticated plant food items were identified in the 11 markets. For the whole survey period, the total number of non-domesticated plant items per market ranged from 26 to 64. We recorded 19 different kinds of mushrooms during the survey. A variety of non-domesticated animals were recorded at the markets and represented 13% of the items sold during the survey. Fish were the most common animals seen at the markets, with a total of 46 varieties observed. Fifteen different insects were

TABLE 2.-Number and percent of times raw food items were recorded at the markets by category and type.

Category	Plant	Fungi	Amphibian	Insect	Crustacean	Reptile	Mammal	Bird	Fish	Total
Non-domestic:										
Number of observances	3022	114	178	268	437	21	3	5	998	5042
% of all observations	19.10%	0.70%	1.10%	1.70%	2.80%	0.10%	0%	0%	6.30%	32%
Domestic:										
Number of observations	10,122	2	37	0	0	0	197	310		10,743
% of all observations	64%	0%	0.20%	0%	0%	0%	1.20%	2.00%	0.50%	68%
Total observations	13,144	116	215	268	437	21	200	315	1073	15,789
Total %	83%	0.70%	1.30%	1.70%	2.80%	0.10%	1.30%	2.00%	6.80%	100%

observed during the survey.

How variable are non-domesticated resources in the marketplace in terms of their diversity and availability?-We were interested in evaluating the variation in the occurrence of non-domesticated resources in the marketplace. We thought this information would provide insight into some of the factors affecting the changing patterns of resource use. In particular, we were interested in determining if there were different seasons in which non-domesticated foods predominated and which species were commonly utilized throughout the region.

In terms of overall market activity, we found the hot season (March through June) to be the most active period at the markets; 36% of the vendors worked during this time period. The markets were slightly less active during the cool (34%) and rainy seasons (30%). Seasonal variation in species diversity at the markets was significant, with the greatest diversity of items occurring in the hot season (Table 3). However, fish were found to be more plentiful and sold in greater variety during the rainy season. Few fish species are "reared" or "stocked," so most are dependent on rainfall. Plants, insects, amphibians, and crustaceans were most abundant and diverse during the hot season, also the period of the most active markets. The hot season (February-May) is considered the season of most frequent food shortage. April, normally the hottest month of the year, was consistently identified as the most difficult time. Non-domesticated foods are also scarcest during the hot season and few are found in the paddy fields then. In this season ponds that retain water and irrigation ditches assume special importance as resource areas. Villagers utilize a wide variety of resources during the hot season, including crabs, snails, fish, amphibians, reptiles, birds, and insects. Rats *(noo plik)* are eaten more often during this time than at any other season of the year.

TABLE 3.-Number of different non-domesticated plants recorded at each market (11 market sample).

Market		KM	CP	HP	WP	Bor	TK	TN	BF	SEL	RE	CY	Total
Season													
Hot*	X = 29.4	31	35	26	40	33	14	34	18	38	34	20	323
Rainy	X = 20.8	14	21	7	35	20	15	30	15	27	31	14	229
Cool	X = 18.4	17	14	14	20	24	7	21	13	23	33	16	202
Total	X = 46.6	40	48	34	62	50	26	62	38	60	58	35	513

Legend for Markets">/-

KM		Kamalasai (Pu)	TN		Tuenj-Nathorn (T)
CP		Chaturaphak Phiman (Pu)	BF		Ban Fang (R)
HP	=	Hui Phung (R)	Sel	=	Selaphum (R)
WP		Wapi Pathum (T)	RE		Roi Et (T)
Bor		Borabu (T)	CY		Chiang Yun (Pu)
TK		Talaat Kaset (T)			

'Species diversity was greatest during the hot season ($F = 32.89$, $df = 20, 2$; $P < .001$)
"Pu=Peri-urban, T=Town, R= Rural

Since the least amount of agricultural activity occurs in the hot season, many individuals turn to off-farm activities and wage labor to earn cash. Despite the difficulty of obtaining non-domesticated items in the hot season, marketing them becomes a viable economic activity, especially for women who have limited access to other cash-generating activities. At this season market activity provides important food and cash inputs. Most villagers indicated that if they bought non-domesticated foods at all, they did so most often in the hot season when resources were scarce and difficult to obtain.

We were interested in determining which species were most commonly utilized for income generation, because these species might be under increased selective pressure locally. We were also interested in patterns of species diversity within and among the markets, as these patterns might indicate the impact of local traditions and habitats on item selection. Habitat degradation in Isan has significantly reduced the biodiversity of the region. Changing human use patterns may be contributing to the pressure on the flora and fauna.

There was considerable variety in the non-domesticated plants sold at the markets (Tables 3, 4, 5); only six were found at all 11 markets. Nineteen species of mushrooms were observed being sold 99 times over all seasons. There was considerable variation in the species of mushrooms seen at the different markets (Tables 5,6,7); no species was found at all the markets. Sixteen mushroom species were observed in the rainy season, eleven during the hot season, and three in the cool season.

TABLE 4.-Number of different non-domesticated plants which were recorded occurring in one or more markets of a total of 110 different plants recorded at all markets.

25	*plants were found at just*	1	*market*
19	plants were found at	2	markets
11	plants were found at	3	markets
14	plants were found at	4	markets
7	plants were found at	5	markets
6	plants were found at	6	markets
3	plants were found at	7	markets
4	plants were found at	8	markets
10	plants were found at	9	markets
5	plants were found at	10	markets
6	plants were found at	11	markets

TABLE 6.-0ccurrences of mushrooms recorded in the 11 market sample.

Season	Number of Species	Number of Occurrences	Number of Markets
Hot	11	34	8
Rainy	16	38	10
Cool	3	22	8
Total	19	99	11

TABLE 5.-Market and seasonal variation in the most common non-domesticatedfood items

Scientific Name (Family)	Local Name	Common Name	Season'"	Number of Markets	Number of Vendors
Plants					
Ipomoea aqualica (Convolvulaceae)	*Pak bung Thai*	Water spinach	HRC	11	223
Tiliacorn Iriandrn (Menispermaceae)	*Bai yaanang*		HRC	11	159
Lil1nocharis flava (Limnocharitaceae)	*Pak karnjong*	Yellow velvet	C	11	170
Spondias pinnala (Anacardiaceae)	*Makok*	Hog plum	HRC	11	144
G/inus spp. (Aizoaceae)	*Pak gen kllom*		HRC	11	44
Carya herbacea (Lycythidaceae)	*Pak kradon pa*		HRC	10	69
Limophila aromalica (ScrophuJariaceae)	*Pak Kra yaeng*		HRC	10	55
Neplunia olerncea (Leguminosae)	*Pak kraced naam*	Water mimosa	HRC	10	44
Cenlella asialica (UmbeJliferae)	*Bai Bua bok*	Aquatic pennywort	HRC	9	60
Marsilea crenala (Marsilcilceae)	*Pak waen*	Water clover	HRC	9	26
Bambusa spp. (Gramineae)	*Naw mai pai pa*		HR	9	51
Amorphophalllls brevispathus (Araceae)	*Pak-e-rok*		HC	9	39
Piper sannenlosum (Piperaceae)	*Pak-e-Iert pa*		HRC	9	39
Croloxylon jormosum (Guttiferae)	*Pak tiew/tuew*		HR	8	38
Melienlha suavis (Opiliaceae)	*Pak waan*		C	8	24
unk. (polygonaceae)	*Pak paew*		HRC	7	15
Barringlonia racemosa (Barringtoniaceae)	*Pak jik*		HR	7	14
unk.	*Nak ngaen*		H	6	6
unk.	*Pak linpii*		RC	6	12
Terminalia chibulaletz (Combretacene)	*Sa-mor*	Chebulic myrabolan	C	6	6
	Mushrooms				
Lenlinus praerigidlls (Pleurotaceae)	*Hed gkra-dang*	Oyster mushroom	HRC	10	57
Heimiella relispora	*Hed PllUeng*		HRC	4	10
Russllia violeipais (Russulaceae)	*Hed na lae*		HR	3	4
Russula spp. (Russulaceae)	*Hed Khai*		HR	3	4

Scientific Name (Family)	Local Name	Common Name	Season*	Number of Markets	Numberof Vendors
Insects					
Oecophy//n smarngdinn (Formicidae)	*Mod daeng*	Red ant egg	HR	8	102
Cntharsius spp. (Scarabaeidae)	*Maeng Kutgee*	Dung beetle	HR	7	14
Lethocerus indicus (Belostomidae)	*Maeng Da na*	Giant water bug	HRC	7	24
Microtricia spp. (Scarabaeidae)	*Maeng Kinoon*	June beetle	HC	7	4
Gry/lotnlpn nfricnnn (Gryllidae)	*Maeng gra chon*	Mole cricket	HC	5	6
	Fish				
Anabns testudineus (Anabantidae)	*Pia moalmor*	Climbing perch	HRC	9	52
Ophicephalus strintus	*Pia chon*	Snakehead fish	HRC	11	226
Clnrias spp.	*Pia duk*	Catfish	HRC	11	171
Puntius gonionti	*Pia ta pean*	Carp	HRC	9	52
	Mollusks and Crustaceans				
Somannin thelpusa	*Poo*	Crab	HRC	11	97
unk.	Hoi *khoang*	Snail	HRC	11	54
Sinotnia ingn/lsiann	*Hoijoob*	Pond snail	HR	11	99
Mncrobmchium lnnchosteri	*Kung*	Fresh water shrimp	HRC	11	37

• H = Hot Season, R = Rainy Season, C = Cool Season

TABLE 7.-Number of different mushroom species recorded at one or more markets of a total of 19 species recorded at all markets.

10	*mushroom species were found at just*	1	*market*
5	mushrooms species were found at	2	markets
2	mushrooms species were found at	3	markets
1	mushrooms species was found at	4	markets
1	mushrooms species was found at	10	markets

TABLE 8.-The number of nondomesticated animal species recorded in the eleven markets.

Season	Fish	Insect	Amphibian	Crustacean	Reptile	Bird	Mammal	Total
Hot	26	15*	7*	9*	1	0	0	58
Rainy	35	9	4	4	2	2	0	56
Cool	32	7	3	5	1	1	1	50
Total	46	15	7	9	2	2	1	82

* Statistically significant differences ($F = 17.51$, $df = 12,2$; $P < .001$)

Insects, amphibians, and crustaceans were sold most often and in greatest variety in the hot season (Tables 5 and 8). Mammals, birds, and reptiles were rare throughout the survey. The low numbers of the latter is most likely related to the extensive deforestation of northeastern Thailand in the recent past. Fish were most available during the rainy and the cool seasons. As with plants, notable differences were found among the markets in terms of the species of fish offered for sale. Three species of fish were found at all markets and two species at nine markets. These fish occur naturally and are also either commonly stocked or reared (Table 5). Fish are among the most important foods gathered from natural sources and are considered staples. Fish are significant sources of protein, fat, and other nutrients. Wet rice agriculture and seasonal bouts of rainfall have led to the development of various stocking and management techniques. These, coupled with traditional methods of preservation, enable local people to utilize fish products throughout the year. Both traditional customs and government-sponsored programs have encouraged fish stocking and rearing practices.

None of the insects occurred at all markets. Seven species occurred at five or more markets. Two species were found in only one market. Red ants *(Oecophylla smaragdina)-both* eggs and eggs mixed with adults-were observed 102 times, the most frequently observed of all the insects. These are often eaten raw with sour vegetables or *jaew* (side dish used for dipping, often fish sauce based), fried with eggs or pork or mixed in *fishgaeng* (Thai curry). The giant water bug, *maeng da na (Lethocerus indicus),* was the second most common insect food, observed 24 times. This very popular insect is commonly used to make *jeaw,* grilled or eaten in *pon pia,* a steamed fish dish.

Four of the nine crustacean species occurred at all eleven markets (Table 5).

Frogs *(Rana* spp.) were found at ten markets; the other six amphibians were found at four or fewer markets. These included a variety of "toads" (e.g., *kee-at e-*

moo, kee-at ta-na). Two types of reptiles were found at the markets: ground lizards, *yae (Lioalepis* spp.), were recorded nine times at four markets, and turtles were seen four times at two markets. Field rats were the main wild mammals seen at the markets. We recorded them twice, both times in the cool season. Two different types of birds were also observed, but we did not collect specimens and did not obtain scientific identifications for them. The birds, like the mammals and reptiles, were quite rare, having been recorded only four times in two different markets.

What factors are important in the choice of non-domesticated resources for sale in the marketplace?-To understand the reasons why non-domesticated food resources were chosen for sale in the marketplace, we interviewed 349 vendors selling non-domesticated food at the markets and obtained information in one focus village during the year. The age of the vendors ranged from seven to 76 years, with a mean of 42 years (sd=15 years).

All of the vendors spoke of the need to earn money. Income earned from the sale of these items was important to the vendors. Although they were not able to support their families from their market activities alone, they indicated that the cash they earned was used for basic household needs, such as food, clothing, and utility bills, and for school fees, religious purposes, and savings. The vendors sold at these markets an average of four days per week (sd = 2; range = 1-7 days/ week).

The 183 different non-domesticated items sold by these vendors included plants, algae, mushrooms, fish, crustaceans, reptiles, birds, mammals, insects, and amphibians. The plant resources sold by these vendors fell into different categories of leafy greens (70%), fruits (10%), algae (2%), mushrooms (6%), bamboo (4%), roots and tubers (4%), and flowers (3%). The leafy greens-the most common item in these markets-eommanded the lowest prices, often selling for one Bhat (U.S. $0.04) per unit. Fruits, mushrooms, and bamboo, rarer and more seasonal in their occurrence, were considered especially delicious and commanded a higher price, three to ten Bhat (U.s. $0.10-0.40) per unit.

Many food plants are considered to have health-promoting or medicinal qualities. Thus the domains of food and medicine overlap considerably. Food preferences are guided by qualities of taste, smell, and texture, which also influence health-promoting choices. Many local people expressed concern about the high levels of pesticides used in the region. Nevertheless, some villagers believe that these non-agricultural items are healthier than domesticated plant foods, despite the fact that many are obtained from paddy fields and other habitats located near agricultural plots where pesticides, herbicides, and chemical fertilizers are used.

Non-domesticated plants provide a wide variety of tastes and textures that greatly embellish the diet. Both the vendors and the people in the focus village discussed the taste qualities of the non-domesticated food items. They consistently judged that the non-domesticated foods were "more delicious" or "smelled good" compared to domesticated food. The qualities of these food add to the taste of the whole meal, which is judged best when it includes hot, sour, and salty flavors. Taste was an important factor affecting the choice of items for sale, as was the

price of the item.

Fish, amphibians, and certain insects are especially favored items in the diet. Compared to plants they often commanded a high price. The vendors were aware of the popularity of these items and specifically sought to obtain them for sale, especially during seasons when they were not abundant. Taste as well as nutritional value and health/medicinal-related factors also influenced the popularity of the animal resources. Some live animals, such as turtles, birds, and even frogs or toads, may be purchased to be liberated as a form of merit-making.

Are there practices or *behaviors that change when items are used for income rather than solely for home cOl1sumption?-Finally,* we were interested in identifying cultural and social changes related to the increased use of wild and semi-domesticated resources as sources of income. We were specifically interested in management activities, as for example, transplanting vegetation into intensively utilized or occupied areas involves a process of management and manipulation with long-term effects on human-plant relationships.

Plant and mushroom food resources were obtained from a number of different resource areas: forests (28%); paddies (23%); gardens (23%); water sources such as ponds, canals, and swamps (22%); and other areas, such as the house compound and upland garden areas (4%). A significant proportion of vendors indicated that the plant items they sold could be transplanted to make them more accessible and to conserve them, since much of the area is being rapidly deforested. Plant vendors were knowledgeable about a wide variety of management practices for the nurturance and maintenance of plants that were transplanted (Moreno-Black 1991; Moreno-Black *et al. 1994).*

Twenty-two percent of the animal vendors indicated that they knew how to manage the animals they harvested, most referring to fish. A small proportion of the vendors also mentioned that they "raised" snails, insects, rats, amphibians, and/or reptiles. Fish, snails, and amphibians were "raised" by releasing them in privately owned ponds, but only fish were specifically fed and protected. Vendors and villagers also discussed capturing live rats and maintaining and feeding them until they were an appropriate size for sale. No one discussed breeding any animals except frogs.

Sixty-two percent of all animals were collected from public resource areas (e.g., rivers, irrigation canals, forests), 22% from privately owned areas. Among the vendors of animal food items, a difference of opinion existed concerning collecting from other people's property for selling and for eating. Thirty-nine percent of the vendors indicated it was unacceptable to collect from another's resource area when collecting for selling, while only 16% said it was unacceptable when collecting for domestic consumption. Eighty-nine percent of the plant vendors indicated they felt it was acceptable to collect food from resource areas other than their own if they were collecting for their own consumption, but only 50% of the vendors felt it was acceptable to collect items for sale from resource areas that belonged to other individuals. (Forty percent indicated that this practice was not appropriate, while eight percent said it was acceptable under certain conditions.)

Information obtained from both the vendors and the villagers showed a shift

in personal relationships with a decrease in sharing of resources through time. They spoke of how in the past there were many more plants and animals. It had been easy to obtain food. But now some items were difficult to find. They said they often transplanted items to their house gardens because they were afraid the plants were going extinct, or that the areas where they grew naturally had been cut down. A variety of animals were also being raised or cared for, and information about the possibility of extending this practice to other species was spreading among individuals. The movement of these food items to privately owned locales, such as the area around a house, marks a change in the relationship between people and resources. Once re-located in the personal compounds of a family, plants become part of an area considered to be privately owned and the availability of these items to the village as a whole is therefore limited.

CONCLUSIONS

Non-domesticated and semi-domesticated foods in the market system in northeastern Thailand fill an important niche. These items, a vital part of the traditional lifestyle, are now a significant part of the commercial exchange system. These resources contribute to individual, household, and community welfare in a complex manner. While the supplier population is primarily rural, the consumer population is comprised of both rural and urban individuals. As villagers continue to seek wage employment, they experience a decrease in the time available for collecting their own food and turn increasingly to purchased foods in the villages and local markets. Demands for these items also increase as they become more valued as luxury or "exotic" foods for urban populations attempting to retain their traditional dietary patterns.

In the expanding cash economy of the region, the ability to obtain and control earnings can empower individuals; thus the motivation for obtaining cash increases. In northeastern Thailand the sale of non-domesticated foods provides a valuable and important source of income. This cash is used to meet household needs and financial obligations. The avenues for obtaining cash continue to be limited, especially for women, and consequently marketing has flourished as both a temporary and permanent means of economic employment.

The striking variability in non-domesticated food resources in the markets emphasizes the urgency for researchers to document the wide range of resources. Similarly, changes in environmental-use patterns-for example, increased relocation of resources into paddy and garden areas, increased management of resources, and increased privatization-suggest the need for continued documentation of these dynamic processes.

Food, food procurement, and food distribution practices transform many aspects of life; they influence social relationships and social control, affect economic practices, instill power or prestige, and alter human-environment relationships and the rules governing these connections (Fajans 1988; Moreno-Black 1991; Moreno-Black *et al.* 1994). Through gathering and marketing activities, an intensive interaction results in the selection, consumption, and exchange of forest products and other gathered items. The growth in the popularity of marketing non-

domesticated resources is changing the patterns of resource exploitation. The increased demand for these items will inevitably put additional strains on the resource base, especially those food items that are considered to have high market value because of inherent qualities of taste and ease of collection. On the other hand, as certain items become more in demand, the push to cultivate them may increase; these items will consequently be afforded some protection from extinction, although they will be changed somewhat in the transformation.

Finally, as the use of local non-domesticated and semi-domesticated resources as cash generators increases, we anticipate that cultural practices concerning the management and gathering of these resources will continue to evolve. Pressure from commercialization of these resources is altering the traditional system. This system emphasized sharing and encouraged reliance on a wide resource base distributed across a variety of habitats as a hedge against the drought and flood conditions that characterized the region. These changing use patterns are also liable to have significant consequences for the ethnobiological knowledge base, since that knowledge is greatly shaped by experience. The changes in the variety of items selected for use coupled with the diminished availability of resources may lead to a constriction of the traditional knowledge system. We need to better understand how the commercialization of resources is affecting their availability. This contextualization of differential use patterns is essential for understanding cultural and environmental change in the region.

NOTES

1 Plant resources often exist on a continuum from truly wild through semi-domesticated to domesticated. Active or incipient manipulation of resources and habitats can also occur on a continuum from selective harvesting through propagation and selective breeding. Various terms have been utilized to describe these different types of resources. In this article we use the term non-domesticated to indicate any resource that is not actively managed and propagated to the extent that it would be altered genetically.

2 This system allowed us to obtain an overview of all the items sold during one continuous period. Once an aisle was recorded, we did not return to that aisle; nor did we record information from individuals who set up after we had already surveyed an aisle. Although this method caused us to lose some data, we felt that it ensured the best "moment in time" picture of the marketplace and enabled us to avoid recording some stalls more than once.

3 All interviews were conducted at the market, during market hours, while the vendors were selling their items. Interviewing was interrupted to allow vendors to conduct transactions. Every effort was made to sit with the vendor, behind the items, so as not to block the items from view or to impede traffic in the narrow, busy aisles.

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