THE ROLE OF FOREST FOOD RESOURCES IN VILLAGE LIVELIHOOD SYSTEMS

A Study of Three Villages in Salavan Province, Lao PDR

"The greatest impact of humanity on the environment stems from the need for food."
FAO, 1992.

Forest food resources occupy a central place in the food system of the Lao people. Fish, frogs, bamboo shoots, plants, tree leaves, insects, wild meat and mushrooms are essential components of the diet for forest dwellers and upland shifting cultivators. There is also a growing market for forest foods amongst lowland farmers and urban communities who no longer have access to productive forest. Considering the high value Lao people place on forest foods, for reasons both cultural and economic, it would seem that these resources have been overlooked and undervalued by government and development agencies.

Participatory research conducted in three subsistence communities located on the edge of the Xe Bang Nouan National Biodiversity Conservation Area in the south of the Lao People's Democratic Republic (Lao PDR), demonstrated that these villagers are highly dependent on the forest for food. Household weighed records showed that after the staple glutinous rice (amounting to 70-80% by weight of all food consumed), forest foods are the main component of the diet, averaging 19% and 11% during the rainy and dry seasons, respectively. Nutritional analysis of household consumption data indicated that although the diet is seriously deficient in micro-nutrients, forest foods are an important source of calcium, vitamins A and C, and high quality protein and iron. By providing a diversity of daily inputs to the diet, and through sale and exchange to obtain rice during times of shortage, forest resources make a vital contribution to nutrition and household food security.

Food sufficiency is the villagers' overwhelming concern. Recognising the relationship between deteriorating ecological conditions and diminishing food supply, both wild and cultivated, villagers observe a marked trend of forest and resource decline. They attribute this decline to a break down in traditional patterns of resource sharing, leading to competitive harvesting by growing numbers of people. They are experiencing increasing uncertainty and expenditure of time and effort in obtaining forest food. In response to their involvement in the study, the villagers identified measures to improve their food supply. They agreed to commit themselves to regulated resource use and management, to be agreed and implemented in co-operation with adjacent villages. Sustainable harvesting systems were planned for the key food species: frogs, fish and bamboo shoots, and a villager-initiated frog conservation and management programme has been established. The clear linkage between food security and resource conservation demonstrated by this study is a compelling reason to support community forest management in order to sustain both people and forests.

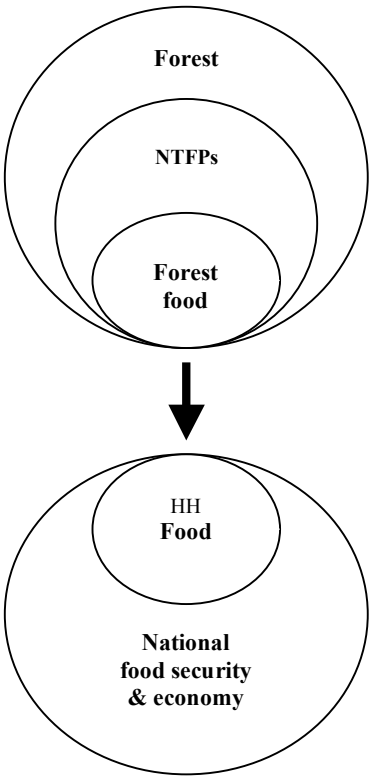
"If there's no forest, there's no food. Nothing!"
Konglunoi villager, 1998.

INTRODUCTION

Forest foods are central to the Lao diet

Forest food resources occupy a central place in the food system of the Lao people. Rural communities who are most vulnerable to food insecurity, traditionally obtain food from natural forests, fallow swidden, agro-forests, rice fields and associated aquatic environments. Seasonally available fish, frogs, bamboo shoots, plants, tree leaves, insects, wild meat and mushrooms are essential components of the daily diet of forest dwellers and upland shifting cultivators. By providing food year round, and through sale and exchange to obtain rice during times of drought and flood-induced crop failure and economic hardship, forest foods make a vital contribution to the otherwise bland and nutritionally poor diets of rural households. At the same time, the cultural significance of traditional foods for daily meals in the home, on ceremonial occasions, and as sought after delicacies in restaurants, has generated a strong market amongst the growing urban population and lowland farmers who no longer have access to productive forest. Thus directly through consumption, and indirectly through sale and barter, forest food resources make a significant contribution to household food security, both locally and at the national level (Figure 1).

Figure 1. The contribution of forest foods to the Lao food system



Forest foods are major NTFPs

As alternative resources are limited, traditional forest dependency continues to be the livelihood base of Lao subsistence communities. Non-timber forest products serve a wide range of subsistence needs, as well as providing an opportunity for earning cash incomes. In the NTFP Project villages, up to 60% of village income is from NTFPs, and villagers' rank food items as the most important forest resources. Used primarily for home consumption, but also for sale and exchange, forest foods constitute the major proportion, in terms of species and value, of the large number of NTFPs harvested. Although villagers report a marked trend of resource decline since the 1980s, particularly of forest animals, fish and bamboo shoots, continuing dependence on traditional forest food reflects the social and economic significance of these resources.

Government policy: Development + Conservation

Since 1986 the Lao government has implemented reforms to move from a centrally planned economy to a market-oriented system. The objective is to continue the structural transformation of the economy and to improve the living standards of the 4.6 million Lao people, 46.1% of whom fall below the poverty line (World Bank, 1995). A key element of this development effort is achieving food security.

Achieving food security: a national priority

Assuming a close correlation between poverty and food insecurity, the incidence of food insecurity is highest amongst the 80% of the population that lives in rural areas. Food availability is unstable and subject to seasonality associated with economic and environmental conditions. Droughts and floods commonly cause food shortages, and dietary imbalance results in serious micro-nutrient deficiencies. Chronic and temporary food insecurity is prevalent and many households are food insecure in terms of both quantity and quality of food (GOL PDR, 1996). As reflected in key policy documents (Box 1), achieving food security is a national development priority.

Box 1. Key policies for food security

- *Socio-economic Development Plan 1996-2000*
  Agriculture, services and human resource development with emphasis on achieving food security
- *Agriculture and Forestry Sector Development Plan to the Year 2000*
  Increased food production and forest use to support socio-economic development:
  - Intensification of lowland rice production; stabilisation of slash and burn cultivation; development of commercial crops and agro-processing
  - Natural forest conservation and plantations
  - Recognition of customary rights of local people as forest users – Land and Forest Aallocation
  - Research and human resources development
- *National Action Plan for Nutrition*
  Household food security is a main issue:
  - Increasing food availability and stability at household level - diversification of production, reducing post-harvest losses and strengthening coping mechanisms
  - Improving consumption habits, introducing a balanced diet
  - Improving food preparation and preservation
  - Prevention and control of micro-nutrient deficiencies
- *Country Strategy Note*
  Provides guidelines for UN assistance for rural and human resource development in support of government policies. Includes a sub-programme for household food security in rural areas.

Source: Lao PDR Country Paper on Food Security, World Food Summit, Rome, November, 1996

Managing forests: Benefits for nature and people

The forest in Lao PDR represents high ecological and economic value, and therefore plays an important role in national development. Although the country has one of the highest proportions of forest cover in the region, about 47% of total land area, the rate of forest decline and loss of biodiversity is of major concern. The government aims to halt forest loss and degradation, associated not only with upland shifting cultivation, but also with on-going logging and forest encroachment for agricultural development. A system of -- National Biodiversity Conservation Areas (NBCAs), occupying % of the total land area, has been established in order to conserve significant flora and fauna. At the same time, the government has acknowledged the customary right of local communities to access the forest for their livelihood through implementation of land and forest allocation to encourage community participation in the protection, management and sustainable use of the forest. In recognition of the importance of non-timber forest products, the Ministry of Agriculture and Forestry is promoting sustainable management and conservation of forest and non-timber forest resources within the NTFP sub-sector (Box 2).

Box 2. The NTFP sub-sector supports conservation and local livelihoods

The main objectives of the NTFP sub-sector are to:

- ☐ increase income from NTFPs through product improvement and marketing;
- ☐ provide alternative livelihoods to shifting cultivation;
- ☐ provide incentives to local communities to conserve forests by increasing the social and economic benefits through sustainable NTFP use;
- ☐ ensure the long term availability of NTFPs by developing systems of sustainable use.

Key issues:

- ☐ Conserving non-timber forest resources and biological diversity
- ☐ Alleviating poverty and supporting rural development
- ☐ Promoting NTFP-based industries

Source: Sustainable Forest Management & Conservation in Lao, Vision 2020 (GOL PDR, 1997)

Do forest foods have a role in the national economy?

Though of long term significance to the people who depend upon them, forest food resources have been overlooked and undervalued by government and development agencies. Although it is generally acknowledged that forest foods are an important part of the Lao diet, development efforts have ignored the role of the forest in providing food. If forest resources make a meaningful contribution to rural food security and household economies, these resources must also contribute significantly at the national level. Forest dependency is ever more critical as the growing population (annual growth rate 2.6%), puts increasing pressure on limited land and food resources. The convergence of government policy regarding food security and natural resource management provides an enabling framework to develop the potential of forest food resources while improving the well-being of rural households. Promoting sustainable use and management of forest food resources provides an opportunity to integrate forest management with improved food security. There would seem to be clear implications therefore, not only for food security and resource sustainability, but also for the national economy.

Context of the study

The Non-Timber Forest Products Project was established in 1995 as an integrated development and conservation project, administered by IUCN and the Department of Forestry, Lao PDR. The Project aims to promote the well-being of local communities within the context of biodiversity conservation, through sustainable development of non-timber forest resources.

Despite the importance of forest foods and the existence of a rich indigenous knowledge regarding their use, no research was available to support the incorporation of food concerns into Project design at inception. The nature and extent of Lao villager dependence on these resources, and the implications this dependency has for food security and resource management, had not been recognised. Initially therefore, the Project focus was on integrating forest management with the

development and marketing of NTFPs. But with the onset of drought-induced food shortage and hunger that led to forest exploitation, including timber cutting to purchase rice, it became clear that food security was of major concern to the villagers. The Project responded by assisting with distribution of relief supplies and establishing village rice banks (NTFP Project, 1998). This study on forest food dependency was approved in September 1997, to be undertaken on a voluntary basis with project support in the field. The central importance of food security was formally recognised when the Project was advised *to implement NTFP-related activities that would improve food and natural resource security* (NTFP Project Mid-Term Review, 1998, p.22).

Research Objectives

Management and use of forests by local communities for food, as well as for other forest products, provides an opportunity for promoting sustainable livelihoods together with sustainable use of the forest ecosystems to which these people belong. It is a stated objective of the NTFP Project to:

> *generate an understanding of local residents' current uses and management strategies concerning NTFPs, and the social and economic values derived therefrom.*
>
> NTFP Project Proposal, 1992

Consistent with this Project statement, the study objective is two-fold:

- To investigate the contribution of forest food resources to food security and community well-being.
- To consider the implications of the findings on resource sustainability and forest management.

These objectives are to be achieved by seeking answers to research questions regarding the patterns of forest food harvesting and use at household and community levels, to take account of:

- ☐ source areas, resource status and harvesting frequency,
- ☐ seasonal patterns of availability and use,
- ☐ quantities and range of species harvested, consumed and traded,
- ☐ economic valuation of forest food resources,
- ☐ patterns of dependency among households and over time,
- ☐ the nutritional value of forest foods,
- ☐ villager perceptions on resource and forest management.

The study area

Land and forest

Field work was carried out in three subsistence communities, Ban Khamteuy, Ban Konglunoi and Ban Nongthe, pilot villages of the NTFP Project in Salavan Province, southern Lao PDR (Figure 2, Table 1). Situated just outside the Xe Bang Nouan NBCA, the villages are surrounded by cleared fields and remnants of degraded dry *Dipterocarp* and mixed deciduous forest. The forest extends into a range of habitats including mixed deciduous and evergreen forest, bamboo forest, grassland and aquatic environments inside the NBCA. Most parts of the NBCA have been impacted by human use, including previous commercial logging, former villages, current cultivation, livestock grazing, hunting, burning and NTFP harvesting. The sixty-five villages surrounding the NBCA, including the three study sites, continue to have heavy dependence on forest resources, with use extending into the core zone along the Xe Bang Nouan.

People and livelihood

As recently settled lowland agriculturalists, these predominantly Lao Theung/Katang communities are historically and culturally dependent on the forest. Previously isolated forest dwellers in the area now designated as the Xe Bang Nouan NBCA, they have always relied heavily on the forest for their livelihood. Self-sufficiency was based on fishing, hunting and gathering, and swidden cultivation. Movement from the uplands, attributed to insecurity during war-time and the need for increased rice production, took place from the 1950s onwards.

Figure 2. Map of the Study Area

Table 1. Characteristics of the study villages

	Ban Khamteuy	Ban Nongthe	Ban Konglunoi
Settlement	1962	1968	1983
Altitude	150 m.	150 m.	140 m.
Access/season **District centre**	Dry, 4 km Ban Dahrn, R.13 Phoutaphan, Nakornphaeng 45 km	Dry, 3 km Phonesoung, R13 Phoutaphan, Nakornphaeng 50 km	Dry, 10 km Route 13 Muang Mai, Wapi 13 km
Population/HHs	203 / 40 HHs	231 / 43 HHs	150 / 22 HHs
Ethnicity	97% Katang, 3% Lao Loum	88% Katang 12% Lao Loum	33% Katang Strong Lao Loum influence
Education	Primary 1-3, 1996 Higher grades Ban Dahrn	Primary 1-3, 1996 Higher grades Ban Dahrn	Primary 1-2, 1982 Higher grades Nong Boua Adult literacy classes
Health **Facilities**	Sickness prevalent Medicine Ban Dahrn 4 km Hosp. Kong Xe Don 24 km	Sickness common Medicine Ban Dahrn 4 km Hosp. Kong Xe Don 26 km	Village head - first-aid Medicine Nong Bua 1.5 km. Hosp. Kong Xe Don 25 km
Cultivated land	40 ha wet season rice Some gardens, fruit trees	58.4 ha wet season rice Gardens, fruit trees	31 ha wet season rice Gardens, fruit trees
Rice production **Rice deficit '97**	0.8 tons/ha All HHs	0.9 tons/ha All HHs	1.2 tons/ha Most HHs
Livestock	Buffalo 53 Cattle 40 Pigs 83 Goats 9 Poultry ?	Buffalo 57 Cattle 50 Pigs 33 Poultry 751	No figures available ? Cattle important
Forest/NTFP use; **NBCA harvesting**	High: mainly subsistence High variety food resources Mak chong, kisi for trade. 15 km inside NBCA	High subsistence use Handcrafts important >15 km inside NBCA	High: subsistence, sale, exchange 20 km inside NBCA
Village development **Motivation**	Well - World Concern 1995 Rice bank - NTFP P. 1997 Low	Well – World Concern 1997 Rice bank – NTFP P. 1997 High	Well - World Concern 1996 Rice bank - NTFP P. 1997 School assistance - UNICEF Adult literacy classes -JICA High

Since resettlement, the area has been subject to commercial logging, and the effects of war and recurrent insecurity have continued to influence traditional patterns of resource use and farming by restricting access to forest and village land. Wildlife and forest resources were plentiful until the early 1980s, but population pressure has imposed increasing demands on natural resources, leading to decline of the overall resource base on which the villages depend. Production of rain-fed rice underpins the livelihood system, but declining soil fertility and unreliable rainfall have led to serious rice shortage. While the forest continues to play an important role in the village livelihood system, particularly as a source of daily food, forest resources are becoming less plentiful due to competitive harvesting and habitat loss.

Methodology

For the purpose of the study, forest foods are defined as *edible wild animal and plant resources obtained from the broader forest ecosystem, i.e. from old and second growth forest, agro-forest, fallow and aquatic habitats including rivers, streams, channels, ponds and rice fields.*

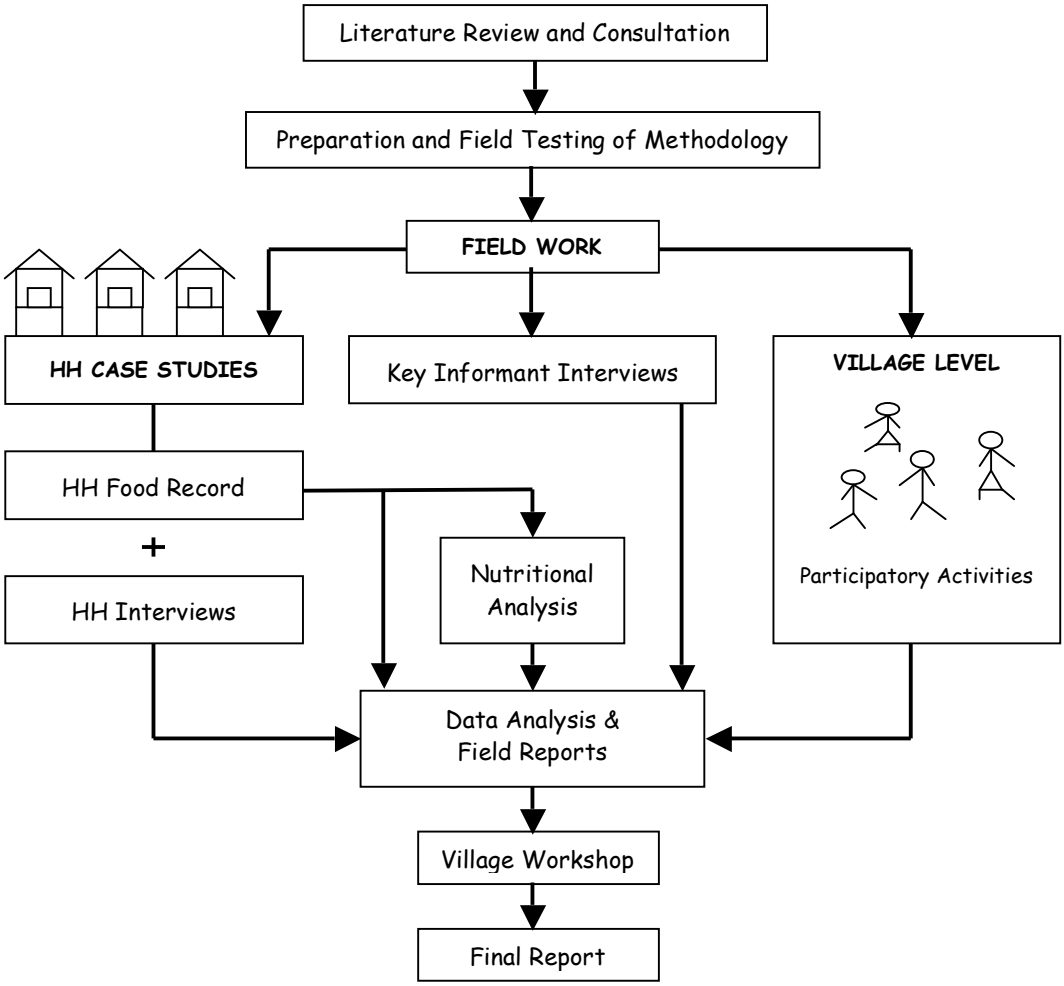
A food-based conceptual approach was adapted from that used by FAO/WHO in work on dietary guidelines for developing countries (FAO/WHO, 1996). A food-based approach encompasses food availability; food diversity; the cultural context in which foods are obtained/produced and eaten; and the ecological setting of the food system.

To take account of seasonal differences in resource availability, harvesting and patterns of use, the study is based on two sets of data collected in the dry and rainy seasons, during March/April and September/October 1998.

Participatory research

Consistent with NTFP Project commitment to a process of participatory learning and action (Ingles, 1996), the study is based on participatory research. It was necessary to identify an approach and methodology that would be sufficiently rigorous to provide for quantitative data analysis to indicate levels of harvesting and dietary outcomes, but that would also provide in depth understanding of how households of differing socio-economic level depend on forest food resources. Through consultation with specialists and recourse to standard nutrition references and RRA/PRA methodologies (FAO, 1990; Pretty *et al*, 1995; Davis-Case, 1990; Messerschmidt, 1995), the study was designed to fully involve the villagers in a process of shared learning (Figure 3).

Figure 3. Study Design



Village level research

Standard participatory assessment and PRA techniques were adapted to design activities suited to the conditions and needs of the study (Table 2). These included ranking of resources according to use, construction of seasonal calendars detailing resource harvesting by age and gender, seasonal matrices to provide in depth information on species availability and ecological status, mapping resource harvesting locations and livelihood analysis. Villager concerns and perceptions about changing resource status and how this affects household food supply were investigated by focus groups of women and men, and key informant interviews with members of resource-poor families most vulnerable to food insecurity. Focus groups carried out SWOL analysis to assess the relevance of traditional resource sharing to design sustainable harvesting systems for key food species and resource management strategies.

Table 2. Village level methodology

Research Questions	Main Tools Used	Objectives
☐ *How does the village livelihood system operate?*	Seasonal calendar Group discussion Livelihood system diagramming	To understand the livelihood system and annual pattern of activities as the context of forest food harvesting
☐ *What are the seasonal patterns of resource availability and harvesting?*	Calendar forest food resources Focus group discussion	To establish availability and harvesting according to gender and age
☐ *What species are available?*	Forest food resource matrices for dry and rainy season – key informants	To obtain in depth seasonal information on food resource species
☐ *How do forest foods fit into the food system?*	Food listing and ranking - mixed focus groups	To understand use and importance of forest food resources
☐ *What are villager perceptions of food groups and food values?*	Food grouping activity - mixed focus group discussion	To identify local perceptions on food grouping, value in diet and food habits
☐ *Where are the source areas, how are resources harvested and by whom?*	Forest walks and transects – mixed groups; women and children	To observe resource locations and harvesting to construct a site typology
	Participatory mapping of resource sites by separate groups of men and women	To learn about resource sites, status and gathering according to gender/age
	Village school mapping activity	To understand children's role in food gathering; To assess potential for introducing conservation awareness into schools
☐ *What are the trends in forest food availability and dependency?*	Historical matrices Time lines - mixed focus groups Key informants	To understand changes in livelihood system and resource use over time
☐ *How does socio-economic level affect household dependency?*	Key informant interviews - resource-poor families	To identify causes of/responses to rice shortage and food insecurity in poorest households
☐ *What are the key food resources and how could management be improved?*	Discussion, planning sustainable harvesting systems - mixed focus groups	To identify key resources and initiate villager planning of sustainable harvesting systems
☐ *What are villager perceptions on management of forest food resources?*	Mixed focus group discussions; SWOL analysis of traditional resource use	To share villager concerns To raise awareness and stimulate villager action

Household case studies

Selection of three case study households in each village was based on level of well-being as previously assessed by NTFP Project wealth ranking. The village committee, in consultation with the Field Team Leader, selected one representative household from each of three categories, *viz*. better off, intermediate and poor, referred to as HHs 1, 2 and 3 (Table 3).

The household case studies (Table 4), consist of a seven day weighed record of all forest food resources harvested, a weighed record of total food consumption, semi-structured interviews and direct observation in homes, fields and gathering sites.

The standard *weighed food record* used in nutrition surveys (Cameron and van Staveren, 1988; FAO, 1990), was adapted to record daily forest food harvesting and consumption at the household level. One person from each study household, together with villager assistants, participated in training in order to weigh and record household resource harvesting and consumption. A daily *24 hour recall* of food eaten by members outside the house was included on the record sheet, and the household interview noted foods eaten less frequently than appeared in the one week record. The quantitative household data provided a basis for comparing household dependency on forest food resources in terms of species, quantity and frequency of gathering, consumption, sale and exchange, gifts, villager valuation of the resources, and nutritional analysis.

Table 3. Characteristics of the case study households

March/April 1998

Village Household	No of people	Adult equi-valent.	Rice land (ha)	Rice prodn (kg)	Rice deficit (mths)	Livestock	
						Large	Small
Khamteuy							
HH 1	5	2.8	3.0	4,000	0	?	?
HH 2	7	4.7	2.0	1,500	2	2	6
HH 3	10	6.9	2.0	300	10	1	11
Konglunoi							
HH 1	10	7.4	2.0	1,500	0	8	74
HH 2	7	5.5	1.5	3,000	4-5	4	37
HH 3	4	2.6	1.5	2,500	6	2	7
Nongthe							
HH 1	8	5.2	2.0	4,000	0	4	22
HH 2	8	5.0	2.8	2,000	8	2	6
HH 3	4	2.8	0	0	12	0	2

Table 4. Household case study methodology

Research Questions	Main Tools Used	Objectives
☐ *What is the household structure, livelihood, level of well-being?*	Semi-structured interviewing Household budgets Direct observation Informal conversation	To learn about family livelihood
☐ *What is the food security situation in the household?*		To identify causes of food shortage and how families cope
☐ *Is dependency related to household level; how is dependency changing; why?*		To understand forest food use in households of different level; To gain perceptions on resource availability and use
☐ *What resources are harvested; quantities and by whom?*	7 day weighed record of resources harvested in dry and rainy seasons	To indicate level of harvesting; To understand family gathering
☐ *What is the gathering frequency of different resources?*		
☐ *How are harvested foods used?*	7 day weighed record of total food consumption	To quantify food consumed, sold, exchanged, shared
☐ *How important are forest foods relative to other food?*		To assess the proportion of forest foods in the diet.
☐ *How do forest foods contribute to the household economy?*	Household valuation of all foods consumed over 7 days	To value forest foods resources
☐ *What is the nutrition situation of the households?*	Nutritional analysis of consumption data from the 7 day weighed record	To obtain total daily nutrient intake
☐ *How do forest foods contribute to household nutrition?*		To indicate the contribution forest foods make to nutrition

Nutritional analysis

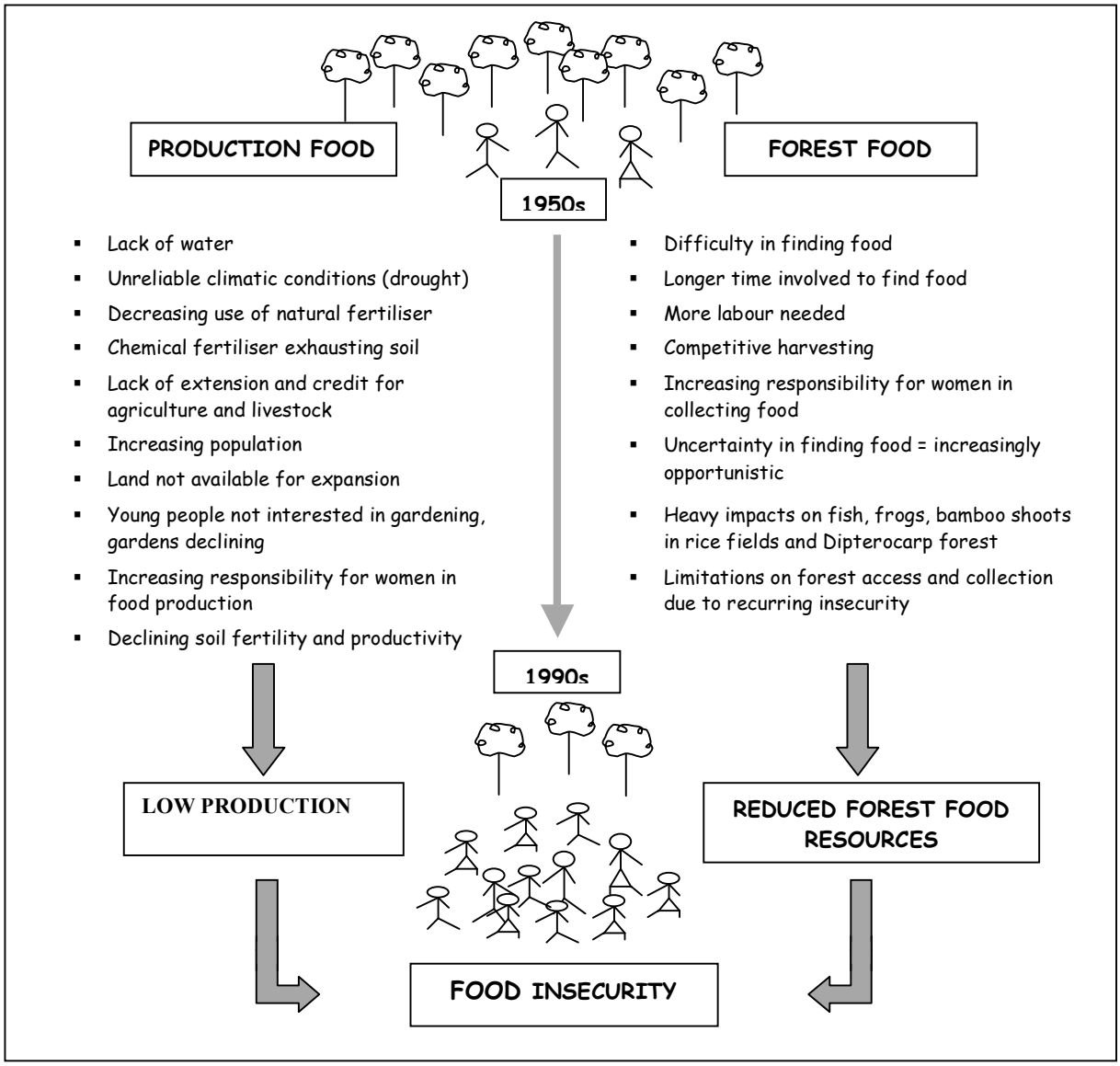
The household consumption data were analysed to obtain the total daily nutrient intake and daily nutrient intake from forest food for each household. The Recommended Daily Allowance (RDA) was calculated for each household according to the Thai standard (Ministry of Public Health, Bangkok, 1989). The household RDA was derived from the sum of nutrient requirements of the household members, according to household age and sex structure. The daily household intake of energy and main nutrients (protein, iron, calcium, Vitamins A and C), was calculated as a percentage of the household RDA and averaged for the seven days of the record. The daily nutrient intake from forest foods was then expressed as a percentage of total nutrient intake for each household.

COMMUNITY LIVELIHOOD and FOOD SECURITY

The evolving livelihood system

Coming from a tradition of upland swidden cultivation, the villagers have adapted to lowland rice farming (Figure 4). Until the early 1980s, forest clearance allowed production to keep pace with population growth. Villagers report being rice-sufficient in the past, producing 3-4 tons per hectare on a small rice field area, but current yields are down to one ton and less. Falling productivity is attributed to declining soil fertility associated with forest loss, and low natural fertiliser availability due to changing grazing practices. Some households have planted high-yielding varieties, but there is a trend back to traditional strains that entail lower levels of risk and debt. Lacking inputs, particularly credit and extension services, and subject to recurrent drought, these communities are vulnerable to rice deficits that occur in most households every year. Further extension of the rice growing area is constrained by shortage of land and labour, while other food production is limited to small household gardens growing vegetables, herbs and sugarcane, fruit trees, livestock and poultry.

Figure 4 Trends in food resource availability



While rice field ownership is a key indicator of household economic status, villagers place high importance on livestock ownership. Cattle and pigs are important as a form of capital and security, being eaten only on ceremonial occasions, while ownership of buffalo as draft animals is a key factor in rice production. The underlying significance of these indicators is the family's capacity to produce or obtain sufficient rice for consumption throughout the year. However, lack of production capacity and declining yields have come to mean rice shortage, even in favourable years, for all but the better-off households. The production of cultivated vegetables and fruit is generally insufficient to substitute for forest foods, and poor access and lack of cash preclude the purchase of food from the market.

Depending on the forest

Although rice cultivation dominates economic activity, the interdependencies within the livelihood system demonstrate how the forest exerts a vital influence throughout. Benefits pass directly from forest to household as a wide range of NTFPs, the greatest proportion of which are food resources, as well as providing livestock grazing, fodder and fuel wood. Lacking alternative livelihood options, villagers make up for the shortfall in agricultural production by using forest resources for subsistence and income generation. Bamboo and bamboo shoots, *Pandanus*, rattan, frogs, toads, fish, red ant eggs and *yang* oil are the main subsistence items, and food resources make an important contribution to household and community livelihood. In the daily struggle for survival, all households gather forest foods, and as rice stocks run out forest resources are an important means of earning cash and obtaining rice through exchange. The main items sold and exchanged are baskets, mats, frogs, bamboo shoots, mushrooms and forest greens.

Declining forest food resources

Population growth is causing mounting pressure on forest resources. Where only ten years ago there was dense forest and abundant wildlife, removal of forest and extension of rice land has brought ecological decline to remaining forest near the villages. Only small wildlife, edible plants and mushrooms remain, and resource sites inside the protected area are also affected by heavy harvesting.

Forest food is important for all households, but resource depletion has resulted in reduced levels of harvesting and consumption: "We can go out all day, but not get enough food for one meal." This has led to increasingly opportunistic gathering. "We want to get bamboo shoots but find mushrooms!" indicates the uncertainty as to what might be found, if anything. As forest food resources are declining, there is conflict over time and labour allocation for gathering and other activities, particularly in households with low labour capacity. This means increasing responsibility and hardship for women in maintaining family food supplies. Concerned about increasing scarcity of resources, some households reported not being able to gather enough even for home use, while poorer households reported some selling and exchange. But villagers value forest foods in the family diet, and for the contribution made to health and the household economy.

Food security matters

Causes of food insecurity

Villagers defined food security as "being able to support themselves at all times, even as population increases." But as experienced in 1997-98, seasonal and long-term food insecurity and malnutrition have become a way of life for these communities. At the household level, food insecurity is determined by low rice production, due primarily to non-ownership of rice land and buffalo. However, the effects of soil infertility, inadequate rainfall and sickness, extend vulnerability to most households, for varying periods, every year. The most critical time is the rainy season when rice cultivation is taking place, and when no rice remains from the previous harvest.

Box 4 highlights conditions in a typical resource-poor household. Lacking the key resources for rice production, such households are forced to borrow not only rice for survival, but also buffalo and/or land, against their future harvest, and at increasing rates of interest. As rice yields have declined, so indebtedness from borrowing has accumulated. Despite the trend towards longer deficit periods, rice shortage has long been the norm for poor families. But whereas in the past rice could be borrowed at low rates of interest, households are now vulnerable to spiralling debt and chronic food insecurity.

For small households at an early stage in the family cycle, lack of key resources and insufficient labour are major constraints. Families also face difficulty if there are many dependent children or few adults of working age. Medical costs and family emergencies are commonly met by rice, thereby creating further food shortage. Sickness also affects labour productivity and food acquisition, particularly if expenditure leads to further build-up of debt.

Box 4. Profile of a resource-poor family in Ban Khamteuy

- A new family with 2 young children
- Rice deficit 9 months.
- No buffalo, poor soil, poor health.
- Rice field area 1.7 ha. Rent out part for 45 tang rice (1 tang = 10 kg).
- Rice production last year 100 tang
- If same this year can pay back debt but will run out month 3 again.
- Need new land but cannot get
- Debt repayment:
  - 50 tang "green" rice for buffalo
  - 30 tang unmilled to rice bank
  - 20 tang unmilled (for 2 tang milled)
- Income : *Kisi* 100 kg @ Kip 350/kg
  = 27 kg milled rice @ Kip 1300/kg
- Labour : wife worked for 80 tang rice
- Forest foods : for family consumption
- Coping strategies
  - Labour – repairing field bunds
  - Making baskets to exchange for 13 tang rice. Last year not possible because of sickness.

Coping strategies

- *Borrowing rice* is the main response to rice shortage. Household effort is directed constantly to debt repayment, as post-harvest rice, as labour, or by selling and exchanging products.
- *Sale and exchange of NTFPs and handcrafts* occurs in all three villages. But resources are in short supply and marketing is poorly developed.
- *Forest food resources* have traditionally been sold and exchanged to obtain rice. This is still of vital importance for the poorest households.
- *Sale and exchange of poultry and pigs* provides cash with which to buy rice and condiments. But loss of poultry and insufficient *kabuk* (a wild plant used for pig feed) limit potential benefits.
- *Labouring for rice or wages* is increasing as a response to food shortage. Construction, irrigated rice cultivation in Mung Kong, and seasonal coffee garden work in Paksong draw labour from the area. Illegal labouring in Thailand was also reported.
- *Cutting trees for timber:* Although officially discontinued in 1995, villagers reportedly cut trees in the protected area to offset rice shortage during the 1998 drought.
- *Changing eating habits:* During the 1997 rice shortage all villagers were reportedly eating g*oi*, a wild tuber traditionally used as a rice substitute. Eating more *chiaow* (a tasty sauce that adds palatability to rice when other foods are lacking) was noted, and reducing food intake by missing meals appeared in the household records as a more extreme response to food shortage.
- *Borrowing rice from the village rice banks* has made a significant contribution to village livelihood by keeping rice in the village and fixing the borrowing rate.

RESOURCE HARVESTING PATTERNS

Resource locations

Year round harvesting is concentrated in the varied habitats close to the villages. Of the total --- species recorded, the greatest proportion is found in the *pah kohrk* (open *Dipterocarp* forest), degraded woodland, in and around rice fields, streams and ponds, and the rocky forested slope bounding the protected area (Table 5).

Table 5. Site typology for forest food resources

ECOLOGICAL SITES		SITE CHARACTERISTICS	MAIN FOOD RESOURCES
VILLAGE LAND	**Rice fields, margins** **Field channels** **Ponds**	- Flat land, bunded rice fields near village - Recently cleared fields in *Dipterocarp* forest - Seasonal field channels; excavated ponds	Frogs, fish, snails, crabs, toads, shrimps, eels Water plants, green leafy plants Bamboo shoots
	Lowland streams **Stream margins**	- Seasonal streams; sandy/rocky beds - Natural ponds; dammed ponds in streams - Damp shady margins (trees, scrub, bamboo) - Marsh	Frogs, fish, snails, crabs, toads shrimps, eels Bamboo shoots Water plants, tree leaves
	Lowland open forest ***(Pah kohrk)***	- Dry *Dipterocarp* and mixed forest - Degraded forest and secondary growth - Subject to surface erosion, gullying	Frogs, rats, squirrels, birds Red ant eggs/larvae, crickets, grasshoppers, beetles Mushrooms, tree leaves
XE BANG NOUAN NBCA	**High forested land** ***(Pah dohrn)***	- Escarpment; ravines, boulders - Steep slopes; plateaux; valleys, rock outcrops - Mixed and single species forest - Grassland, bamboo - Subject to burning	Snakes, lizards, forest animals, birds Bamboo shoots Flowers. fruits Tree leaves Honey
	Xe Bang Nouan and tributaries	- Perennial Xe Bang Nouan + tributaries - Permanent water holes - Damp shady margins	Frogs, fish, toads, eels, snails Bamboo shoots Water plants

Family gathering

The most frequently gathered items, frogs, crabs, snails, fish, bamboo shoots and greens are collected by all family members, but there is clear gender differentiation with respect to hunting and trapping of forest animals that is carried out exclusively by men and boys. Fishing, using nets and fish traps constructed in the fields, is done mostly by men, while women collect frogs and other aquatic animals in dip nets and baskets. Children play an important role in the gathering of food resources.

Normally, whole households move out to their rice field shelters during the rice cultivation period, but because of insecurity, this was not possible in 1998. Therefore, family members went out each day, taking cooked rice and chilli from the village, and finding frogs, fish, crabs, snails, bamboo shoots and green leaves to cook while working in the fields.

It is usual for food to be gathered in small quantities for one meal at a time, or at most a day at a time, though larger quantities are gathered for sale and exchange. The record shows that women and girls made frequent short and purposeful trips to sites near the village to gather the daily items, whereas less frequent longer trips to collect fish and animals were undertaken by men. Most households recorded daily harvesting of at least one plant and one animal resource during both seasonal surveys.

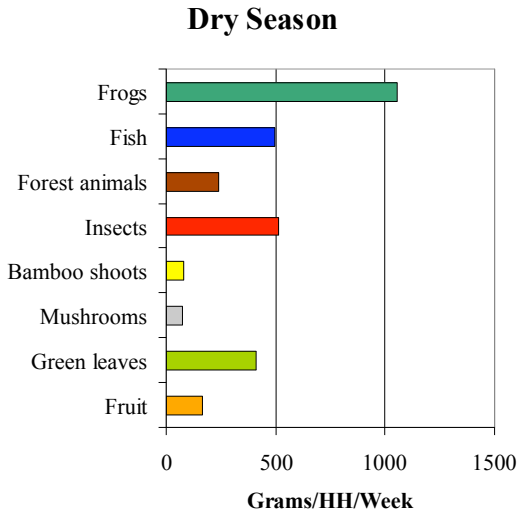
Harvesting frequency and time allocation were highest in Khamteuy where household averages of four and nine person hours per day (or 28 and 63 hours per week), were recorded during the dry and rainy seasons. This reflects frequent trips by women and children to sites near the village, plus the relatively high number of full day trips into the forest by men and older women. While this may be related to the level of hardship in Khamteuy, it is likely that food gathering was being carried out in conjunction with other activities such as NTFP harvesting and hunting at a distance from the village.

Seasonal harvesting and resource value

The records show that all households collected forest foods on a daily basis, with the rainy season quantities being more than double the dry season quantities, averaging 7 and 3 kg/household/week (Figure 5). Figure 5 includes villager valuation for each resource group. At household level there appears to be no consistent relationship between socio-economic status and quantities harvested,

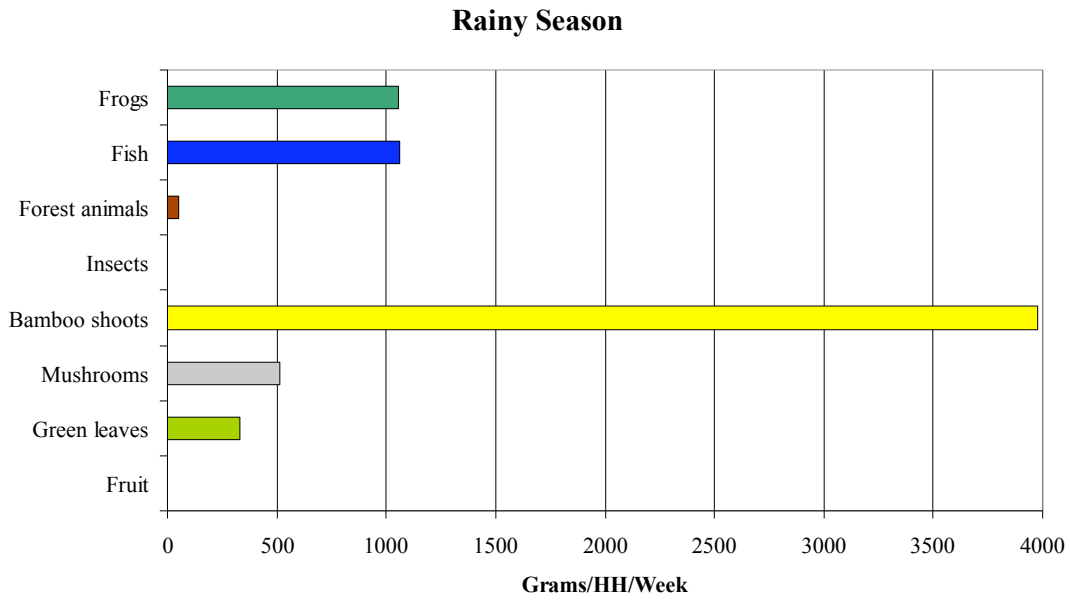
except that better-off households tended to gather a greater diversity, including higher quantities of animal resources, mainly for consumption. Poorer households collected greater quantities of plant resources, reflecting the use of these resources for exchange. Konglunoi households recorded the highest quantities of harvesting in both seasons, Nongthe the least; Khamteuy households recorded the greatest diversity. Seasonal patterns of resource harvesting are shown in Figure 6.

Figure 5. Seasonal harvesting and valuation of forest food resources (average/HH/week)



Resource values

Resource	Dry		Rainy	
	Kip	%	Kip	%
Frogs	2,123	40	3,034	30
Fish	1,050	20	2,417	24
Forest animals	411	8	133	1
Insects	561	11	0	0
Bb shoots	33	1	3,094	30
Mushrooms	83	2	739	7
Green leaves	589	11	861	8
Fruit	471	9	0	0
Total	**5,322**	100	**10,278**	100
	$1 = Kip 2,500		$1 = Kip 3,850	



Key findings for dry season resources

- ☐ The most important dry season resources are *khiat nam thao* (frog), *khai mot daeng* (red ant eggs/larvae), and *pak wan* (a green leaf).
- ☐ The average quantity of resources harvested was 3 kg per household during the survey week.
- ☐ Most species were found in the *pah kohrk* and degraded forest surrounding the villages and along local stream beds, with all family members being engaged in high frequency collection of frogs (5 days/week/household), red ant eggs (5 days), green leaves (4 days) and fish (2 days).

Figure 6. Khamteuy annual calendar for forest food resources

- ☐ Red ant eggs, collected by women and girls, provide a rich source of nutrients. Children collect grasshoppers and dung beetles (*chakchan and chuchi*) for family consumption and gifts.
- ☐ Fish are sought after as availability decreases with the drying out of rice fields, village ponds and streams. As there is little agricultural work in progress, groups of villagers make full day trips into the protected area to collect fish from the Xe Bang Nouan and perennial water holes on tributary streams, as well as snakes, lizards and fruit in the high forest.
- ☐ During the dry season, the availability of certain species is directly influenced by short-term variations in temperature and moisture. Thus, on the rocky ledges bordering the NBCA, women collect the flowering plant, *dohrk gachio*, and some mushroom species (*hed bot, kow, buak, poh*) are found in damper sites. Rain also stimulates the growth of bamboo shoots along dry streambeds, permitting intermittent harvesting of *nohr mai pek.*
- ☐ Harvesting of *mak chong* (malva nut, *Sterculia lychnophora*), had just begun in Khamteuy when the survey took place. The hard fruit is softened by cooking and eaten with rice as *chioaw.* Important for medicinal purposes, *mak chong* fruits only one year in three, and is marketed to Vietnam and China.

Key findings for rainy season resources

- ☐ The most important rainy season resources are bamboo shoots (*nohr mai lai* and *nohr mai pai),* fish, frogs (*kop* and *khiat mo*), mushrooms and green leaves (*pak samek* and *bai yanang)*.
- ☐ The average total quantity gathered was 7 kg per household during the week of the survey.
- ☐ The most frequently gathered resources were green leaves (5 days/household/week), bamboo shoots (4 days), fish and frogs (3 days).
- ☐ The greatest diversity of resources, notably green leaf and mushroom species, was recorded in Khamteuy, reflecting the relative ease of access to a wide range of habitats.
- ☐ Gathering is concentrated in and around the flooded rice fields and *pah kohrk,* and along streams, in close proximity to the villages. This relates directly to rainy season availability in these locations and to high labour demand for rice cultivation.
- ☐ In contrast to the dry season, fewer trips are made to the forested mountains and rivers inside the protected area. Irregular trips to the uplands are mostly to obtain more valuable resources such as monitor lizards, snakes, squirrels, *bai yanang,* and *mak keng* to sell and exchange for rice.

THE CONTRIBUTION OF FOREST FOOD TO COMMUNITY WELL-BEING

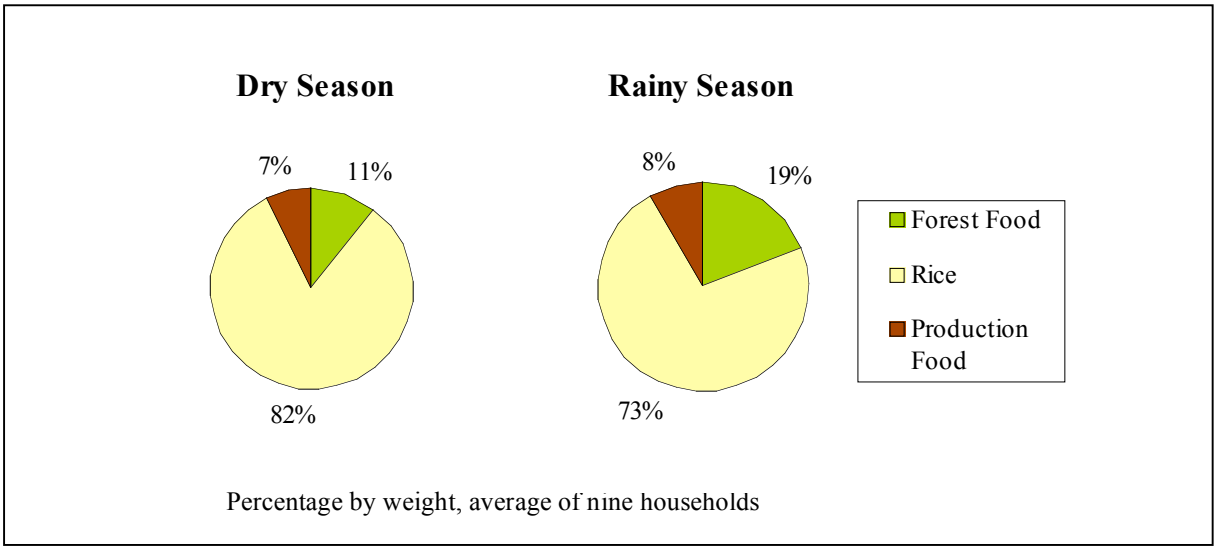
Food for all seasons

Forest food resources make a significant contribution to the food system of the study households throughout the year, both directly for consumption, and indirectly through sale and exchange for rice and essential cooking ingredients. As seen in Figure 6, frogs, fish, small animals and greens are gathered continuously, while other species are distributed across the seasons with shorter periods of availability. Thus forest foods provide a regular flow of nutrients to household diets.

Rich inputs for poor diets

Since the food system is based on the staple glutinous rice, this dominates the diet, at an average proportion by weight of approximately 82% and 73% of total consumption during the dry and rainy seasons respectively (Figure 7). Accounting for the adult equivalents in each household, this represents a daily average rice intake of 752 and 721 grams per person. Second to rice, forest foods are an essential component of the diet, accounting on average for 11% and 19% of total household consumption in the dry and rainy seasons. Thus apart from rice, forest foods amounted to 61% and 70% of total consumption. As forest foods provide year round diversity to otherwise bland and poorly balanced diets, they ensure a regular source of nutrients.

Figure 7. Household food consumption



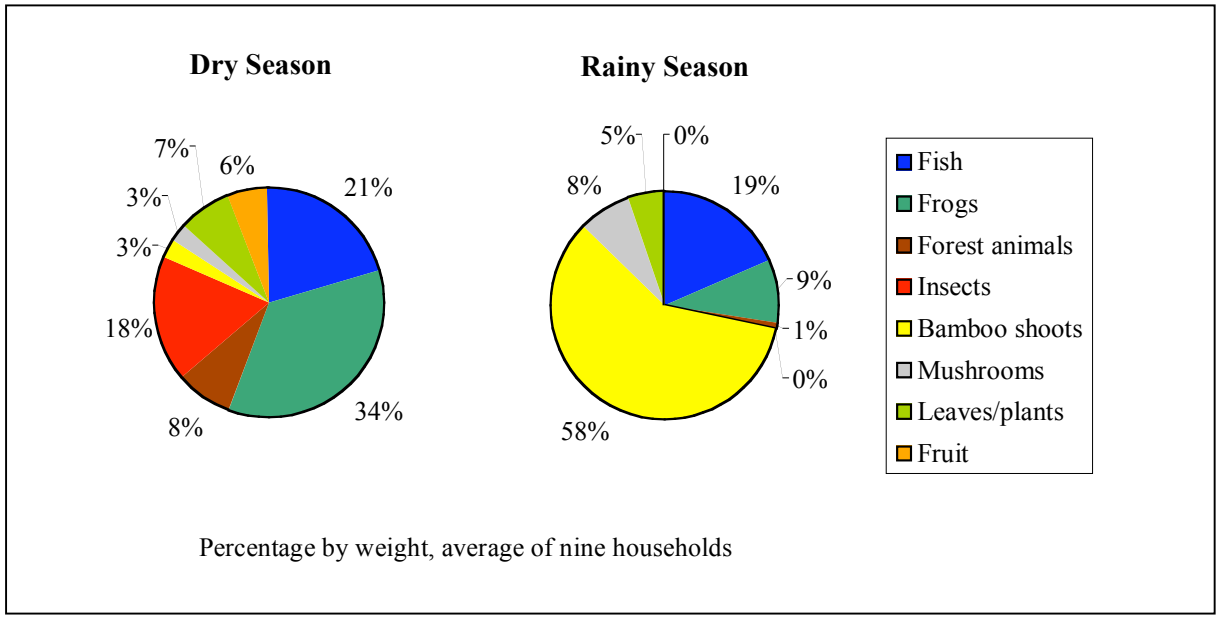
The quantities of forest foods eaten during the rainy season are about double the dry season quantities in most households. At the village level, Konglunoi households consumed most, reflecting a higher quantity of animal food, particularly fish. However, Khamteuy households recorded the highest proportion of forest food in the diet. At household level, there is considerable variation in dependency, the highest proportions generally being recorded by the poorest households, ranging up to 37% of total consumption in Khamteuy HH 3 during the rainy season (Table 6).

Table 6. Daily food consumption

Village Household	Dry Season				Rainy Season			
	Adult Equiv.	Total food (gms/pers)	Forest food (gms/pers)	Forest food % of total	Adult Equiv.	Total food (gms/pers)	Forest food (gms/pers	Forest food % of total
Khamteuy								
HH1	2.8	1,227	165	13	2.9	1,330	226	17
HH2	4.7	843	57	7	4.7	1,104	165	15
HH3	6.9	427	49	12	4.6	673	246	37
Average	4.8	832	90	11	4.1	1,036	212	20
Konglunoi								
HH1	7.4	622	80	13	7.9	1,138	203	18
HH2	5.5	1,215	185	15	5.6	1,224	219	18
HH3	2.6	1,014	98	10	2.6	1,220	210	17
Average	5.2	950	121	13	5.4	1,194	211	18
Nongthe								
HH1	5.2	781	69	9	5.2	953	89	9
HH2	5.0	789	31	4	5.1	968	269	28
HH3	2.8	888	86	10	2.8	745	186	25
Average	4.3	819	62	8	4.4	888	181	20
Average of HHs	**4.8**	**867**	**91**	**11**	**4.6**	**1,039**	**201**	**19**

Forest meat, mainly fish, frogs and insects, is the most important dietary component derived from the forest during the dry season, ranging from 44% to 99% of total forest food intake (Figure 8). It appears that forest meat intake is not influenced by availability of meat from non-forest sources, as better-off households with home production meat consumed similar amounts, or even more than poorer households who lack production meat. At the village level, forest meat consumption was highest in Konglunoi, and lowest in Khamteuy. Plant foods are relatively unimportant in the dry season, although there is a tendency for poorer households to eat more forest fruit and vegetables. In contrast, the rainy season pattern is dominated by bamboo shoots, with plant food, including green leaves and mushrooms, being the greater proportion of forest foods eaten in all households.

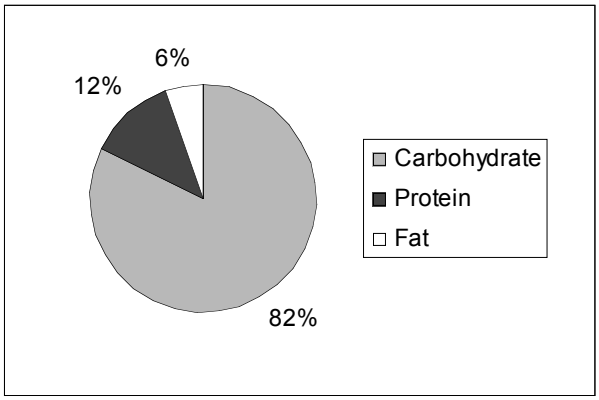
Figure 8. Forest food consumption



Findings of the nutritional analysis

Rice is the main source of carbohydrate that makes up 82% of total energy intake in the dry season (Figure 9). In the rainy season an average of 88% carbohydrate reflects the addition of bamboo shoots, while there is slight seasonal variation in protein and fat related to higher quantities of meat and insects being available in the dry season. Over all, micronutrient deficiency is indicated by the inadequate intake of Vitamin A, Vitamin C, calcium and iron (Figure 10). Although analysis did not include iodine, iodine may also be deficient, and it is expected that other micronutrients are also low. The analysis identified forest food intake as a percentage of total intake only for the rainy season.

Figure 9. Average proportion of energy intake from carbohydrate, protein and fat (dry season)



Total nutrient intake

Energy: Over all energy intake is just adequate at about 100% of the RDA, but at the household level there is a large range from under 60% to 125% in the rainy season. Dry season percentages are slightly higher, ranging from 60% to 140% of RDA.

Protein: Protein intake is generally more than adequate averaging almost 150% and 140 % of RDA in the dry and rainy seasons respectively. Only HH3 in Khamteuy recorded insufficient intake, whereas two level 1 households recorded over 200% of the RDA in the dry season.

However, less than 25% of total protein intake is higher value animal protein as most is vegetable protein derived from rice.

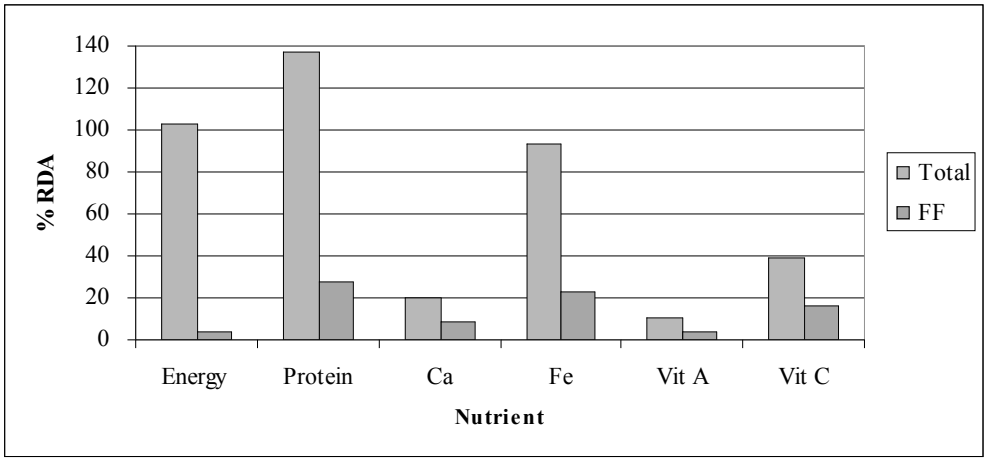
Calcium: With a range in intake of 10-35% of the RDA, it is clear that all the study households are deficient in Calcium.

Iron: In the dry season, average iron intake at 70% of the RDA is inadequate, and of total intake, 58% is vegetable iron. In the wet season, the figures are 94% and 79% respectively. The poorer households have lower percentages.

Vitamin C: The intake of all the study households was inadequate at 30-40% of the RDA during the rainy season, and half this amount in the dry season.

Vitamin A: The average Vitamin A intake is very low at about 10% of the RDA in both seasons, with poorer households receiving slightly more than the better-off households during the dry season.

Figure 10. Average household nutrient intake as percentage of RDA (rainy season)



Nutrients from the forest

By providing dietary diversity, forest foods ensure a significant supply of nutrients. Although the diet is seriously deficient in micronutrients, forest foods are an important source of the micronutrients that are available. Approximately 44% of total Calcium and Vitamins A and C, and 25% of total iron intake came from the forest during the rainy season.

Energy: About 4% of energy intake came from forest food.

Protein: Average protein intake from forest food was about 20% of total intake, representing 27% of the RDA. However, the forest is the main source of animal protein, accounting for about 73% of total animal protein in the diet. The three Khamteuy households obtained all their animal protein from forest animal food, whereas HH1 in Nongthe received most of their animal protein from home production meat.

Calcium: On average, about 40% of Calcium intake came from forest food, amounting to 9% of the RDA. Small fish provide the main source of calcium.

Iron: About 25% of iron intake came from forest food. The percentage of forest animal iron as a percentage of total animal iron, averaging 80%, or 12% of the RDA. Thus the forest is the main source of both animal protein and animal iron.

Vitamin A, Vitamin C: Over all, about 40% of Vitamin A and Vitamin C intake came from forest foods, amounting to 4% and 17% of the RDA, respectively. However, the poorest households do better than average (over 60% of Vitamin A and C intake came from the

forest), due to their relatively higher intake of plant food. The better-off households have negligible intake of Vitamin C in the dry season when most of their forest food is meat.

What are forest foods worth?

The Kip values recorded in Table 7 are a summation of the daily household estimates for all foods consumed, including food eaten in the fields during rice cultivation. As far as possible, valuation was based on the actual selling/buying/exchange values in the village.

Forest foods represent a significant proportion of total food value, ranging from a household average of 11% to 19% in the dry and rainy seasons respectively. Household variation is 4% to 48%, with the poorest households recording highest percentages of total food value as forest foods.

Table 7. Daily household food consumption value

Village/ Household	Dry Season (1$ = Kip 2,500)				Rainy Season (1$ = Kip 3,850)			
	Adult Equiv.	Total food (kip/day)	Forest food (kip/day)	Forest food % of total	Adult Equiv.	Total food (kip/day)	Forest food (kip/day)	Forest food % of total
Khamteuy								
HH1	2.8	4,246	462	11	2.9	6,381	1,316	21
HH2	4.7	2,889	267	9	4.7	7,506	1,234	16
HH3	6.9	2,278	341	15	4.6	5,309	2,531	48
Average	4.8	3,138	357	11	4.1	6,399	1,694	26
Konglunoi								
HH1	7.4	4,605	591	13	7.9	11,677	1,690	14
HH2	5.5	6,684	1,017	15	5.6	10,382	1,464	14
HH3	2.6	2,636	255	10	2.6	4,457	929	21
Average	5.2	4,642	621	13	5.4	8,839	1,361	15
Nongthe								
HH1	5.2	4,059	361	9	5.2	7,016	1,081	15
HH2	5.0	3,947	156	4	5.1	5,749	741	13
HH3	2.8	2,486	242	10	2.8	3,761	760	20
Average	4.3	3,497	253	7	4.4	5,509	861	16
Average of all HH	4.8	3,759	410	11	4.6	6,915	1,305	19

Safety-nets for poor families

Food sufficiency is the overwhelming concern of all households. However, the poorest are most dependent on the forest, both for daily subsistence and for the resources that are exchanged and sold as a means of survival. Of the study households, HH3 in Nongthe demonstrated the most acute level of food insecurity and the highest level of dependency on the forest. Having neither rice nor garden production and low labour capacity, the family was totally dependent on exchanging forest food resources and baskets for their daily rice and chilli, while other food needs were met entirely by forest foods and gifts. High rainy season dependence was observed in Khamteuy HH 3 where 37% of total consumption, amounting to almost half of the household food budget, came from the forest, and all rice during the week of the survey was obtained by exchanging *pak wan.* Giving and receiving forest food primarily serves a social purpose, but is of economic importance for poorer families when forest food gifts are reciprocated as rice and production food.

At the community level, forest resources are used primarily for subsistence, but sale and exchange are more important in Khamteuy in terms of species range and gathering frequency (Table 8). The over all results indicate that there is a higher level of dependency on the forest in Khamteuy than in Nongthe or Konglunoi.

Table 8. Use of main seasonal resources

	Main food resources	Khamteuy				Nongthe				Konglunoi			
		Cons	Sale	Exc	Gift	Cons	Sale	Exc	Gift	Cons	Sale	Exc	Gift
Dry season	Frogs - K. namtao												
	Red ant eggs												
	Fish												
	Insects												
	Pak wan												
	Pak naam												
	P. kadohrn, tiew												
	Dohrk gachio												
	Mak chong												
	Snails, shrimps												
	Mushrooms												
	Lizards												
Rainy season	Bamboo shoots												
	Frogs – Kop												
	- Khiat mo												
	Mushrooms												
	Snails, shrimps												
	Fish												
	Pak samek												
	Bai yanang												
	Pak kayeng												
	Monitor lizard												
	Mak keng												

COMMUNITY PERCEPTIONS ON FOOD RESOURCE MANAGEMENT

Villagers review traditional resource sharing

Village elders recount how traditional sharing operated in the past when resources were abundant and gathering was for family consumption only. Aware of their own part in resource decline, villagers acknowledge that over-harvesting has exceeded the replacement capacity of key food species. Traditional methods of fishing and hunting have given way to more expedient but destructive use of guns, fine mesh nylon nets, poison, explosives and battery torches, encouraging indiscriminate collection of undersize fish and tadpoles, and large quantities of frogs. There is also concern about destructive methods and high harvesting levels of bamboo and *Pandanus*. Free ranging cattle are reported to cause damage, and previously recognised rights of use to certain sites and resources are being ignored. These infringements mean loss of livelihood resources as well as being a potential source of conflict.

Villagers agree that greater control over resources is needed in order to reduce the impact of competitive and destructive harvesting. Clearly defined village boundaries should help in this respect, but due to a strong cultural sense of sharing, established patterns of open access sharing still influence resource use (Table 9. Although the NBCA was designated in 1993, heavy resource use continues. This involves not only permitted gathering of food resources and other NTFPs, but also ongoing hunting and burning, for which nobody takes responsibility, least of all the NBCA authorities who, the villagers claim, are unable to monitor the area or impose sanctions.

Table 9. Villager analysis of traditional resource sharing

Strengths	▪ Strengthens co-operative sharing within and between villages ▪ Encourages working together to meet common needs ▪ Problems can be resolved to avoid sanctions and conflict ▪ In the past resources were plentiful and provided for everybody ▪ Traditional collection methods conserved resources ▪ Traditional sharing and rights are respected by villagers	**Weaknesses**	▪ Equitable sharing is difficult ▪ Many people are competing for declining resources ▪ Leads to conflict as difficult to protect resources according to rules ▪ Leads to forest and resource loss through careless use, cutting trees, hunting, burning ▪ Harvesting practices and equipment (poison, nylon nets, explosives, battery torches) are destructive ▪ Traditional rights are not always acknowledged in official rules and regulations
Opportunities	▪ There is an opportunity for sustainable resource management if: i) people are aware of needs and benefits of conservation ii) boundaries are clearly defined, mutually agreed and respected by neighbouring villages iii) rights and regulations are jointly planned, agreed and respected	**Limitations**	▪ Villagers cannot ensure sustainable resource management without adequate support from District, Provincial and NBCA authorities in: i) developing awareness of conservation ii) enforcing regulations iii) applying sanctions

Land and Forest Allocation

Since land and forest allocation was carried out in 1998, Khamteuy and Nongthe have accepted responsibility and formal use rights for demarcated sections of the NBCA (see Figure 1). Reportedly, conservation awareness has improved among neighbouring villages who have agreed to report instances of fire, tree cutting and wildlife hunting to the District authorities. However, numerous examples of ongoing conflict over resource use were mentioned. Removal of *mak chong* by cutting down trees in the Khamteuy allocated area in 1998, was seen as a serious infringement of the hitherto recognised rights of Khamteuy villagers to this valuable resource. Problems were reported between Khamteuy and the northern villages of Budtapan and Phoupie in Savannakhet Province over non-recognition of fishing restrictions in a designated reserve reach on the Xe Bang Nouan, and encroachment into rice fields and village forest by neighbouring villages was commonplace.

Though acknowledging the potential benefits of land and forest allocation, villagers report on-going hunting, tree cutting, destructive harvesting and forest fires. Despite agreement on the part of village committees, illegal harvesting and burning continues, but penalties do not serve as deterrents due to lack of villager awareness and low levels of enforcement. There is inadequate co-operation amongst villages, and management is difficult due to fear of conflict. But even when village boundaries are clearly defined, and land and forest allocation takes effect, available resources must still be shared. Therefore, the traditional system still has relevance as the basis of future resource management.

Sustainable management of key food resources

Based on ecological status, importance for subsistence use and potential for income generation, fish, frogs and bamboo shoots were identified as the key food resources in all three villages. Villagers considered current harvesting practices in relation to growth, regeneration and life cycles of the species concerned, then initiated design of sustainable harvesting and management systems.

The villagers recommended sustainable harvesting cycles and management rules for fish and frogs, based on the need to protect breeding stock and under-size fish from removal by establishing reserve areas, and regulating harvesting. Measures were proposed to promote regeneration and reproduction, including defined breeding and reserve areas and propagation through controlled breeding. The rice

field/degraded *Dipterocarp* forest environment is an ideal habitat for the local frog species, *kop* and *khiat* (Bryan Stewart, *pers. comm*. October 1998), and it would be inappropriate to introduce species that would counter the NBCA goal of protecting local biodiversity.

Sustainable use of bamboo was based on reducing destructive over-harvesting and increasing availability by individual planting around family rice fields, and for shared use on village land. Planting fodder species, *mei du* for cattle and *kabuk* for pigs, was also recommended. Considering the difficulty in even finding enough to eat, villagers recommended that forest food resources should not be used for sale and exchange until productivity is increased through sustainable management.

Villagers stressed the need for co-operation within their own communities and with neighbouring villages in order to share and manage resources sustainably. It was emphasised that the practical effectiveness of mutually formulated and agreed management systems must be actively supported by District, Province and NBCA authorities through awareness building and enforcement of rules.

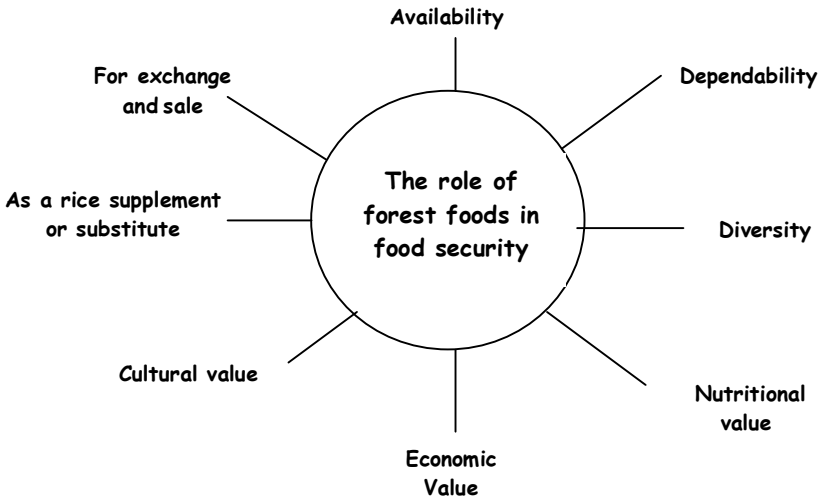
DISCUSSION

1. How do forest foods contribute to food security?

"Food security exists in a household when all its members, regardless of age and sex, are assured of access at all times to the food that they need for a healthy life." FAO, 1992.

With reference to the above definition, the following discussion identifies the ways in which forest foods have relevance in contributing to food security in the study villages (Figure 10).

Figure 10. The role of forest foods in food security



☐ Availability and dependability

Forest foods have always played an important role, giving the food system stability and integrity. In contrast to agricultural production, the forest has traditionally provided a dependable and freely available source of food. However, as villagers experience increasing difficulty in finding resources, forest foods make up a smaller proportion of the diet than in the past.

Resource decline has a direct negative impact on the nutrition and livelihood of forest dependent people. In north-east Thailand forest food consumption decreased due to forest loss and drastic reduction of biodiversity (Dearden, 1997). In the Phu Wiang valley, loss of access to resources after forest closure had a detrimental effect on the diet and livelihood of ethnic communities, particularly the poorest families, who once relied on the forest (Saowakantha *et al,* 1994). The effect of the decline in wild food resources on diet has been observed also in Vanuatu and Tonga (Olsson 1991), and in North Vietnam (Yen *et. al.* 1994).

Considering the importance of forest resources to these Lao communities, the findings dispel the notion that forest foods are supplementary, a term that inappropriately suggests they are peripheral to the diet. Despite reduced resources and diminishing returns for time and labour expended, forest resources continue to make a meaningful contribution to household and community food security on account of their high frequency year round consumption.

☐ Diversity

Villagers value forest foods for providing variety in their daily diet, adding taste and palatability to the staple rice. As found in better-off households, even when production food is available, there is often a preference for wild food as being tastier and more compatible with traditional food habits. Villagers also have clear perceptions regarding the benefits of different forest foods for health, strength, work capacity and survival: *"We get benefits from forest food when we eat what our body needs."*

☐ Nutritional value

Eating a *diversity* of foods in sufficient *quantity* helps to ensure intake of the nutrients essential for health. Forest foods have considerable nutritional importance in the study area because of the range of resources available throughout the year. Many forest foods are higher in vitamins and other nutrients than domesticated varieties, and the protein content of wild meat is sometimes higher than that of domestic animals (FAO, 1992).

Table 10. Forest foods as nutrient sources

FOREST FOODS	ENERGY	MICRONUTRIENTS	
	Carbohydrate, Protein, Fats, Sugars	**Vitamins**	**Minerals**
Forest animals, birds	High in fat Complete protein	Offal/organs high in nutrients Vitamin B.	Animal iron
Fish, crustaceans frogs, molluscs	Complete protein	Some Vitamin B	Animal iron Calcium from small fish (bones)
Insects, larvae, insect eggs	High in protein High in fat	Vitamin A Caterpillars rich in B 12	Animal iron
Mushrooms	High in carbohydrate Rich in protein	Small amounts Vitamin A and C depending on species.	Most species low in iron
Bamboo shoots	High in fibre and carbohydrate Rich in vegetable protein	Minimal amounts, lost in cooking	
Plants - leaves stems flowers	Low in energy Source of soluble fibre.	Leaves important for Vitamins A, C and folic acid. The darker the leaf, the more A,C.	Vegetable iron from dark greens
Tubers	Rich in starch		
Honey	High in energy Rich source of simple sugars	Vitamin A	
Nuts	Carbohydrate, oils, protein		
Fruit, berries	Sugars and soluble fibre	Important source of Vitamins A, and C	Calcium Magnesium Potassium

The pattern of energy distribution and nutrient content in the study area is similar to that of communities in the Phu Wiang Watershed in north east Thailand, being high in carbohydrate, low in fat, and seriously deficient in vitamins and minerals (Kiatirat Kunarattanapruk, pers. comm., 1998; Saowakantha *et al*, 1997). Due to decreased wildlife, frog and fish availability during the 1998 rainy season, it is likely that average protein intake from forest food at 25% of total intake was lower than usual. Nevertheless, 75% of total animal protein came from the forest.

As Vitamin C enhances vegetable iron absorption, and given the high intake of vegetable iron and low intake of Vitamin C, actual iron intake is probably less than indicated, and therefore, there is likely to be a high incidence of anaemia amongst the population. However, on average, almost half of total Vitamin C intake came from the forest, and for some poorer households the proportion was over 60%.

Thus, although the results indicate that total micronutrient intake is generally far below the RDA, forest resources contribute a significant amount of the micronutrients that are available in the diet. The household record indicated that poorer households benefit more than better-off households in this respect as their diets include more forest plant foods, but forest resources provided almost all of the animal iron intake for all the study households.

Forest resources provide *high quality* dietary inputs; the challenge is to increase potential nutritional benefits by increasing the *quantity* of forest food consumption in order to boost intake of much needed vitamins and minerals.

☐ **Free foods of high value**

Though forest resources are perceived as free, they have high value, and not only in economic terms. The intrinsic worth of forest foods has to do with their cultural and social significance, whether used as customary daily food, gifts or for ceremonial occasions. And increasingly, the exotic appeal of wild foods means they are favoured by urban dwellers who have become a growing market for them. In economic terms, representing 11% and 19% of the monetary value of all food eaten during the dry and rainy seasons surveys, forest foods make a significant contribution to the household economy. The non-expenditure aspect of forest foods is particularly meaningful for the poorest households who, lacking cash and production foods, would otherwise be deprived of this regular source of food.

☐ **As a rice supplement/substitute**

In contrast to most forest food being a regular component of the diet, the starchy tuber, *goi* (Latin name), is used as a seasonal supplement and substitute for rice. Described by villagers as a low status survival food traditionally used to tide over periods of food shortage, *goi* was used extensively during the 1997 drought. Due to heavy harvesting, availability was low in 1998, and delayed rice cultivation limited collection and preparation (a lengthy process of pounding and cooking to remove natural toxins). Also, the village rice banks may have reduced the need to eat *goi.* Nevertheless, it was reported that more than half the Khamteuy households were eating g*oi,* and exchanging snack food prepared from g*oi,* during the 1998 dry season. In two of the poorer study households, the high proportion of bamboo shoots consumed relative to rice suggests that bamboo shoots, a rich source of carbohydrate, my have had a rice substitute role.

☐ **For exchange and sale**

Although village level results indicated that forest food resources are important for sale and exchange, this was not strongly supported by the records, except for the poorest households. The low level of exchange and sale during the 1998 rainy season was due to low resource availability; insufficient food could be found even for family consumption. It is also likely that the village rice banks reduced the need to obtain rice through sale and exchange of forest resources, thereby releasing labour for rice cultivation, and possibly taking some pressure off the forest at the same time. Notwithstanding the trend of reduced sale and exchange, the benefit of forest foods in obtaining rice is crucial for the poorest households.

2. Who are most dependent on forest food?

Comparing household dependency

As indicated by harvesting and consumption patterns, forest foods are a normal part of the diet for everybody in these communities. As an indicator of actual dependency, however, it is not only quantity, but also the proportion of forest foods relative to other food within the household food system that is meaningful. Thus, 36% of total food consumption in Khamteuy HH3 came from the forest, indicating the highest level of dependency among the study households. Lower level households in Nongthe also demonstrate a higher than average proportion of forest resources in the diet, suggesting that poorer households place greater reliance on forest foods. Conversely, the 9% component of forest food consumed by HH1 in Nongthe indicates low dependency on the forest due to availability of production meat and vegetables.

Although household economic level influences dependency, the general lack of clear differentiation amongst the study households suggests that forest food use is associated not only with economic level and food production capacity, but that other factors are operating as well. Household harvesting capacity, as determined by the ratio of dependent to active working members, and according to household structure and stage in the family cycle, was found to be a factor. Mothers of young families in small households reported less opportunity for gathering as compared with women in larger families where older children share gathering responsibility. Also, there appears to be a stronger preference for traditional foods in some households, which may explain why some families value forest foods more highly than others.

Comparing village dependency

As evidenced by reported periods of rice deficit and responses to food shortage, Khamteuy is more vulnerable to food insecurity than either Konglunoi or Nongthe. *Goi* was reportedly being used as a rice substitute only in Khamteuy, indicating that rice shortage and poverty were most severe there. The highest consumption of forest food resources, notably fish and frogs, was reported in Konglunoi, but based on proportion of total intake, it appears that Khamteuy families have higher dependency on the forest and consume a greater variety of resources. In Nongthe and Konglunoi there is more opportunity to develop new rice land, and greater incentive to attain self-sufficiency through handcraft production and propagation of forest foods. With little land available for new cultivation, Khamteuy villagers have less opportunity to increase rice production and fewer options for coping with food shortage. Therefore, improved availability of forest foods has particular relevance for this village.

There are strong indications that malnutrition, particularly micronutrient deficiency, is responsible for increased vulnerability to sickness and the level of child mortality from malaria and other infections. That poor nutrition plays a part in health problems is reflected in the high incidence of sickness reported in Khamteuy, particularly among women and children. There are also indications that women's susceptibility to illness may be associated with low iron intake.

3. What are the implications for resource management?

People count in conservation

Recalling dense forest and rich biodiversity in the past, the villagers describe forest depletion accompanied by the virtual disappearance of many wild life species. A parallel can be seen in *Lahu* subsistence communities in north-east Thailand, for whom the forest was once the source of livelihood. Due to the cumulative impact of land conversion and environmental degradation, a rapid *faunal collapse* has occurred there since the 1950s. Policy and actions that disregard the unity of conservation and development "*can mean the pivotal difference between a viable and independent economy and one that is entering the tailspin of the poverty-dependence vortex,"* (Dearden 1996). The failure of development efforts, it is claimed, is due to inadequate attention being paid to the ecological dependencies in the system, and notably the importance of forest products in the hill tribe diet and the use of forest products to offset rice deficiencies.

The social cohesion and adaptive capacity of the southern Lao communities have enabled them to survive as largely independent economies with minimal inputs from outside. Having demonstrated considerable capacity to cope with changing circumstances, both natural and imposed, dependency on the forest for food, and other products, continues to be a critical aspect of their livelihood. As marginalised communities living in difficult conditions, their future depends on sustaining the natural resource base and strengthening the linkages in the livelihood system. Therefore, promoting self-reliance based on community management of locally available resources is a vitally important conservation and development opportunity.

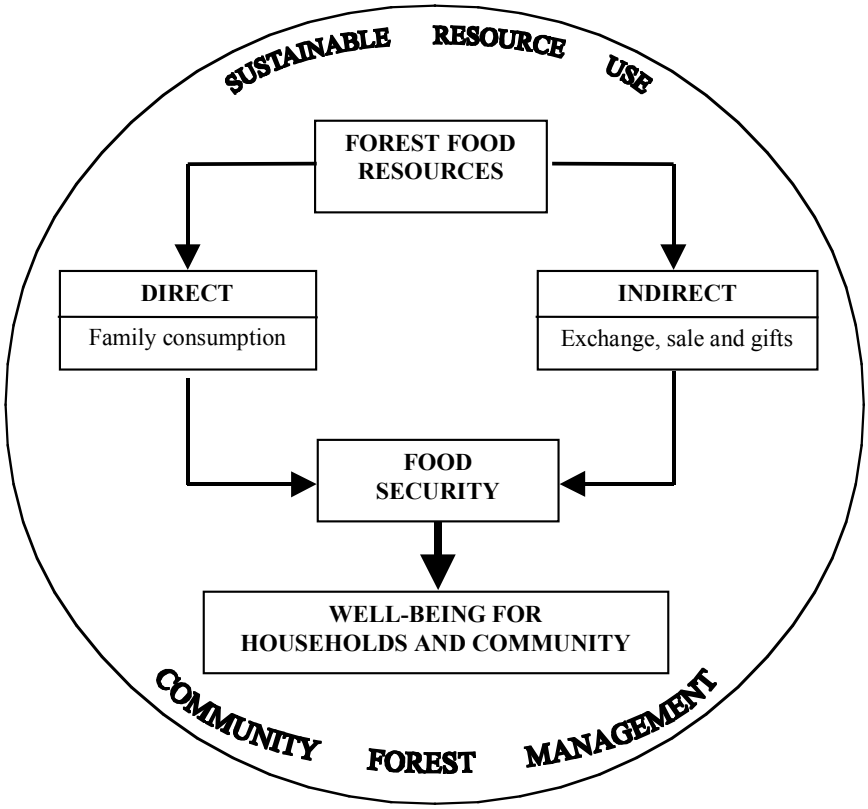
Resource management for food security

Rice alone cannot solve the problem of food insecurity, but as the staple energy source it is the most important item in the food system. But limited land, declining soil fertility and unreliable rainfall mean that there is little scope for increasing either yields or production, short of a dramatic shift in rice cultivation techniques. While the rice banks have alleviated seasonal rice shortage, hunger and debt,

there is a clear need to increase the supply of other foods to provide a *balanced* diet with adequate micronutrient intake. Substitution of cultivated fruit and vegetables for forest products is limited by lack of water in the dry season, and without technical support, domestic livestock is susceptible to disease. There is, therefore, a strong case to develop the potential of forest dependency to improve food security. This has particular relevance in a situation where the drive to achieve national level food security has largely neglected household food needs in the poorest communities.

The forest used to be a dependable source of food, but at current levels of harvesting, the traditional system of open access sharing is breaking down. Resource shortage is a reality of which the villagers themselves are acutely aware as they experience increasing difficulty in meeting their daily food needs. Forest depletion and resource decline threaten to undermine the vital contribution forest resources make to household food security and community well-being. In terms of sustainability of both the forest and local livelihoods, it is encouraging therefore, that the villagers themselves are committed to improving food security by securing their use of forest food resources (Figure 11).

Figure 11. Resource management for food security and well-being



The study has raised villager awareness of the urgent need for sustainable resource management, and stimulated action based on shared understanding of:

- food availability;
- food resource status and ecological impacts of resource use;
- health benefits of forest foods in the diet;
- conservation as it applies to food resources;
- the relevance of forest foods in the future.

4. Observations on methodology and fieldwork

- *Participatory research* would seem to be particularly suited to this type of study. The participatory process empowers local people, and by enabling them to take an active role in research, helps them understand their problems and identify their own solutions.

- The *case study* approach was appropriate for the conditions under which the study was conducted, *i.e*. limited time, support and facilities. By providing focus and in-depth understanding of typical household conditions, it gave a reliable indication of the food situation and role of forest foods at the household level that could then be placed in the context of the broader community picture.
- The opportunity for villagers to be actively involved in weighing and recording their resource harvesting and daily meals created a focus of interest that was then shared within the community.
- Inaccuracies and inconsistencies occurred in the weighing of food, particularly during the first survey. If such a study were to be carried out again, it could be improved by having a field team dedicated to carrying out the study, without the distraction of regular project work at the same time. This would enable time to be given for proper training prior to commencing the survey.
- A key factor is the need for effective translation, involving Kathang, Lao and English languages. This was a major problem that prevented team preparation for the first survey, necessitating postponement of interviewing and group activities until the second round. Competent translation during the second survey enabled the team to fully understand the purpose and methods of the study, so that the fieldwork was carried out with confidence and enthusiasm.
- The high level of villager motivation provided clear evidence of the relevance of the study to these people. Stimulated by their active role in the research, the villagers were eager to share their knowledge and experience.
- Women were particularly knowledgeable regarding resources and household food security issues, and readily participated in all aspects of the research.
- A measure of both the commitment of field team and villagers, and the level of co-operation between them, was the way in which the survey proceeded despite problems of insecurity. When village access was denied during the second survey (the researcher was required to remain in the provincial centre), groups of villagers walked from Khamteuy and Nongthe to Ban Dan daily to work with the field team.
- For the nutritional analysis, sufficient data was collected to provide an indicative picture of household nutrition and how forest foods contribute to this. Because of discrepancies and missing data, some days of the first record were omitted from the analysis; during the second round such inconsistencies were resolved during data collection, permitting analysis of the complete record.

5. Forest food study village workshop

A village workshop was held to present the results of the study and provide a forum for discussion (Box 5).

Box 5. Forest food study workshop, Ban Nongthe **29-30 November, 1999**

Participants: Village leaders, key informants, case study household representatives; agriculture/forestry, health and education officials from Wapi and Nakhornphaeng Districts; NTFP project staff.

Objectives:

- To present the results of the food study in respect of diet and health
- To outline changes in forest food resource availability and implications for food security
- To promote understanding of the importance of forest foods in daily lives
- To encourage villager thinking re resource use/management, and improving food security through food production.

Outputs:

- Awareness raising regarding food and health
- Discussion: Over-use of resources and unsustainable practices leading to resource shortage
- Discussion: Livelihood improvement through resource management
- Discussion: The need to increase food production in order to reduce demand on forest resources
- Stake-holder analysis: Functions and responsibilities of village communities, NTFP Project, XBN NBCA management, health and education authorities

Conclusions:

- Food insecurity is linked to declining resources and forest depletion
- Improving the status of the ecology will improve villager livelihood
- Conservation includes the proper use of resources to ensure their sustainability
- All forest users and authorities concerned must take on responsibility for resource management

Source: Forest Food Study Workshop Report, NTFP Project, Salavan.

FUTURE DIRECTIONS

There is clear evidence that forest food resources continue to make a significant contribution to the village food systems, and therefore have the potential to play a vital role in reducing seasonal and long-term malnutrition and food insecurity. The villagers themselves perceive the potential for improving food security through natural resource management, together with improved agricultural production and alternative sources of income (Box 6).

Box 6. Improving livelihoods and food security

"Protection of resources is to promote resource availability for our use."

The villagers identified potential solutions to their livelihood problems, focusing on overcoming debt and increasing self-sufficiency by:

- ☐ increasing rice availability through improved production using natural fertiliser;
- ☐ decreasing expenditure and exchange of rice for chilli and tobacco by improving garden and fruit production;
- ☐ generating income from NTFPs, handcrafts, livestock and gardens by selling rather than exchange;
- ☐ managing forest resources for greater productivity for subsistence and trade;
- ☐ breeding fish and frogs; planting bamboo

Forest dependency should be linked with protection of the forest ecosystem in order to maintain and enrich the productivity of key food resources. Promoting sustainable management of forest food resources presents the opportunity to integrate forest management with improved food security. There are compelling reasons to develop and more fully utilise forest resources in a sustainable manner while this is still possible. Therefore, conservation and development should give priority to improving food security and well-being by helping these communities secure the use of forest foods. This depends on:

- Recognition of the importance of forest food resources to forest dependent communities, in terms of the social, economic and cultural benefits they provide.
- Awareness building amongst villagers, and other stakeholders, of the benefits of ecologically sustainable resource use and management. As change in attitude and behaviour is the most important long-term outcome of community conservation work, it is important that villagers and government authorities from all sectors concerned work together.
- Acknowledgement of local people as the key decision-makers in resource use and management, holding rights and sharing responsibility for sustainable harvesting and management systems based on mutually designed, agreed and respected rules, for application both within village areas and inside the NBCA.
- It is essential that this process should be effectively supported by district, provincial and NBCA authorities.