Fish, frogs and forest vegetables:

Role of wild products in human nutrition and food security in Lao PDR.

Prepared by Joost Foppes for IUCN, June 2008

1. Introduction

Rapidly rising world food prices raise concern about the food security for millions of poor people in developing countries. How will they cope? A traditional coping strategy for poor people in rural areas is the collection of plant and animal products from the wild. This paper illustrates the value and scale of this coping strategy in the case of Lao PDR.

Lao PDR is classified as a "least developed country". In 2004, 71 % of its population lived on less than US$2 a day and 23 % on less than US$1 a day. Despite the steady economic growth of the last 15 years, the nutritional status of the Lao population has not improved and food insecurity still affects parts of the population. The economy is largely subsistence-based and agriculture remains the major sector. Only 27 % of the population lives in urban areas and significant parts of the country are mountainous, uncultivable and inaccessible by road. Unexploded ordnance contamination is still widespread (WFP, 2007).

This paper argues that forests, rivers and wetlands are a robust source of natural foods, especially for poor families. The quality and quantity of this 'free' food supply is hard to replace. Investing in the preservation of these biodiversity resources is a cost-efficient nutrition strategy, next to food production from fishponds and farms, which rely on external inputs and require more labor and capital investments per unit of food produced[1].

Strategies striving for healthy and diversified nutrition, based on local food resources, could contribute significantly to food sovereignty in rural areas. Creating awareness on the nutrition values of natural foods may also become a powerful incentive for local communities to manage local wild food resources sustainably. Thus, wise use of wild foods could also result in better "in-situ" preservation of (agro-) biodiversity. This study is published by IUCN, The World Conservation Union. IUCN promotes biodiversity conservation for food security through its national country program in Lao PDR.

[1] The author explicitly wishes to thank Jutta Krahn from FAO and Chris Barlow from MRC, for sharing their rich knowledge. Special recognition goes to Kate Clendon who pioneered the IUCN food study in Salavan in 2000-2001.

2. The urgency of the situation: widespread malnutrition in Lao PDR

In 2007, the World Food Program (WFP) published a 'Comprehensive Food Security and Vulnerability Analysis' (CFSVA) report for Lao PDR. It was the first nation-wide food security study undertaken in the country. It received international attention and was quoted in the New York Times. It concluded that:

- Every second child in the rural areas is chronically malnourished. This is alarmingly high and the same level as ten years ago.
- Two thirds of the rural population are either food insecure (13%) or live on the edge of food security and could become food insecure should a shock occur during the year.
- Dietary intake of fat is generally too low. Wild meat and fish are the main sources of protein and fat. As these natural resources are under threat, it is critical to ensure their preservation and households' access to them.

The study found that 50 % of rural children under the age of five are stunted in their growth (according to WHO standards). Stunting at early age not only reduces physical development but also affects the development of the brain and the ability to learn.

Food insecure people are typically farmers with little fishing and hunting activities or unskilled laborers. The Sino-Tibetan and Austro-Asiatic groups are highly vulnerable to nutritional problems; they usually reside in the highlands.

The main causes for malnutrition were found to be in the policy environment. Measures are currently lacking to mitigate the effects on food security of some policies such as the bans on opium production and shifting cultivation, and the resettlement strategy. The study therefore strongly recommends a nutrition strategy as the main solution to this problem. Some of the specific recommendations of the study are incorporated at the end of this paper.

Another cause for concern is the inadequate care and feeding practices (especially on breastfeeding and weaning) causing malnutrition of infants. There is a specific problem with food taboos after giving birth among some ethnic groups. Not eating fish or meat reduces the quality of the mother milk, increasing malnutrition of infants. Education campaigns in local languages are needed to address these issues.

In short, traditional food culture may sometimes prevent rural children from having sufficient nutrition. At the same time, wild foods, such as forest vegetables and fish are reported to hold an untapped potential for improving food and nutrition security. The following sections will explore that potential.

3. The setting and methodology of the IUCN Salavan forest foods study

IUCN implemented a project on Non-Timber Forest Products (NTFP) in Lao PDR from 1996-2001, funded by the Netherlands Government. This project was aimed at developing models for sustainable use of NTFP for poverty alleviation and as an incentive for community-based forest management. It developed successful cases of NTFP based marketing and forest management at village level. Through stakeholder consultation and networking, the project also contributed to mainstreaming of NTFP in key Government

and donor policy documents regarding forestry and poverty alleviation. The project generated a wealth of knowledge on NTFP use in Lao PDR, among them a pioneer study on the role of forest foods in nutrition (Clendon, 2001). This paper draws on experiences and lessons learned from the IUCN study, as well as incorporating more recent insights based on the work of the author and others.

The IUCN forest foods study was carried out in three subsistence communities: Ban Khamteuy, Ban Konglunoi and Ban Nongthe, in Salavan Province, in southern Lao PDR. Situated just outside the Xe Bang Nouan National Protected Area, the villages are surrounded by paddy fields and wetlands, while the forests are mainly found in the National Protected Area. The forest consists of a range of habitats including mixed deciduous and evergreen forest, bamboo forest, grassland and aquatic environments.

Some sixty-five villages surrounding the Protected Area, including the three study sites, continue to have heavy dependence on forest resources for livestock raising, hunting, collection of NTFP, firewood and logs for building houses. These predominantly Katang ethnic communities (belonging to the Austro-Asiatic language family) lived in the past mostly inside the forest of the Protected Area. Self-sufficiency was based on fishing, hunting and gathering, and swidden cultivation. They were moved out of the forests in the 1950s, due to insecurity during war time and the need for increased rice production.

Wildlife and forest resources were plentiful until the early 1980s, but population pressure has imposed increasing demands on natural resources, leading to a decline of the overall resource base on which the villages depend. Production of rain-fed rice now underpins the livelihood system, but poor sandy soils, declining soil fertility and unreliable rainfall continue to impose regular rice shortages. 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.

Detailed weighed food records were collected on intakes of food per household in two data sets, one in towards the end of the dry season (March-April) and one towards the end the wet season (Sept-Oct) of 1998. These data were combined with a nutritional analysis at the University of Khon Kaen, Thailand. Thai standards for Recommended Daily Allowances (RDA) were used, as Lao standards were not yet developed at that time (Clendon, 2001).

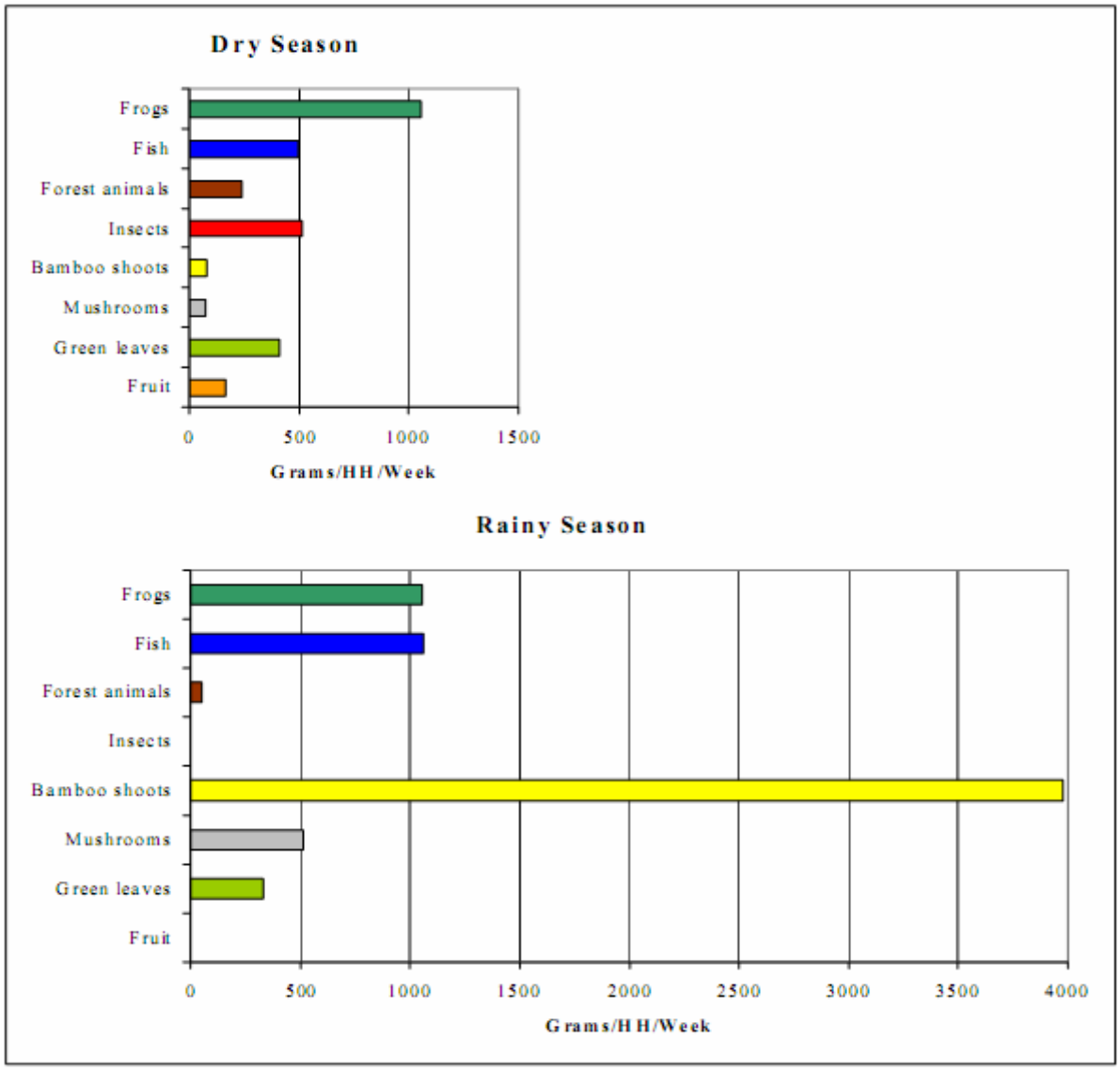
4. The importance of forest foods in the daily diet

The main findings of the Salavan study were:

- Food security is an acute concern of most families in the study area
- All families in the three villages collect forest foods on a daily basis
- Villagers consume a great variety of forest foods
- Forest foods are the most important source of food besides rice

The amount of forest foods gathered per family per week varied from 3 kg in the dry season to 7 kg in the wet season, or around 260 kg per family per year. Main products gathered were bamboo-shoots, frogs, fish, insects, mushrooms and green leaves (see also figure 2).

Figure 1: Quantities of forest foods gathered per family per week, Ban Khamteuy, Salavan (Clindon, 2001)



Field surveys from other areas in Lao PDR confirm the high proportion and high variety of gathered forest products in the daily diet of rural Lao families (Meusch e.a., 2003, Krahn, 2003, Bush, 2003). Over 700 of these edible NTFPs have been recorded so far: edible shoots and other vegetables, fruits, tubers, mushrooms, small water animals, wildlife etc. (see table 2). The diversity of NTFPs consumed reflects the rich agricultural biodiversity of the rural landscape in Lao PDR.

Table 1: Diversity of forest foods in Lao PDR (IUCN NTFP Project database).

No	Category	No products	Examples
1	Fruits, seeds	87	Sugar palm fruits, Baccaurea berries, Irvingia nuts
2	Leaves	86	Barringtonia, Lasia, Azadirachta, Centella
3	Shoots	23	Bamboo shoots, rattan shoots, palm hearts
4	Tubers, roots	22	Yam tubers (Dioscorea), galangal roots
5	Mushrooms	16	Ear mushrooms, Shii-take, Termite mushrooms
6	Flowers	4	Sesbania, Butea,
	ALL PLANTS	**238**	
1	Fish	300	Cyprinidae, Pangasiidae, Siluridae, Notopteridae
2	Birds	63	Doves, partridges, pheasants, bulbuls, estrildas
3	Mammals	54	Squirrels, wild boar, rats, civet cats, mouse deer
4	Reptiles, amphibians	41	Frogs, monitor lizards, snakes, turtles
5	Molluscs	7	Freshwater shrimps, crabs, snails, shells
6	Insects	5	Red Ant Eggs, bamboo grub, dung beetles
	All ANIMALS	**470**	
	TOTAL	**708**	

5. How forest foods contribute to a healthy diet

The food system is based on the staple glutinous rice. Rice dominates the diet, at an average proportion by weight of approximately 82% and 73% of total consumption during the dry and rainy seasons respectively. 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. Forest foods amounted to 61% and 70% of total consumption of all foods other than rice. As forest foods provide year round diversity to otherwise nutritionally poor, poorly balanced, and bland diets, they ensure a regular source of key nutrients (Clendon, 2001).

Rice was found to be the main source of carbohydrates (82%) in the diet. Rice is also a key source of protein. The diet of these relatively poor families met 100% of daily requirements for energy (carbohydrates, fat, proteins), 150% for protein (although most from rice, not from higher quality animal protein). Nutrients which were much below daily requirement levels were Vitamine A (10%), Vitamine C (30-40%), Calcium (10-35%) and Iron (70-90%).

Similar data on deficiencies in Vitamine A and Iron were also found in northern Lao PDR (Kaufmann, 1997). Although the diet is seriously deficient in micronutrients, forest foods are an important source of the micronutrients that are available. Forest foods were found to provide 4% of energy, 20% of total protein intake (but 73% of total animal protein), 40% of calcium (small fish provide the main source of calcium), 25% of iron, 40% of vitamin A and vitamin C (4% and 17% of the RDA), respectively (Clendon 2001). Poorest households do better than average (over 60% of intake of vitamins A and C came from

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

Table 2: Forest foods as nutrient sources (Clendon, 2001)

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

6. Indirect and direct contribution of forest products to food security

Another key finding of the Salavan food study was that villagers mainly rely on selling of forest products to buy rice in times of food shortage. With an average rice yield of 0.9 ton/ha from rainfed paddy on sandy soils, rice shortages are common for most families in the three villages. Villagers sell forest products such as resins to buy rice. This is a common pattern all over rural Lao PDR.

Kaufmann, 1997, surveyed 470 families in Luang Nam Tha Province (Nale and Sing districts). She found that for the average family, over a period of 10 years, there will be 5-6 year with average yield (9 months per year enough rice to eat), 3-4 years with bad yields (5-6 months enough rice to eat) and 1-2 with good yield (no shortage). The same pattern has also been found in other case studies (Clendon, 2001, UNDP, 2001, Foppes and Ketphanh, 2003, McLennan, 2004). The overriding pattern is that in the uplands, rice shortages are structural and at any given point in time there will be a number of poor families who are facing an acute need to cope with the problem of rice shortage.

The main coping mechanism for poor families facing acute rice shortages is to borrow rice. The debt is repaid either with rice from the following year, by hiring out labor, by selling livestock or by selling NTFPs. Upland farmers have buy or borrow rice to cover a shortage of three months or more. In the Luang Nam Tha study of Kaufmann, 1997, this is equivalent to about 545 kg of husked rice, worth

around 55 $. The average cash income of interviewed families in that study was estimated to be around $100. In other words, it is safe to assume that roughly 55 $ or 55 % of cash income were used to buy the missing rice, either directly or later, as repayment on a loan.

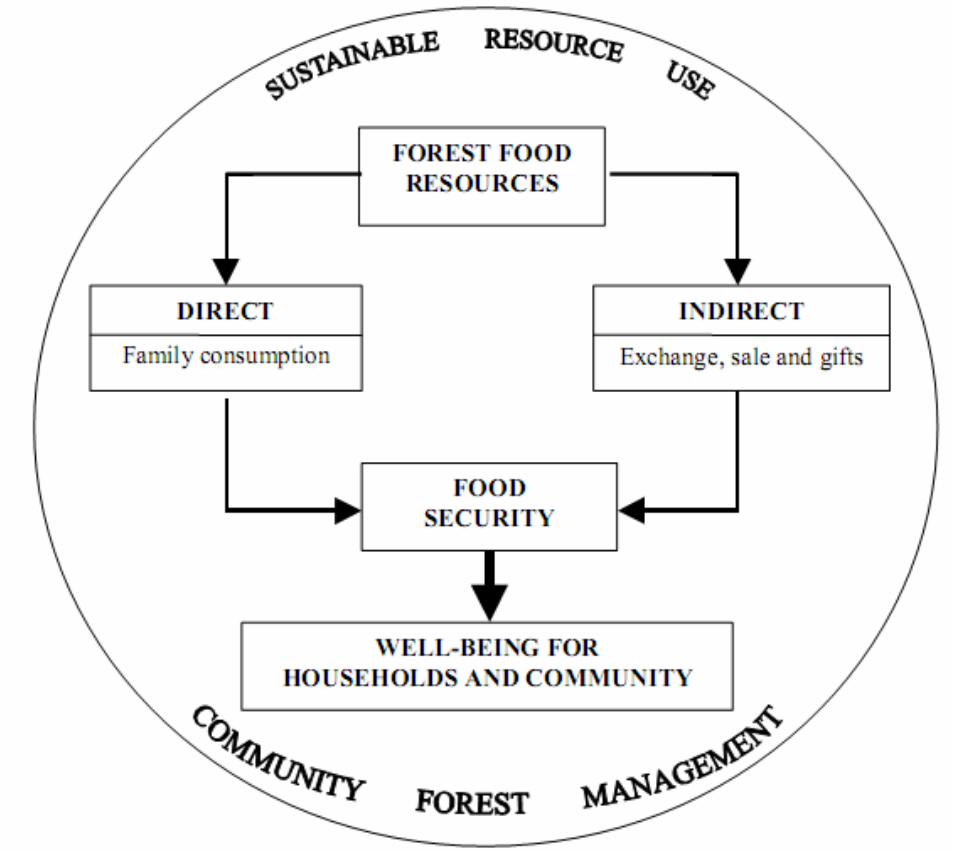
NTFPs contributed on average 61% of cash income among respondents in that study (74% in Nale, 48% in Sing district), or around $60 per family. We can conclude that almost all of the income, derived from NTFP selling, was used to buy rice (55/61 or 90%). This example has been confirmed in several other studies (see table 3). In Luang Namtha, the cash income from NTFP may have increased over the last six years, e.g. an on-going study in the same province found average cash income from NTFPs to be $123 per family in Luang Nam Tha district in 2003 (Anoulom, in press).

Table 3: Two estimates of cash and non-cash income per family per year of Two estimates of cash and non-cash income per family per year of rural upland households, with special emphasis on the role of NTFP gathering (original values were converted to US$ equivalents to compensate for currency changes of Lao kip (LAK) over time). Sources: Foppes and Ketphanh, 2004, Rosales e.a. 2003.

Location	Khammouan (5 villages	Sekong (3 villages)
Year	1997	2003
Cash income per family per year $	170	155
NTFP cash income $	69	12
NTFP cash income %	41%	8%
livestock cash income %	32%	0%
other cash income %	27%	92%
Non-cash income/family/year $	519	815
NTFPs for subsistence $	200	359
NTFPs for subsistence %	39%	44%
Rice consumption	46%	32%
Firewood	8%	6%
Other subsistence use	7%	18%
Total cash/non-cash income $	689	971
cash income % of total income	25%	16%
non-cash income % of total income	75%	84%
$ of total income from NTFPs	269	398
% of total income from NTFPs	39%	41%
Expenditures for rice buying $	111	87
Rice buying as % of cash income	65%	56%

Food security is often equated with rice production (Rigg and Bouahom, 2002). Glutinous rice is definitely the staple food for the people of Lao PDR, but there is a growing recognition that food products gathered from forests and wetlands are equally essential for the food security to Lao people. Gathering of Non-Timber Forest Products (NTFPs) is an important element in the livelihood of most Lao rural families, especially in for those living in the uplands. We can conclude that NTFPs contribute in two ways to food security: (A) through direct consumption of forest foods next to rice (B) through selling NTFPs to buy rice in times of shortage (Figure 6).

Figure 2: Direct and Indirect Impact of forest foods on food security (Clendon, 2001)



7. Trends in the availability and market demand for wild foods

Various field surveys report a decline in the availability of wild NTFP resources (Foppes and Ketphanh, 2000). Table 5 illustrates the way villagers report such declines. The main reasons for this decline are increased market pressures on NTFP resources, loss of forests due to commercial logging and conversion to agriculture, rapid population growth and massive population movements during and after the war of 1964-1975, growing insecurity on land tenure and access rights, despite Government efforts to regulate this.

For wild catches of fish and other aquatic animals, fishing families usually report declines in yields over time. These may be more an indication of the increase of the (human) fishing population then a decline in the overall availability of fish (Coates, 2001). Large hydropower projects could have a severe impact on wild fish populations by restricting fish migrations. The next sections will look at fish in more detail.

Table 4: Changes in off-takes per effort units for 3 key NTFP's over 10 years (Foppes and Ketphanh, 2004)

NTFP	10 years ago	Today
Wildlife	Plenty of wildlife: turtles, monitor lizards, deer, snakes, jungle fowl, other birds. You could easily hunt them in your backyard. There was no outside market, no selling. Only our village hunted (9 families only).	Many species disappeared: turtle, deer, jungle fowl, birds. You can walk for 48 hours and still not get anything. Market demand is big, prices are getting higher (1 mouse-deer costs 12,000 kip). Many outsiders come to hunt in our forest. Village has 57 families now.
Fish	You could catch 4-5 kg within 1 hour. There were only 9 families. No selling, no destructive methods used, only traps and nets.	You can not even get 0.5 kg in 1 hour. There is not enough to feed all our 57 families. Strong outside market (2,500 kip/kg). Destructive methods used by outsiders: explosives, guns, poison. Decline: 90%
Rattan	In 1 day, you could get 300 stems, or as many as a man can carry. We used to also have big diameter rattan, now only small diameter species.	You can only get 20-30 stems in a day. Harvesting has intensified over the last 2 years. 1 stem sells for 200kip. We know there is no quota but we need to sell anyhow. Decline: 90%.

What is the trend in demand for wild foods, as people have more access to markets and change to a consumer-type lifestyle? It is difficult to find studies that address this issue. One trend that can be observed is that some forest foods become regarded as “gourmet” specialties among urban consumers. Edible rattan shoots are a good example. As they can no longer be found near the capital city of Vientiane, a number of farmers have started growing this wild food as a vegetable crop in gardens, there is a high demand for this specialty food (Evans and Sengdala, 2002). More research is needed on trends in food consumption preferences in Southeast Asia.

8. The importance of fish and other aquatic animals

A key finding of various nutrition studies in Lao PDR is that dietary intake of fat is generally too low. The use of oil in the diet is rare and most of the fat comes from wild meat and fish. Households who have livestock tend to sell it or eat it only for special occasions. What differentiates households with acceptable food consumption from households with poor or borderline food consumption is mostly wild animal/fish protein intake. Access to such food sources is therefore critical.

A study on fisheries in Savannakhet province, Lao PDR, argues that capture fish are more important for the poor but what is done is too heavily focused on aquaculture (Bush, 2003). While aquaculture is often promoted as a means to increase household food security and income, the study shows that this idea of aquaculture as a means to meet the deficit between food supply and demand is a gross simplification. Instead it is argued that food security may be better addressed through attention to existing aquatic resources. Yet all the extension efforts in fisheries are focused on promoting aquaculture, to the neglect approaches such as community based co-management of catch fishery systems.

The study found that 65% of all fish sold on the local markets are from wild catches, 35% from fish ponds. Wild fish has a higher market price (US$1.14) than pond fish (US$ 0.98). The average daily per capita consumption was estimated at 54.7g of which 75% is fresh fish, 23% other aquatic animals and 3% processed fish. Capture fish and other aquatic animals are present in 85% of all meals (Bush, 2003).

As a livelihood, neither fishing nor aquaculture is regarded as a very important activity by communities in any of the districts. On average, communities ranked fishing as the fifth or sixth most important agricultural activity. Aquaculture is usually the responsibility of the male head of the household. Women and children are very active in the capture fishery, operating in a number of habitats and using a variety of fishing gears. Poorer families are less likely to adopt aquaculture as a result of the high cost of pond construction, lack of available land, and lack of access to technical assistance. In comparison, most families with ponds were identified as wealthy , fish culture is also used as a main indicator of wealth. None of the families doing aquaculture reported selling mature fish to local retail markets (Bush, 2003).

9. The economic value of wild foods

The most recent and reliable estimate of the amount of wild catch fisheries in Lao PDR is 208,503 ton/year or 28.6 kg/capita/year (Hortle, 2008). With a market price of US$ 2.20 in 2008, that represents a value of US$ 459 million per year. Wild catches represents more than 90% of the total annual consumption of fish and other aquatic animals in Lao PDR (Hortle, 2008).

An earlier study by the World Food Program (WFP) in Lao PDR estimates that 2,245 villages can be classified as poor and 3,682 villages were identified a being vulnerable to food insecurity. Compared to an estimated total of 9,931 villages (800,000 families) in the country over 2003, that means 23% of the entire population can be classified as poor and 37% as vulnerable to food insecurity (McLennan, 2004). That is more than one third of the Lao population. These people depend on wild fish and forest foods for their survival.

A study by IUCN on the values of two protected areas in northern Lao PDR estimated the value of forest foods consumed by local families to be around US$ 168 per family per year (IUCN, 2003). A value of US$ 100 for wild foods consumed per family per year in rural areas throughout Lao PDR would be a conservative estimate. With 80% of the population or 640,000 families living in rural areas near forests, the value of forest foods consumed in Laos can be estimate to be at least US$ 640 million per year.

Together, annual consumption of fish and forest foods in Lao PDR amount up to US$ 1.1 billion dollars per year, which is equivalent to 32% of the GDP of the country[2].

[2] Gross Domestic Product of Lao PDR was US$ 3.4 billion in 2006 . Source: Worldbank Lao PDR Country Data Profile: http://devdata.worldbank.org/external/CPProfile.asp?PTYPE=CP&CCODE=LAO

10. Replacement costs of wild foods

How much would it cost if Lao PDR were to lose its wild food resources? Quite detailed calculations were made in Lao PDR to answer this question for fish and other aquatic animals, as hydropower projects are obliged to compensate local communities for such losses.

In the case of the Nakai Nam Teun II Hydropower Project, the biggest scheme in the country, a social development study estimates that the loss of fish catches in the lower Xe Bang Fai river as a result of dam construction upstream would be as high as 731,838 kg per year. With a price of US$ 2.2 per kg in 2008, that is a loss of US$ 1.6 million per year. The same study provides a detailed compensation plan to replace wild fish catches with fish production in fish ponds and paddy fields, with a cost of US$ 7.4 million. In other words, to replace one kg of wild fish with one kg of pond fish would cost almost five times the price of one kg of fish.

Volume 4 of the same social development plan contains a detailed plan for compensating loss of Non-Timber Forest Products (NTFP) in an area where forest will be lost due to the construction of the powerhouses and a regulation pond for the Nakai Nam Theun II hydropower project .

A group of 456 households from 10 villages were using 340 ha of mostly degraded forest lands here (land parcels 33-36 in Ngommalath district). The majority of these households belong to the Brou (Makong) ethnic group. These families source NTFP, timber products and fish and wildlife from their communal forest land.

With 371 families actually collecting NTFP from the communal area, the amount of NTFP harvested from the communal forest was 183 kg per family per year, or 200 kg per ha per year. The total value of NTFP harvested by these 372 households was US$ 15,407 or US$ 41 kg per family per year (see table 5). They qualify for a five year compensation for the loss of this income, or US$ 77,034. Similar calculations are made for timber products (timber, bamboo and firewood), fish and wildlife taken from the same area.

Table 5: Compensation Values for wild products collected from 340 ha of degraded forest by 456 households in Ngommalath district, Khammouan (source: Social Development Study, Nakai Nam Theun II, 2004)

Products	Consumption	Value	Users	Total Value	Compensation
	kg/family/year	US$/family	No families	US$/year	over 5 years
Non Timber Forest Products	183	$ 41.53	371	$ 15,407	$ 77,034
Timber Products	1442	$ 210.72	372	$ 78,388	$ 391,940
Fish and other water animals	27	$ 21	336	$ 7,123	$ 35,616
Wildlife	21	$ 31.50	120	$ 3,780	$ 18,900
TOTAL	1,673	$ 230	456	$ 104,698	$ 523,490

To compensate for five years of use, the hydropower project would need to pay a sum of US$ 523,490 or US$ 230 per family per year. The plan does not detail how affected families would replace the production of lost wild products, where that could be done or whether this is technically feasible.

These two cases illustrate the difficulties of replacing wild food sources and the high costs involved. Where possible, wild food resources should be preserved as an efficient means of providing food security to local people.

11. "Bigger picture": how wild foods relate to food security

There is an on-going global discussion on how to understand different concepts of food security (Windfuhr and Jonsén 2005). The "rights to food" concept has been around since 1948, it has become an integral part of basic human rights. It means that each Government has the obligation to ensure access to adequate food for everyone and ensure freedom from hunger. While this approach assisted Governments to develop policies to develop norms on what should be done, it did not really help them to achieve concrete results.

The term "food security" became popular from the 1970's onwards. It is used by FAO and other organizations in food insecurity and vulnerability mapping systems (FIVIMS) (FAO, 2000). It provides very detailed ways of assessing food needs and This approach On the global level, this approach resulted in programs aimed at increasing national food production. Soon, it was questioned whether these production-oriented policies helped to solve the problems of hunger and malnutrition. The food security approach focuses more on rights to access and purchase food, rather than access to productive resources. The use of the term food security often misses the crucial element of the right to food.

So recently, the focus of food security debate has swung back to the concept of rights to food, especially the rights of local smallholder farmers, fishing men and women to access local food resources. The "food sovereignty" approach stresses the problems of access to land by smallholder farmers and pastoralists, and opts for a family farm / community-based rural development model that is based on agro-ecology, i.e. the sustainable use of available natural resources. This family farm/community-based model of agro-ecology is suggested as an alternative to the current trends of concentration of land and the control of other inputs (such as seeds and livestock breeds, pesticides, etc.) and outputs (marketable products).

Sustainable use of wild foods would fit very well in the light of these rights-based approaches as a secure strategy for countries in the Mekong region to address, effectively, the causes of hunger and malnutrition and the barriers to rural development.

12. Combining goals of food security and biodiversity conservation

While wild foods provide a very efficient and locally available source of nutrition, it must be recognized that dependency on wild food resources is a key determinant of vulnerability for poor people in the Mekong region, especially for ethnic minorities (Cornford and Matthews, 2007). The ability of natural resources to continue to support poor people's livelihoods in the Mekong region is at a crisis point. Losing traditional agriculture is in effect a loss of culture and this is the primary experience of poverty for ethnic minorities in the region.

For policy makers, this means that adequate legal and administrative protection should be provided to the diverse forms of resource tenure used by ethnic minorities. Policy makers need to become more aware of the effects of modernizing agriculture on poor people and think of specific interventions to reduce deprivation. Thirdly, more space should be given to cultural values in the hard-nosed world of economics, policy and development programs.

Since 2007, the Ministries of Health and Agriculture in Laos are engaged in an interesting process of developing a National Nutrition Strategy (Ministry of Health, 2008). Besides determining objectives like improving nutrient intake, nutrition education campaigns and investments in nutrition etc. this strategy comprises a large section on improving household access and food availability.

Here, approaches like “nutrition-friendly” agriculture, forest management and land use planning and “nutrition-friendly local food economics” are put forward that build very much on wise use of wild food resources. Ideally, nutrition values would become a key element of social impact assessments of any larger investment schemes that impact on wild food resources such as concessions for hydropower schemes, mining and agricultural plantations (rubber, eucalyptus, bio-fuels). The World Food Program (WFP) supports the Ministry of Health in starting up a pilot project to develop a suitable nutrition, health, and child care curriculum that uses participatory techniques and draws from local knowledge (WFP, 2007).

13. Pathways for supporting wise use of wild foods

The WFP study provides a set of clear recommendations to reduce malnutrition through wise use of wild foods, mainly at national policy level (WFP, 2008):

High level policy level recommendations to create an enabling environment for effective reduction of hunger and malnutrition:

- The Lao Government should give the highest priority to addressing malnutrition
- The concept of food security should be expanded beyond just rice availability to include production, access to and consumption of a wider range of food items
- The impact of certain policies, such as the resettlement policy, on food security should be monitored and addressed
- The values of wild food resources and their replacement value should be integrated in impact assessments for hydropower dams, agricultural and mining concessions and any other large infrastructural projects that have an impact on biodiversity resources and on food security

More technical policy recommendations at the national level:

- Encourage a higher consumption of proteins and oil/fat (general education campaign)
- Provide an "essential package" of nutrition, hygiene and quality education to primary school students should be expanded to more provinces

- Safeguard access to wild meat and fish through the management of wildlife and aquatic resources, which are increasingly under threat
- Address the vulnerability to food insecurity of Hmong-Mien, Sino-Tibetan and Austro-Asiatic groups through the creation of human and physical assets specifically aimed at these groups
- Develop nutrition monitoring systems also with regards to hazards such as droughts and floods
- Set up a system to monitor cross border food trade, prices of food commodities at district level and initiate studies with other relevant ministries to understand internal flows of food

Additional recommendations are provided in a paper from NAFRI and SNV, based on experiences in the IUCN project (Foppes and Ketphanh, 2004):

- Secure intellectual property rights for Lao NTFPs in a context of conservation of biological and genetic diversity
- Promote the unique values of' Lao cuisine' based on wild foods as a high quality healthy alternative for gourmet markets in the world (could be combined with a "one-village-one-product" trade promotion strategy)

Recommendations for extension at district and village level:

- Put nutrition and rights to food central in livelihood based strategies
- Apply rapid appraisal tools to identify role of wild foods in livelihoods and food security
- Give local communities clear access rights to forest resources to ensure their food security
- Include indicators and criteria on nutrition and use of wild foods in livelihood assessments
- Promote networking between agencies and village groups, local innovators and private sector at district and province level

Recommendations for further research:

- Economic analysis of the food security aspects of wild resources as a tool for social and environmental impact assessments of large infrastructural projects
- Set up systems to record and support the exchange of local knowledge regarding domestication and ecology of wild plants and animals
- Identify and protect genetic resources of forest food species
- Develop nursery and multiplication systems for key species, agroforestry trials to identify best practices for production of key species in gardens, farming systems research to integrate domesticated NTFPs in long rotation hill farming systems
- Special feasibility studies to assess the potential for product development of little known product groups, e.g. edible insects
- Studies to monitor changes in quality and quantity of forest foods in diets/consumption patterns of the rural population
- Studies to explore the overlap between 'food' and 'medicine' properties of many forest foods, as a basis for healthy lifestyles

14. Conclusions

Wild food products are a crucial part of human nutrition and food security in Lao PDR, they deserve more attention in national strategies on nutrition and biodiversity. Here is a quick summary of the main line of argument:

"Fading image": Wild foods such as fish, other water animals and forest foods, are often easily dismissed as something backward, something of the past, something that will soon disappear anyhow.

"Hidden strength": Yet estimates for the values of wild foods tend to be revised upwards with every new study on the topic. The value of wild foods consumed in Lao PDR annually is equivalent to US$ 1.1 billion, or 31% of GDP . Wild foods remain the main source of nutrition for millions of poor people in rural areas. In Lao PDR, 90% of all fish consumed is from catch fisheries, and fish is the main source of animal protein in the diet. Forest foods are the main safety net for poor families, providing not only most of food consumed with rice but also a source of cash income to buy rice in times of shortage.

"Hard to replace": It is very difficult and costly to replace wild foods with cultivated products. In Lao PDR, it would cost the equivalent of 5 kg of fish, to replace 1 kg of wild fish with 1 kg of fish cultivated in a pond. Fish pond costs money for construction and they depend on external inputs and labor to produce fish. In mountain areas it is often impossible to construct fish ponds. Replacement costs of Non-Timber Forest Products after deforestation or flooding are equally costly.

"Low ecological footprint, food sovereignty": Wild foods require no external inputs, minimal management, they regenerate themselves and they are locally available, especially to the poor.

"Uniqueness": Wild foods are an irreplaceable part of local cultures. Losing wild foods which are so characteristic for many local cultures in Lao PDR means a loss of cultural identity. Keeping wild foods on the menu is part of preserving the national cultural heritage.

"The wisdom of keeping wild food resources intact" Of course wild foods alone will not be able to provide sufficient nutrition to keep up with the rapidly growing human population. Agriculture and livestock systems will need to be intensified quickly. But as wild foods do contribute a huge amount of nutrition already, throwing them away by careless destruction of forests and water resources would make the goal of eradicating malnutrition even more difficult. It makes economic sense to keep wild food resources intact and accessible to local communities.

"Consequences for development strategies": Malnutrition in Laos needs to be addressed urgently. Wild foods need to be put central in national nutrition strategies. In Lao PDR, this is already happening , as the national nutrition strategy emphasizes education and raising awareness on the benefits of wild foods for a healthy diet. Nutrition strategies that promote sustainable use of wild foods also provide a powerful incentive to local communities to preserve the biodiversity resources that surround them. Linking nutrition with biodiversity provides a promising strategy for sustainable poverty alleviation.

15. References

ANOULOM VILAYPHONE, TAKEDA SHINEYA AND KOBAYASHI SHIGEO (2005). Fallow Vegetation of Traditional Khmu Swidden Cultivation in Northern Lao PDR. Nihon Shinrin Gakkai Taikai Koen Yoshishu (CD-ROM), Volume 116, page 3B28. http://sciencelinks.jp/j-east/article/200520/000020052005A0688811.php

BUSH, SIMON R. (2003) Comparing what matters with what is done: fisheries and aquaculture in the Lao PDR. Australian Mekong Resource Centre (AMRC), Division of Geography, School of Geosciences, University of Sydney, NSW, Australia, 19 pp. http://www.lars2.org/unedited_papers/unedited_paper/Bush.pdf

CLENDON, KATE (2001) The role of forest food resources in village livelihood systems, a study of three villages in Salavan Province, Lao PDR. IUCN-NTFP Project, Vientiane, 2001, 41pp.

COATES, DAVID (2001) Biodiversity and Fisheries Management Opportunities in the Mekong River Basin. Fisheries Program, Mekong Secretariat, 40 pp. http://www.unep.org/bpsp/Fisheries/Fisheries%20Case%20Studies/COATES.pdf

CORNFORD, JONATHAN AND MATTHEWS, NATE (2007) Hidden Costs: The underside of economic transformation in the Greater Mekong Subregion. Oxfam Australia,Victoria, 31 pp. http://www.oxfam.org.au/campaigns

EVANS, TOM D. AND SENGDALA, KHAMPHONE (2002) The Adoption of Rattan Cultivation for Edible Shoot Production in Lao PDR and Thailand—From Non Timber Forest Product to Cash Crop**.** Economic Botany: Vol. 56, No. 2 pp. 147–153**.** http://www.bioone.org/perlserv/?request=get-abstract&doi=10.1663%2F0013-0001(2002)056%5B0147%3ATAORCF%5D2.0.CO%3B2

KRAHN, JUTTA (2006) The dynamics of dietary change of transitional food systems in tropical forest areas of Southeast Asia. The contemporary and traditional food system of the Katu in the Sekong Province, Lao PDR. PhD Thesis, Institut für Agrarpolitik, Marktforschung und Wirtschaftssoziologie, Abteilung Welternährungswirtschaft, Rheinischen Friedrich-Wilhelms-Universität, Bonn. 245 pp.

FAO (2000) Guidelines for National Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS): Background and Principles. FAO Information Management Division, 29 pp. http://www.fao.org/DOCREP/003/X8346E/X8346E00.HTM

FOPPES, JOOST AND KETPHANH, SOUNTHONE (2004) NTFP use and household food security in Laos. paper prepared for the NAFRI/FAO EM-1093 Symposium on "Biodiversity for Food Security", Vientiane, 14-10-2004, 14 pp.

HORTLE, K.G. (2007) Consumption and the yield of fish and other aquatic animals from the Lower Mekong Basin. MRC Technical Paper No. 16, Mekong River Commission, Vientiane. 87 pp.

IUCN (2003) Field Study on the Economic Aspects of Nam Et and Phou Loei National Biodiversity Conservation Areas. 68 pp. http://www.mekong-protected-areas.org/lao_pdr/field.htm

KAUFMANN, SILVIA (1997) Nutrition and Poverty in ethnic minority areas of Northern Laos, a case study of Khamu and Akha communities in Nalae and Sing districts. Health and Nutrition Team of Muang Sing and Nalae, February to May 1997, 139 pp.

MCLENNAN, KARIN, 2004. Lao PDR: Analysis of forest dwelling populations and vulnerability to food insecurity at the village level. VAM-Vulnerability Analysis and Mapping, World Food Program (WFP) Lao Office, Vientiane, 2004, 54 pp.

MEUSCH, E., YHOUNG-AREE, J., FRIEND, R. & FUNGE-SMITH, S.J. (2003) The role and nutritional value of aquatic resources in the livelihoods of rural people – a participatory assessment in Attapeu Province, Lao PDR. FAO Regional Office Asia and the Pacific, Bangkok, Thailand, Publication No. 2003/11, pp. 34. http://govdocs.aquake.org/cgi/content/abstract/2006/101/1010470

MINISTRY OF HEALTH (2008) National Nutrition Strategy, Draft Version for submission to Steering Committee. Vientiane, April 2008, 17 pp.

MOLLOT, ROGER, CHANTHONE PHOTHITAY & SONSAI KOSY (2004) Seasonally Flooded Habitat and Non-Timber Forest Products: Supporting Biodiversity and Local Livelihoods in Southern Lao PDR. WWF Lao Program with Living Aquatic Resources Research Center (LARReC) and the Livestock and Fishery Section of Savannakhet Province, Vientiane, 27 pp.

NAM THEUN II HYDRO POWER PROJECT (2005). Social Development Plan for the Nam Theun II Hydropower Project. Volume 3: Downstream Area Resettlement and Livelihood Restoration. http://wwww.namtheun2.com/gallery/lib_sdp.htm

RIGG, JONATHAN AND BOUNTHONG BOUAHOM (2002) Food Security and Sustainable Livelihoods in the Lao PDR. Country Report, INCO-Dev Thematic Network on Sustainable Livelihoods in Southeast Asia, University of Roskilde, Denmark. see also website: www.ssc.ruc.dk/inco/activities/deskstudies/Desk%20study%20Laos.pdf

ROSALES, R. M. P., M. F. KALLESOE, ET AL. (2003) The economic returns from conserving natural forests in Sekong, Lao PDR. Vientiane, IUCN Asia, Regional Environmental Economics Program (REEP): 47 pp.

WINDFUHR, MICHAEL AND JONSÉN, Jennie (2005) Food Sovereignty: Towards democracy in localized food systems. FIAN-International. ITDG Publishing, The Schumacher Centre for Technology and Development, Bourton-on-Dunmore, Rugby. 57 pp. http://www.ukabc.org/foodsovpaper.htm

World Food Program, WFP (2007) Comprehensive Food Security and Vulnerability Analysis Report for Lao PDR. To be posted on www.wfp.org/odan/senac or www.vam.wfp.org