Institut für Agrarpolitik, Marktforschung und Wirtschaftssoziologie
Abteilung Welternährungswirtschaft

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

I n a u g u r a l – D i s s e r t a t i o n

zur

Erlangung des Grades

Doktor der Ernährungs- und Haushaltswissenschaft

(Dr.oec.troph.)

der

Hohen Landwirtschaftlichen Fakultät

der

Rheinischen Friedrich-Wilhelms-Universität

zu Bonn

vorgelegt im Februar 2005

von Jutta Krahn

aus Hilden

Referent: Prof. Dr. Dr. h.c. Walter Schug

Koreferent: P.D. Dr. Friedhelm Marx

Tag der mündlichen Prüfung: 20.07.2005

Erscheinungsjahr: 2005

Diese Dissertation ist auf dem Hochschulschriftenserver der ULB Bonn

http://hss.ulb.uni-bonn.de/diss_online elektronisch publiziert.

ACKNOWLEDGMENTS

First of all, I would like to extend my sincere gratitude to Professor Walter Schug for his kind supervision of this work, and in particular for his advice not to "lose myself in the beetle details". I especially wish to acknowledge his multi-level support in helping to complete this interdisciplinary project which reaches far beyond his main interest in the field of economics. Indeed, it was through his lectures that I first became interested in the dynamics of development work. Next, I would like to express my deepest thanks to P.D. Dr. Friedhelm Marx (my second supervisor) for the many valuable discussions which extended far beyond issues of chemistry. My heartfelt gratitude is also extended to the "lost" third supervisor, Professor Joseph M. Platenkamp, Head of the Institute of Anthropology, Münster University. It was through his assistance that I was able to link up with the Lao Cultural Research Institute (CRI) of the Lao Ministry of Information and Culture.

I would further like to say "*khob chai lai lai*" to: Dr. Houmphan Rattanavong, Dr. Chantapilith Chiemsisouraj and Sisomphone Soukhavongsa at the CRI for facilitating and advocating my research. My very special thanks also go to Monsieur Dr. Ananda Paxaxay for showing me "the Buddhist way of fieldwork", and for his successful and innovative handling of the various "maleurs" we were facing. In addition, my sincere thanks to Sekong's CRI, and in particular to *Sahai* Sivilai and *Sahai* Khampai who were very patient in accepting stubborn Western research ideas in such a remote place. I would also like to acknowledge the CRI in Kaleum.

I would like to express my heartfelt thanks to UNDP SEP DEV's team in Sekong, especially to the Project Director Chanhome. Without SEP DEV's help this work would never have been possible. This is not only for allowing me to erect my camp on the SEP DEV river bank and use their office facilities, but also for discussions and for cheering me up in times of illness and great frustration. I would also like to thank Albert Soer, Jacqui Chagnon, and Andrew Mittelmann.

In terms of local wisdom, I am extremely grateful to "*Ajan*" Vipon at the Lao Front for National Construction for sharing with me his indigenous knowledge on the Katu. I would also like to gratefully acknowledge the many Katu families who were selected as target families from the villages. Plomm and his wife Sum in particular opened the door for me into the Katu's universe. My sincere thanks also go to: Bounkheun, Soumphone, Meud, Bounleua, Dang, Ngeu, Sida, and Vipat.

For chemical analysis, my appreciation is extended to the Institute of Nutrition, Mahidol University, Bangkok. Thanks in particular goes to the kindly assistance of Ajan Somsri Charoenkiatkul as well as that of Ajan Orapin and Kitti Sranacharoenpong. I would also like to thank the owner of the Atlanta Hotel in Bangkok, Dr. Charles Henn, for allowing me to fill up the hotel's refrigerators with samples when I arrived late, and also for the inspiring talks we had in the hotel's lush garden.

For the identification of Latin names I appreciate the help of Dr. Vichit Lamxay, Boonthavy Douangphosy, Chantavy Vongkhamheng, Dr. Arlyne Johnson, Ken Aplin, Bryan Stuart, Dr. Frank Steinheimer, Chris Shepherd, Dr. Rainer Günther, and Dr. Michael Ohl. I would also like to thank Dr. Hutterer for his feedback on my calculations on usable meats.

For supporting and financing my health survey I would like to express my deepest gratitude to WHO Laos, and in particular to its former head Dr. Giovanni Deodato and his colleague Hanne Strandgaard. In this vein my thanks also goes out to Dr. Latxamee, at the Provincial Hospital in Sekong, to the Malaria Control Station and in particular to Dr. Rattanaxay and his team in Vientiane.

For introducing me to Lao ecological issues I would like to thank TERRA, Ian Baird, Joost Foopes, the rest of the WCS team, and WWF. For the various exciting discussions on the cultural affairs special thanks goes to Dr. Jim Chamberlain and Steeve Davieau.

I am also very grateful to the team of German Agro Action in Laos and Bonn and in particular to Gregor Faath for the valuable discussion on NGO work in Laos and for helping me wherever possible in Vientiane. I am grateful for having been allowed to join your team in Odoumxay which permitted me to expand my horizon over the Sekong border. There are also various other NGOs and development organizations to whom I am grateful including: FAO Laos, Concern, DED, and Care amongst others. In particular I wish to thank Laurent's ACF team who allowed me to join their working expedition to Upper Kaleum.

Special acknowledgment is due for the financial support from the Graduiertenförderung Nordrhein Westfalen, and the German Academic Exchange Service (DAAD), and for the grants and positive encouragement from the Vater und Sohn Eiselen Stiftung, and the Arthur und Anne Feindt Stiftung.

For helping me out with the many English problems I am very grateful to John Couche and Tom Bantock in Berlin. Thanks also goes out to Alheide von Wehrs for her administrative support.

And also I would like to warmly thank all my friends in Sekong, Vientiane, Bangkok, Berlin, and Cologne. "Ein besonders herzliches Dankeschön" goes to Bruce, Rachel, Bernadette, Petra, and Vere Nah.

Finally, I wish to express my heartfelt thanks to my parents for their forbearance, their generous support, and for the free rein they furnished me with, without all of which it would not have been possible to prepare for – nor complete – this thesis.

ABSTRACT

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

From a nutritional point of view, this thesis started with the hypothesis that Laos is lacking a food security concept which sufficiently responds to the country's unique cultural and biological resources, and as such to provide local solutions for its emerging nutritional problems in the uplands.

The author concentrated on the following five objectives: (1) The traditional and contemporary food system and diet were described, and the present nutrient intake was assessed. (2) The health and nutrition situation was analysed. (3) Determinants for dietary change were identified. (4) Recommendations about harnessing positive dietary change were proposed. (5) Assumptions within the current Lao food security concept were discussed and tentatively corrected.

Between 2001 and 2003, through the investigation of material and cultural elements of the Katu food system, a historical continuum of food acquisition as well as of culinary principles was identified and described for four villages. It was shown that the traditional Katu diet was nutritionally adequate but is shifting towards inadequacy, which appears to be related to a higher intake of rice (adversely processed) and a concomitant lower intake of a variety of other staples, meats, wild fruits, and wild vegetables. The identified high levels of stunting, wasting, being underweight and parasitic infections, however, do not vary significantly between the villages. Low levels of anaemia and iodine deficiency disorders were identified, but vit A deficiency could not be detected. It is instructive that negative dietary change can be ascribed in particular to the two villages which are apparently more "modern". There the lower nutrient intake might only be buffered by a better health or access to medicines. The two villages in the forest away from the lowland societies show a more acceptable nutrient intake, but factors other than the intake of nutrients might have an impact on their nutritional situation. These could be disease, excessive smoking, and continuous exposure to chemical residues from the war period.

The negative dietary change has shown to be mainly the result of two direct causes. The first cause is the disruption of the agroecosystem (most severely hunting). The second – and less acknowledged - cause is the vanishing of interrelated culinary principles, including kinship solidarity and concomitant culinary monotony. The Katu's food system was also found to be strongly affected by underlying forces which are slipping out of the Katu's control. As such, forces for the national integration together with the interaction of regional systems and evolving market commodities appear to suppress the Katu's own potential for cultural innovation and occur at the expense of the local environment.

Subsequently, it was inferred that there is yet a high food-based potential to arrest the process of the Katu's negative dietary change. However, the current Lao food security concept is neither based on a comprehensive understanding of the changing dynamics of upland food systems, nor does it attempt to draw on the full potential of traditional food chains, cuisines, and diets. As such, the author identified four major fallacies: Firstly, it was proposed that the concept makes many uplanders food insecure by ill-definition. Secondly, it was shown that the goal of reaching food security via market integration becomes illusive. Thirdly, until now, most of the food security activities are localized at the food chain level and do not appear to sufficiently respond to culinary principles. Fourthly, it was postulated that the food security concept is completely detached from the underlying causes of nutritional problems.

It became evident that the concept of food security for ethnic minorities living in tropical forest areas rich in biodiversity urgently needs to be restructured and be made more polyvalent. It is proposed that the need for external and high input interventions is far less than anticipated as local self-help potentials are not yet optimized.

DEUTSCHE KURZFASSUNG

Der Wandel von Ernährungssystem und Nährstoffaufnahme in den tropischen Waldgebieten Südostasiens. Eine Fallstudie über das traditionelle und das transformierte Ernährungssystem der Katu in der Provinz Sekong der Demokratischen Volksrepublik Laos

Dieser Arbeit liegt die Hypothese zugrunde, dass das derzeitige Konzept zur Ernährungssicherung in der VR Laos nicht das Potential hat, einen positiven Ernährungswandel der verschiedenen Ethnien in den Wald- und Waldrandzonen zu unterstützen. Die Arbeit verfolgt fünf Hauptziele: (1) Das traditionelle und das derzeitige Ernährungssystem sollen dokumentiert werden. (2) Traditionelle und derzeitige Ernährungsweisen sollen anhand von Nahrungsmittelgruppen beschrieben werden. Die derzeitige Nährstoffaufnahme wird ermittelt und mit den Empfehlungen für die Nährstoffzufuhr sowie dem Ernährungsstatus verglichen. (3) Einflussfaktoren auf das heutige Ernährungssystem unter besonderer Berücksichtigung des Ernährungswandels werden ermittelt. (4) Empfehlungen für die Steigerung der Nährstoffzufuhr werden entworfen und notwendige Voraussetzungen dafür werden identifiziert. (5) Das derzeit angewandte Ernährungssicherungskonzept wird diskutiert.

Von 2001-2003 wurden mittels eines selbstentwickelten Rahmenkonzepts kulturelle Elemente (Cuisine) wie auch materielle Elemente (Nahrungsmittelkette) des traditionellen und des transformierten Ernährungssystems beschrieben. Es wurde festgestellt, dass die traditionelle Ernährung der Katu nährstoffreich ist, welches auf einen sehr hohen Verzehr von Fleisch, verschiedener Getreidearten, Wurzel- und Knollenfrüchten und einem hohen Anteil an Wildfrüchten und -gemüsen zurückzuführen ist. Die Konsummuster von heute wurden wie folgt charakterisiert: Hoher und ansteigendender Reisverzehr, rückgängiger Fleischkonsum, ansteigender Verzehr domestizierter Obst- und Gemüsearten. Insbesondere Protein, Fett, Vit B_1, Vit B_2, Kalzium, Eisen und Zink wurden als kritische Nährstoffe identifiziert. Es wurde ermittelt, dass alle Dörfer ein hohes Mass an *stunting*, *wasting* und Untergewicht aufweisen. Eisen- und Jodmangel konnten nur in geringem Mass und Vit-A Mangel nicht festgestellt werden. Die Analysen der Stuhlproben zeigten ein hohes Mass an parasitären Infektionen. Es wurde herausgefunden, dass der Verlust der traditionellen Katu Medizin bisher nicht mit neuen Gesundheitsdienstleistungen abgepuffert werden kann.

Allgemein konnte festgestellt werden, dass der negative Ernährungswandel auf zwei Hauptursachen beruht: Erstens, trägt der unvorteilhafte Wandel des Agrarökosystems, insbesondere eine abnehmende Jagdausbeute, massgeblich dazu bei. Zweitens, die Vereinfachung der kulinarischen Prinzipien, insbesondere der Nahrungsmittel-, Speisen- und Gewürzvielfalt verringern das Potential einer ausgewogenen Nährstoffzufuhr. Externe Einflussfaktoren auf das Ernährungssystem wurden identifiziert und gruppiert in a) biokulturelle Adaptation, b) Umweltzustand, c) nationale und d) regionale Integration.

Es wurden Empfehlungen für einen positiven Ernährungswandel ausgesprochen mit Foki auf a) sechs Nahrungsmittelgruppen, b) die Nahrungsmittelkette und c) die Cuisine unter besonderer Berücksichtigung der externen Einflussfaktoren. Es erscheint evident, dass derzeitige Ziele zur Ernährungssicherung auf falschen Annahmen beruhen: Ernährungssicherheit wird ausschliesslich als Reissicherheit definiert. Nährstoffverluste durch den zurückgehenden Konsum von Wildgemüsen und –tieren werden unterschätzt und ihre Substitution durch gekaufte Nahrungsmittel überschätzt. Der Fokus auf Produktion und Kauf von Nahrungsmitteln überlagert das Potential, die Anteile der Nahrungsmittelgruppen zu optimieren und vorteilhafte Zubereitungs- oder Konservierungsmethoden wiederzubeleben bzw. Innovationen in der Cuisine einzuführen. Es wird nicht ausreichend versucht, auf externe Einflussfaktoren einzuwirken. Es wird die These aufgestellt, dass auch in anderen tropischen Waldregionen mit hoher kultureller Vielfalt und Biodiversität das lokale Ernährungssicherungspotential nicht ausreichend genutzt wird und nicht in jedem Fall externe Intervention mit hohem Input notwendig sind.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Abbreviations

ADB	Asian Development Bank
ACF	Action contre la Faim
ASEAN	Association of Southeast Asian Nations
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit
CESVI	Solidarieta Italiana Per Il Mondo
CRI	Cultural Research Institute
DAAD	Deutscher Akademischer Austausch Dienst
DC	Dietary change
DED	Deutscher Entwicklungsdienst
DGE	Deutsche Gesellschaft für Ernährung
FAO	Food and Agriculture Organization of the United Nations
FCT	Food composition tables
FSS	Food security strategies
GAA	German Agro Action (Deutsche Welthungerhilfe)
GDP	Gross domestic product
GFWS	Gravidity fed water system
GMS	Greater Mekong Subregion
GOL	Government of the Lao PDR (central government)
GTZ	Gesellschaft fuer Technische Zusammenarbeit
HLPC	High pressure liquid chromatography
IDD	Iodine deficiency disorders
IFAD	International Fund for Agricultural Development
INMU	Institute for Nutrition (Mahidol University, Bangkok)
IRRI	International Rice Research Institute
IUCN	International Union for Nature Conservation
Lao PDR	Lao People's Democratic Republic
Lao UXO	Lao National Unexploded Ordnances Programme
MIC	Ministry of Information and Culture
MSG	Monosodium glutamate (seasoning powder)
NPEP	National poverty eradication programme
NTFP	Non-timber forest products
OAA	Other aquatic animals
PPA	Participatory poverty assessment (see also references)
RDA	Recommended daily allowances
RTs	Roots and tubers
SC	Shifting cultivation
SEA	Southeast Asia
SEP DEV	Sekong Ethnic People Development Project of the United Nations
TERRA	Towards Ecological Recovery and Regional Alliance
TRAFFIC	Wildlife trade monitoring network (Programme of WWF and IUCN)
UM	Usable meats
UNDP	United Nations Development Programme
USDA	United States Department for Agriculture
UXO	Unexploded ordnances
WB	Worldbank Group
WCS	World Conservation Society
WHO	World Heath Organization of the United Nations
WWF	World Wildlife Fund

TECHNICAL TERMS

ad.	Adapted from (used for nutritional values)
BCT	Bones, cartilage, and tendons
cap	Capita
d	Day
g	Grams
kcal	Calories
mg	Milligrams
mo	Months
n.d.	No data
SD	Standard deviation
sp.	Specie (one only)
spp.	Species (possible species in family)
TLBW	Total live body weights
TQE	Toxic equivalents
UM	Usable meat
UMEP	Usable meat and edible body parts
μg	Micrograms

CHEMICAL TERMS

β-Car	β-Carotene
Ca	Calcium
CHO	Carbohydrates
Crude F	Crude fat content
Crude P	Crude protein content
Cu	Copper
DM	Dry matter
FA	Fatty acid
Fe	Iron
I	Iodine
K	Potassium
Mg	Magnesium
MOFA	Mono-unsaturated fatty acids
PUFA	Poly-unsaturated fatty acids
Se	Selenium
SFA	Saturated fatty acids
Vit	Vitamin
Zn	Zinc

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

Sustainable development is confronted by high rates of mal- and undernutrition worldwide; in particular by a disproportionate level of biodiversity rich areas, especially in the uplands. In tropical Southeast Asia these upland areas are often forests, predominantly inhabited by diverse ethnic, often indigenous groups. As such, tropical Southeast Asian forests are rich in both cultural and biological diversity, but poor in terms of socio-economic development. Over the centuries in these pockets of forests, traditional culture-specific food systems have evolved. Traditional economies are based on swidden farming, livestock production, hunting, fishing, and gathering edible forest products and other NTFPs (Non-timber forest products) from the forest.

In the past, traditional diets often met nutritional recommended daily allowances (RDA) for macronutrients, vitamins, and minerals. In various examples, it has been demonstrated that the many unique wild plants, together with the wild animals eaten by ethnic groups contributed significantly to a balanced nutrient intake. For some species tremendously high values of critical nutrients have been identified.

Within the processes of pervasive delocalization, traditional food systems are now being increasingly reshuffled. This translates into dietary change, for better or worse. Negative dietary change, which is prevalent in most cases, is often the result of an imbalance between external and internal determinants. In these cases, nutrient intake has shifted towards a level below the recommendations considered standard for health and a good quality of life.

Institutions and agencies involved in working with food security do not, however, sufficiently address the evolution of negative dietary change. Firstly, they mainly act on the materialistic dimension, but seldom explore the contentious cultural dimension. Secondly, there is a lack of knowledge about the food resources which ethnic people know and use. Scientific and laboratory data for nutrients and phytochemicals is unknown for many species. Thirdly, the idea that increased food production necessarily translates into food security at rural household level, and thus into a better nutritional intake, has been proved fallacious. Taken together, questionable assumptions for achieving food security in forest areas among the various Southeast Asian ethnic groups run the risk of causing transient impact - or even project failures.

This study emanates from the practical observation that an area in the Lao People's Democratic Republic (Lao PDR), which was once food abundant, is now classified as food insecure and extremely poor. The Katu, an Austro-Asiatic group indigenous to the mountain chain bordering Viet Nam were once relatively adept at using various food sources, especially wild animals. Now many Katu villages are no longer able to meet nutritional requirements.

From a nutritional point of view, and in the case of the Katu, the author postulates that the current concept of food security in the Lao PDR does not have the potential to advocate a positive dietary change in the uplands and the ethnic groups there. This infers that the current concept held by the Lao government (GOL) and foreign development organizations is not based on a comprehensive understanding of the dynamics of dietary change in transitional upland food systems. The meagre database on food systems is mainly based on lowland research. Statistical compilations are sometimes found to be substantially varied according to governance partialities. The current received wisdom does not sufficiently respond to all the relevant problems and challenges, and it appears to be obscured by an excessive focus on improved rice production. There is an urgent need to review the current assumptions of the Lao food security concept, and the options which ethnic peoples themselves have in adjusting to their changing food systems and diets.

This study has five main objectives:

(1) Based on a two-year empirical study, the traditional and contemporary food systems of the Katu are described. Both systems are portrayed by the description of their main elements.

(2) The traditional and contemporary Katu diets are described in terms of the main food groups. For the contemporary diet, the nutrient intake is assessed. As an indicator of its nutritional adequacy the Katu health and nutrition situation is analysed.

(3) Determinants for transformations in the contemporary food system, which necessarily translate into dietary change, are identified.

(4) Recommendations about harnessing positive dietary change in the transforming Katu food system are provided. These are complemented by the identification of prerequisites, which are necessary to put the recommendations into practice.

(5) Assumptions within the current Lao food security concept are discussed and corrected in order to gain the potential to advocate positive dietary change.

Taken together, this interdisciplinary project is designed to map out constructive possibilities for making the Katu food system provide better nutritional requirements in ways that are environmentally, economically, and socially sustainable.

1.2 Outline

The work starts with the description of transitional food systems and diets in tropical forest areas of Southeast Asia (chapter 2). For that purpose the author developed a theoretical framework which accommodates seven main elements of traditional food systems. When necessary, chapter 2 also includes comparative information from other parts of the world (e.g. nutritional values). Then a model is presented to explain negative and positive dietary change which is subsequently discussed in relation to the orthodox concept of food security. Before starting in chapter 4 with the analysis of the Katu's food system, diet, and health, chapter 3 introduces the dynamics of the development process in the Lao PDR. The description of the Katu food system highlights culinary aspects of dietary change, which is complemented by a very detailed description of the nutrient intake in the contemporary diet. In chapter 5 determinants for transformations in the current Katu food system, which necessarily translate into dietary change, are identified. For that purpose a theoretical framework from Huss-Ashmore and Thomas (1988) was employed. After having given recommendations and identifying prerequisites for improving the contemporary Katu diet in chapter 6.1 and 6.2, chapter 6.3 provides a brief evaluation of the Lao food security concept. The main findings of this work are summarized in chapter 7.

There are summaries at the end of each chapter. The various tables (and the attached photos) highlight the main findings.

In Appendices 1.1 and 1.2, species of traditional foods known to the Katu are presented in animal and plant groups. Where possible, Katu, Lao, English, and Latin names are provided for all species. The details on Katu and Lao language renditions are presented in "Notes on Appendix 1". In Appendix 2 results from chemical analysis of selected food items are listed. Appendix 3 contains calculations of the nutritional values of food groups, where local data was not available.

For the avoidance of doubt it should be noted that the intellectual background of this work comes from nutritional sciences and development research in particular. The eclectic usage of anthropological material is therefore warranted but has been limited to the author's training in nutritional sciences.

Overall, the derivations proposed in chapter 6 are highly transferable and might provide a basis for other concepts of food security in biodiversity rich areas of Southeast Asia. The reader however, should refrain from drawing upon the Katu culinary principles which are culturally distinct.

1.3 METHODOLOGICAL FRAMEWORK

1.3.1 The research conditions

Within the restraints of time and conductibility, the author ventured to complement classical methods from natural sciences with anthropological techniques.

The challenge of conducting a multidisciplinary study under the conditions in the Lao PDR, and in the Sekong Province in particular, was formidable. Research was hooked up at the Cultural Research Institute (CRI), a line agency of the Lao Ministry of Information and Culture (MIC). The difficult processing of bureaucratic necessities by the Lao government, which impinges on any research project, together with the inaccessibility of the Kaleum district called for constant change in the research plan. The author had to accept that as a female researcher, permission to visit the very origin of Katu settlements in Upper Kaleum would not be granted (for the map of the research area see figure 7)[1]. While running her own research project, the author was not connected to any development organization, but received most generous support from the staff of the Sekong Ethnic People Development Project (SEP DEV) of the United Nations Development Program (UNDP). By courtesy of the GOL, final permission for fieldwork was given in January 2002 - despite having first been rejected in November 2001. Final permission was also granted by the Ministry of Foreign Affairs. Subsequently, most of the data was collected over a consecutive 17 month period in four Katu villages. In spring 2004 the author was able to visit the target villages again. During field work there were major health risks due to endemic diseases, unexploded ordnances from the war time (1960s-1970s) and wildlife.

Investigation into the Katu food system and diet was especially difficult as many of the Katu food items have no corresponding Lao word. In Kaleum most of the women speak only Katu. The nutrient composition was unknown; daily and seasonal availability of foods fluctuated substantially. For plant and animal species there are no congruent references available. Much of the Lao biota is still unidentified. Compared to other Southeast Asian countries, secondary literature on food acquisition, consumption, and health was almost nonexistent. Some figures in the official government's statistics deviate from what is shown here.

The profile of the different villages is described in chapter 4.3. All villagers were very cooperative and generously helped to facilitate the research. During her research time the author made frequent trips to the villages which were accessed on foot or by car, boat, or motorbike, depending on the season. The author was never allowed to stay alone in the villages and was always accompanied by counterparts from the MIC's line agency CRI. The counterpart from the central level also conducted translation from English into Lao. Then either villagers or the counterpart from the district level translated from Lao into Katu. After about one year the author was able to conduct her field trips without the assistance

---

[1] *The author intended to travel to the old settlements of Ban Tham Deng and Ban Kandon, which would have been a 4-5 day walk from the Kaleum district capital (each way). The author assumed that the difficulties she encountered were the results of it transpired that they in fact derived from a hidden agenda, a fear that any accidents and disease in such an inaccessible area would have had severe consequences for those officials responsible for the district: the provincial administration and the CRI. The author's suggestion to provide a letter expressing that she would take the full responsibility for the consequences was rejected both by GOL and the German Embassy. Nevertheless, the author endeavoured to get an understanding of the whole area. One trip to Upper Kaleum was made with ACF under the direct auspices of the District Government. Village production statistics and other data from this trip were used for comparison.*

of an English translator, and she was allowed to stay in Kaleum overnight with someone only from the district level.

1.3.2 Analysis of the food system: Cuisine and food chain

At the outset maps of earlier and current village sites were drawn. Comparisons to past villages relationships were recalled by the elderly Katu.

To describe the transitional Katu food system a mix of methods was applied. Structurally, the elements of their food system (detailed in figure 1) were each explored both with qualitative and quantitative methods. Villagers rely mainly on oral history and not statistics. Therefore almost all of the socio-economic and demographic village data was gathered with great difficulty, since production, income, health and demographic statistics are not recorded by the villages' statistic book. All production statistics indicated here are calculations from the villagers' own estimations; to the villagers the concept of kg or t is mainly unknown. The author set one *thaang* at 10kg, one *kasop* (or sop) at 30 kg, or one *khapa* at 20kg unhusked rice. For comparison within the districts, in Kaleum in particular, no reliable production statistics exist. For cassava harvest the author assumed that one tree yields approximately 3-4kg of tubers (unpeeled).

In general, village statistics were first obtained and then later compared with sample information from ten families. The target families always included the village head's family and were completed with randomly selected families from three economic strata. There was no overall questionnaire. The families were interviewed step-by step, mainly in the evenings. The general research concept was split into various topics which were each worked through in successive trips over the course of two years. Qualitative data was obtained, including ranking of taste, problems, eating frequency and perception of change (e.g. health status), etc. It should be noted that the tables in chapter 4 with n=10 indicates ten families (not people). Indeed, the ten families (consumption units) comprised 54 people in NB-TM, 132 in KDM, 61 in TK, and 53 in TD. As time progressed the author was able to frequently question focus groups both formally and informally on a wide variety of topics.

For the historical data the elderly were consulted separately. In order to obtain information about the processes of change, a timeline was discussed with the village chief. The historical production data was recalled to the best of the villager's recollections. It should therefore be noted that some of the historical data is not exact. However, trends can be inferred from the historical data which was the ultimate intention here. Moreover, "Ajan" Vipon at the Lao Front for National Reconstruction in Sekong - being of Katu origin and who was born in Upper Kaleum - was a key informant concerning Katu culture and historical change.

Close relationships with the families evolved. Since most of the time was spent in the village Tham Deng (TD), most of the participatory observation took place there. The author participated in the shifting cultivation such as slashing, burning, field preparation, sowing, weeding, and harvesting. Moreover, the author joined the Katu in the forest to set and check traps, helped with gathering, with digging cassava, and she observed fishing. Back in the village, the author spent her time in the hearth area to observe storage and cooking methods, and sometimes she helped with preparation.

Traps, snares, agricultural implements, cooking utensils, and cooking methods are described in chapter 4.4 and 4.5. Ethnographic descriptions are far from exhaustive as only relevant aspects were recorded. One should not eliminate from the accounts the fact of whether the observed behaviour was modified due to the presence of the author.

1.3.3 Diet

To understand dietary breadth and local foods, the author went to great lengths to compile a specific Katu food list. In order to record plants, transect walks into forest and fields were undertaken. Despite the high number of species identified, villagers in TD claimed "*you have to conduct three more years of research to fully understand our gamut of used species*". Names were listed in the local Katu dialect; however, some names could not be recalled due to mispronunciation. Most villagers in TD belong to the linguistic Katu subgroup *axan rangae,* whose dialect is not fully understood in other Katu villages. Names of species and varieties which could not be recalled in TD, were deleted from the initial Katu food list, which was comprised of more than 1,000 entries. Taboos and other cultural principles were opportunistically explored. Food preferences were analysed at village level only with the aim of identifying the "Katu mouth".

1.3.3.1 Identification of fauna and flora species

Some plant specimens were collected, which together with photographs, were then handed to a taxonomist of Dong Dok University, Vientiane. The rest of the flora was identified by the Lao names under usage of the classical work from Vidal and the compendium edited by Evenson (Vidal 1959; Evenson 1994). Some of the species remain unidentified. Specimen collection was severely hampered by limited access to the habitat, by seasonal changes, and by transport difficulties. One full specimen collection was discarded in the field due to accidental formalin exposure.

For the identification of the fauna, books were brought to the villages to enable a focus group of men to become familiar with the diagramming of animals. Key informants were then asked to identify those species recorded in the Katu food list. Cross-checking took place by asking questions on size, shape, appearance, feeding and preying habits, behavioural patterns, and song. The villagers had extraordinary knowledge on the fauna and were able to provide much more information than the author was able to record. The species identified were cross-checked with international references and reports to establish whether the selected species were indeed residents in the research area (these were Chujo 1964; Napompeth 1965; Baudon 1968; Gressitt 1970; Lekagul and McNeely 1977; Turner and Rose 1989; Lekagul and Round 1991; Holyo del, Elliot *et al.* 1992; Clement, Harris *et al.* 1993; Kemp 1995; Ng and Naiyanetr 1995; Schaller 1995; Bezzel and Bauer 1995a; Bezzel and Bauer 1995b; Lambert and Woodcock 1996; Timmins and Vongkhamheng 1996; Manthey and Grossmann 1997; Cox, Dijk van *et al.* 1998; Feare and Craig 1998; Showler, Davidson *et al.* 1998; Duckworth, Salter *et al.* 1999; Madge and Burn 1999; Nowak 1999; WWF 1999; Baird 1999a; McGavin 2000; Cheke, Mann *et al.* 2001; Francis 2001; Stuart, Djik van *et al.* 2001; Eames, Steinheimer *et al.* 2002; Alstroem and Mild 2003).

Technical assistance was further provided by WCS and WWF in Vientiane, TRAFFIC in Kuala Lumpur, and the Natural History Museum in Berlin. Fish, frogs, and OAAs were preserved in a 10% formalin solution. Amphibians were partly identified from the author's photos by the Smithonian Institute in Washington. The Katu food lists in Appendix 1.2 indicate methods and references for various taxa. The reader should refrain from seeing this Appendix as confirmation of the animal's habitat. The data here is an ethnozoological classification which provides only preliminary data on species taxonomy. It should be recalled that most of the taxa is still scientifically unidentified in this region (WWF 2003a). Besides the preliminary habitat surveys of Showler and Timmens *et al* not much information is available on the Sekong Province (Timmins and Vongkhamheng 1996; Showler, Davidson *et al.* 1998; Steinmetz, Stones *et al.* 1999).

For some plants several Lao and Katu words coexist in the same village (e.g. *gnak khui, van son, gnak falang, gnak kho heng*[2] in Lao*, lan prrluh, tchatogn xaxae, tchatogn ahang* in Katu*).* Correct recording required asking different people several times, who often disagreed amongst themselves (Katu names were sometimes confused with *Nge* names during

---

[2] *Translated literally as "exploitation", referring to the French colonialism with the connotation that the more people cut this plant, the more it will flower. The more the people defend themselves the more forces arrived.*

translation). It should be noted that the Katu Lao translation is not an official one, but the version provided by the villagers. The Katu names were not recorded according to linguistic methods, but instead to the best of the author's knowledge. Details for the language renditions are presented before the Appendix 1 (see "Notes on Appendix 1").

1.3.3.2 Consumption frequency

In order to establish consumption frequency, the author initially used a standardised food frequency questionnaire (see Gibson 1990:42), but she experienced little enthusiasm from the villagers. One village head refused to answer these "strange" questions ("*What type of meat do you mean*?"). As a result, the author reverted to different methods and for meat consumption in particular which are described in the following.

Overall consumption

Finally, overall consumption patterns were recorded by means of estimated, or weighed, food recalls. Ten families in each village were asked three times a day to record at the time of, or following preparation, all foods which were consumed. Some portion sizes were estimated[3]; some portion sizes were weighed.

For historical comparison the author designed a "food wheel". Villagers were asked to quantify the estimated consumption per food group with seeds of tamarinds, which had to be laid on a piece of cardboard. On the cardboard four circles comprising the main taxa of the staples, fruits, vegetables, and meat were painted in a wheel-like composition. The number of tamarind seeds was later translated into overall percentages. Another food wheel was painted comprising of wildlife species. This was used to exercise the taste ranking. Different coloured stones indicated low, moderate, and high taste. Other taste ranking was conducted with paper cards.

Calculation of wildlife consumption

Interviews on wildlife were held in focus groups. Men were asked to recall their approximate annual kill rates of avian and mammalian species. Their memory was considerably accurate[4]. Whenever there was the possibility this "hunting list" was continuously expanded and verified, such as after a successful trapping, during the evenings, or whilst detecting wildlife trails in the forest. As such, continuous verification of data showed low deviation and permitted the assumption that all answers provided by the villagers were honest. Much of the data included here is not intended for publication in Laos as it poses the threat that the villagers could be prosecuted for illegal hunting.

Tentatively, the author compiled an inventory indicating total live body weights of all species. Weights of specimens collected in Laos could not be used, because most of the animals were put in formalin, making recording impossible afterwards. In the case of mammals and birds, weights were drawn from literature; for reptiles, amphibians, and insects estimates were applied. Estimates were orientated at snout-vent-length (SVL). From the literature, wherever possible, the author adopted ranges of body weights including differences in size according to sex and age. Where no data existed, weights from reference animals of the same genus or family were used. Often the mean of various species was calculated.

From the total live body weights (TLBW) the fraction of usable meat (UM) was computed with results being expressed as a percentage of TLBW. Many ethnographic reports of various hunter-gatherer societies showed that virtually the entire edible carcass was

---

[3] *Estimations were mainly used when foods had already been consumed or weighed less than 20g.*

[4] *The author ventures to argue that it is easier to recall trapping and hunting via a mind-map than to mind map what has ended up in the cooking pot.*

consumed, being estimated to range from 50-70% of the live animal weight (Cordain, Brand-Miller *et al.* 2000). The percentage of UM varies depending on species, sex, age and season (Reitz and Wing 1999; Cordain, Brand-Miller et al. 2000). Yet, there is no set of rules by which to determine the fraction of edible meat in a carcass[5] (p.c. V. Geist 2004). This is a matter which is deeply influenced by cultural factors (Reitz and Wing 1999:222). Consequently, UM portions from the literature were slightly modified for the Katu culture into what the author coins UMEP (usable meat and edible body parts). Reference data for UM, which is normally calculated as TLBW minus skeleton, skin and viscera have been changed (see White 1953; Reitz and Wing 1999:222). The starting point however, was White's principle of 70% for birds and short-legged mammals and 50% for long-legged mammals (White 1953). Usable meat and edible body parts (UMEP) for mammals were calculated as follows:

UMEP*mammals = TLBW - parts of skeleton, horn, hoof, hair, minor parts of viscera[6]

*Including: hide, blood, main viscera, fat and lean, small bones.

Bird skeletons are estimated to be 7.5% of total body weight (Reitz and Wing 1999:226). The author has classified the UMEP of birds into three groups. First, for small birds (<50g) the estimated total body weight is multiplied by 90%, on the assumption that half of the bones are eaten. Medium size birds (51g-150g) are multiplied by 85% and large-bodied birds (>151g) by 80%. Only, the hornbills, with their big beaks, are multiplied by 70%. This is based on the author's assumption that:

UMEP*birds =TLBW - parts of skeleton, beak, minor parts of viscera, feathers

*Including: hide, blood, main viscera, fat and lean, small bones.

Including major viscera and parts of skeleton here, means that the author applies higher values than the mean of 70% for birds usually used by the zooarcheologists (White 1953; Reitz and Wing 1999). The author calculated the UMEPs of more than 60 bird species.

As part of the difference between UM and UMEP the author brought fractions of edible bones, cartilage and tendons (BCT) into the calculation, which are based on 7.5% of TLBW - but reduced according to edibility (e.g. rats 50% edible, big cats only 20%).

For livestock the following calculations were applied: Water buffalo (80% UMEP, 60% UM), pig (90% UMEP, 80% UM), chicken (85% UMEP, 70% UM), cows (80% UMEP, 50% UM), goat (80% UMEP, 50% UM). The calculations for UM were orientated to the German UM after slaughter (proposed by the "Bundesanstalt für Fleischforschung").

For frogs and toads UMEP was set at 90%, calculated as TLBW minus 50% of all bones and minus small amounts of viscera. Günther estimates 75% UM for Western cultures, discarding all bones and viscera (R. Günther 2004). 90% UMEP was also used for lizards. For snakes, with the exception of the python, there is no systematic TLBW data available. The author calculated a length-weight ratio of 8.8. She used a mean TLBW of 1,046g and 90% UMEP after witnessing the preparation of a big rat snake, which contained most of the bones, cartilage, skin, etc. finely chopped as *laab*.

---

[5] *As suggested by Geist, in the Katu, as in other cultures, the head (tongue, brain, eyes, head-musculature, post-orbital fat) is considered a delicacy, as are part of the viscera, namely the heart, liver, lungs, kidneys, thymus, testicles, and tripe. The intestines and the bladder are consumed as well. Legs (especially of primates and deer) contain marrow. Phalanges were nibbled off for their gelatinous portions. Bones were formerly crushed and boiled out for bone-fat with health promoting benefits. But generally the separation of edible from inedible parts happens in the mouth rather than during the cooking process. Anything that is too crunchy is spat out.*

[6] *Of the skeleton, the skull and vertebrate bones are mainly discarded, while others are appreciated for their marrow. To the Katu, the usage of horns and hooves for medicinal purposes was unknown in the past and of low value. The fur is mainly removed through burning or is plucked after treatment with hot water. For the Katu, it is taboo to use animal furs as coat.*

1.3.3.3 Nutritional analysis of selected Katu food items

A total of 40 selected food items of the Katu cuisine were analysed for their nutritional values at the Institute for Nutrition, Mahidol University Bangkok. The chemical methods applied can be seen in table 1.

Logistic and financial limits meant that only one sample per species or food item was analysed. By chemical standards, a number of samples have to be used to derive average values and variations (Gibson 1990). Often in the Katu villages selected species could either not be collected, or were not in season, or had already been eaten up, or were destroyed during transport. In order to optimize sample collection, the author provided incentives to the villagers. Often, however, samples had to be discarded as the weight of usable parts was too low (e.g. wild leaves). Cooked samples were either prepared in the villages or in the laboratory. Non-edible materials such as snail shells, sticks, and stems were removed. Plants approx: 1-4kg were gathered to select 200g for chemical analysis. Vit C rich plants were transported in black plastic bags and tin foil to minimize contact with oxygen. Logistics, however, required that plants had to be collected in the afternoon the day before departure. It is therefore possible that some of the vit C was oxidized before arrival in the laboratory (see Belitz and Grosch 1992).

Table 1: Summary of chemical methods

Nutrients	Methods of analysis
Energy	Calculation from carbohydrates (4.1 kcal/g), fat (9.3 kcal/g), and protein (4.1 kcal/g) 7
Protein	Kjeldahl method; protein was calculated from total nitrogen using 6.258 as a conversion factor.
Fat	Soxhlet method
Ash	Charred sample, ash in furnace at 500-550°C
Moisture	Air oven at 100-102°C for most foods; vacuum oven at 89-100°C for meat; vacuum oven at 70°C for samples with high fat and/or sugar content
Carbohydrates	By difference: 100g – (total g of water + protein + fat + ash)
Calcium	Atomic absorption
Potassium	Atomic absorption
Magnesium	Atomic absorption
Iron	Atomic absorption
Zinc	Atomic absorption
Copper	Atomic absorption
Phosphorus	Flame photometry
Vit A	High pressure liquid chromatography
β-Carotene	High pressure liquid chromatography
Vit C	Sample preparation with HPO3 and acetic acid
Vit E	HPLC
Riboflavin (vit B2)	HPLC
Thiamine (vit B1)	HPLC
Vit B12	Microbiological assay
Vit B6	Microbiological assay
Niacin	Microbiological assay

Source: Own compilation

Besides those Katu food items analysed in the laboratory, it should be noted that other nutritional values provided here (see Appendix 3) are drawn from various food composition tables (FCT). The main priority was given to ASEAN food databases (Puwastien, Burlingame *et al.* 2000) and to the database of the Institute for Nutrition, Mahidol University, Bangkok (INMU 2002). Other important references were the national

[7] *Physiological calorific value.*

[8] *Limiting factor: The factor 6.25 was used indiscriminately to convert total nitrogen into protein, based on the assumption that proteins contain on average 16% nitrogen.*

FCT of Vietnam (GOV 2000), the USDA database, and the FCT established by Souci Fachmann-Kraut (DFA 1991). For selected foods FAO databases were consulted (FAO 1968; 1988), together with individual analyses of wild meats and vegetables of various studies. DeFoliart provides the database for nutritional values of insects (DeFoliart 1991). The author's own results for proximate composition of macronutrients, minerals, vitamins and fatty acids are presented in Appendix 2 and in chapter 4.6.2. For the RDA analysis, both Appendix 2 and Appendix 3 were used.

1.3.3.4 Adequacy of diet

Modern nutritional sciences have demonstrated that good health is dependent upon the consumption of nutrients vital for normal body metabolism and which cannot be synthesized de novo (Leitzmann and Elmadfa 1990).

Individual requirements as RDAs of gross energy, protein, fat, vit A, vit B_1, vit B_2, vit C, Ca, Fe, and Zn of the selected ten families (see chapter 1.3.2 for family selection) were calculated from Thai RDA (see Appendix 4). These RDA figures were then compared with the daily per capita intake of these nutrients derived from estimated and weighed food recalls. The comparisons are expressed as percentages of the households who met the requirements. For other nutrients, only estimates are applied connecting to the consumed amounts per food group. Results from the food wheel and key focus interviews make it possible to establish an historical trend. As such the author is tentatively able to identify old and relatively new deficiencies. It should be noted, however, that this work does not relate nutrient intake to anthropometric results.

The preparation of food by heat can lead to essential change in weight and nutrient content, either connected to an increase in the water content, or to a reduction in the water content (Bognar 2002). The author therefore tried to use only prepared foods or dishes for which the calculation of nutrient intake was available. Food composition data was applied only to edible fractions, waste arising from preparation (peeling, cleaning, washing, etc.) of the initial raw material was excluded. For the calculation of the nutrient content of processed meat an average "recipe" was created to be able to calculate nutrient loss.

1.3.4 Health survey

A health survey was conducted to assess a) the nutritional situation and b) the health situation at village level. Without the generous support of WHO it would not have been possible to conduct this survey. Structurally, the survey was divided into the following tasks a) anthropometry, b) stool sampling for roundworm (*Ascaris lumbricoides)*, whipworm (*Trichuris trichiura*), hookworm (*Ancylostoma duodenale*), and liver fluke (*Opisthorchis viverrini*) c) blood test for anaemia (Haemoglobin Colour Scale), d) goitre palpation (Scale 0, 1A, AB and 2), e) cornea check for signs of vit A deficiency, e) interviews of selected families for respiratory diseases such as tuberculosis, and for malaria, and skin problems, and f) focus group discussions at village level. The total sample size for anthropometry was n=197 and for stool sampling n=415. A total of 362 physical examinations were conducted. Villagers were randomly selected by lottery. For obtaining the age of the children, the parents were first asked to recall the month of birth (or season), then the year. For calculating levels of stunting[9] and wasting[10], the latest Thai standard was used. The calculation was computed at INMU, Bangkok. Since laboratory haemoglobinometry was not available, the WHO Haemoglobin Colour Scale (Copack) was used as a simple device for matching a blood sample on a special absorbent test-strip with haemoglobin levels on the test kit scale (4-

---

[9] *As an anthropometric index stunting (height-for-age) reflects linear growth achieved pre- and postnatal with its deficits indicating long-term, cumulative effects of inadequacies of nutrition and/or health.*

[10] *As an anthropometric index wasting reflects body weight relative to height (weight-for-height) and indicates a recent and severe process that has produced a substantial weight loss.*

14g/dl). Its reliability has widely been confirmed (Stott and Lewis 1995; Lewis, Stott *et al.* 1998; Ingram, Lewis *et al.* 2000; Montresor 2000). For identification of clinical symptoms of iodine deficiency, palpation was used following the below stated classification endorsed by WHO and the International Council for the Control of Iodine Deficiency Disorders. Its uniform use among different observers allows comparison of the severity of goitre among different regions (Dunn and Van der Haar 1990). As such it is a) grade 0 for no goitre, b) grade 1 for enlarged thyroid lobes visible with head titled back[11], c) grade 2 for thyroid enlarged, visible with neck on normal position. The survey team consisted of Lao medical doctors and trained medical staff from the Lao Malaria Control Station, including the director of the Sekong hospital.

After the conclusion of the health survey, medicines were provided to the villages. Everyone (excluding lactating and pregnant women as well as children under two years), received one tablet of Mebendazol (500mg). To the village head Paracetamol, vitamin C, Ampicillin, Entacyn, Berberin, Bactrim, Multivitamin, Chininsulfat were granted. Each village received also WHO educational materials for the schools.

1.3.5 Analysis of the Lao food security concept

Besides fieldwork and literature research, for the evaluation of the Lao food security concept the author also interviewed key persons from bi- and multilateral development organizations and international non-governmental organizations working in Laos. She also interviewed various freelance consultants as well as the team of the Thai NGO TERRA (Towards Ecological Recovery and Regional Alliance). She complemented this foreign view of the development context with many interviews with officials from the Lao government including the CRI, and the Lao Front for National Construction.

[11] *There was no division made between grade 1a and grade 1b.*

CHAPTER 2: DYNAMICS OF DIETARY CHANGE IN TROPICAL FOREST AREAS

2.1 NOTIONS OF FOOD SECURITY

2.1.1 Ecology of food and nutrition

"*We are what we eat*", Feuerbach's pithy phrase of 1825 with its variegated quality still applies today. It can be taken literally, as it links diet and health. But it also relates to alleged spiritual attributes or physical behaviour after ingestion (Kirsch 1973; Falk 1994:8; Condominas 2003)[12]. Food acquisition and culinary behaviour have extensively served to develop and maintain identities, both individually and collectively and in terms of gender, nationalism, class, ethnic group, etc. (Rozin 1982; Falk 1994; Wester 1996; Counihan 2000:1513). Indeed, food is not just composed of chemical elements for the human body, but is also an integral part of our daily, social, and cultural lives (Rhoades and Nazarea 1991:217). Most cultures therefore invest food with non-nutritional roles (Rhoades and Nazarea 1991:223; Draper 2000:1475; Krahn 2000).

Over the centuries, culture specific food systems based on the instinctual search for food have developed (Pelzer 1978:7; Kuhnlein and Receveur 1996). With his model of food ecology, Leitzmann (2003) points out that culinary behaviour relates to the main elements of life (see also Counihan 2000:1513). Moreover, consumption patterns relate back to their influencing factors. People do not only affect their health but also their natural, cultural, political, and economic environment through their diets (Leitzmann 2003). Consequently, the nutritional well-being of people is not merely an outcome of development, but a pre-condition for it (Braun 1999:42; Gillespie and Haddad 2001).

Concurrently, food is a pawn in political strategies of states and households (Counihan and Van Esterik 1997:1). The idea of controlling food systems along their food chains so as to encourage the consumption of food by the population is a century-old concept (see Barloesius 1999:202; Messer, Haber et al. 2000:1372), and takes its newest form in food security interventions.

2.1.2 Southeast Asian tropical forest areas and ethnic people

In tropical countries some 300 million people, most of them poor, are fully or partly dependent on the forest for their food resources (Smith, Williams et al. 1992; Hladik, Linares et al. 1993; Bennett, Nyaoi et al. 2000a; Bennett and Robinson 2000b; Kuhnlein 2003; McNeely and Scherr 2003:45). Amongst those, various ethnic minority groups, often indigenous people[13], are the most impoverished and marginalized (Johns, Chan et al. 1994; BMZ 1996; Kuhnlein 2003; McNeely and Scherr 2003:45). In the uplands in particular, where high biological and cultural diversity coexist, successful food systems have been developed over centuries. They are, however, coming under increasing stress, often being denigrated by governments and or development organisations.

The isolation of Southeast Asia's uplands is highlighted by its geographical proximity to some of the main population and economic centres in the world (Ronnås 2001:1). These long-standing isolated forest areas are now opening up to the outside world, resulting in increasingly rapid social, economic and environmental change (Russell 1989; FAO 1999a;

---

[12] *E.g. there is the traditional Katu eating taboo of Bufo melanostictus (akut arok) during the first day of rice sowing, out of fear that after ingestion one transforms into this ponderous toad, and begins to work very slowly.*

[13] *The author does not intend to fuel the discussion about the term indigenous people, but does imply here those population groups living and acting differently from mainstream cultures.*

Ronnås 2001:2). Concomitantly, there are high levels of mal- and undernutrition especially in vicinities adjacent to, or in, biodiversity hotspots (McNeely and Scherr 2003:45).

Extensive research has revealed that the uplands have been the focus of intense discussion. Parallel to the recognition of the elusive quest for growth and foiled development in the tropics (see Easterly 2002), Taylor (1996) noted that failures to comprehend the uniqueness of upland conditions have been the main obstacle. Table 2 summarises some of the most salient factors, used to categorise ethnic people as 'backward' and label them as having been eking out a miserable life since early history.

Table 2: Salient attributes of tropical forest areas

Attributes	Description
Difficult access	Lack of infrastructure and services
Heterogeneity	High biodiversity, high cultural variety, interdependence of production bases
Fragility of upland ecosystem	Soil vulnerability to repeated use, limited supply of other resources, low biological carrying capacity
Marginality	Avoidance of risks, shortage of arable land, limited private resources, dependence on common property, low agricultural yields, limited market conditions, limited employment opportunities
Small scale*	Small scale specialisation, location-specific comparative advantages
Cultural values	Prevalence of spiritual refuges and ancestral lands
Lack of political influence	Little voice in decision making, top down development and conservation policies

*It may be objected to equate scale with low productivity (Uphoff 2002). See also Taylor (1996:3).

Source: Compiled from Uphoff (2002) and Taylor (1996).

The above attributes were also used to justify the need for external interventions. As such, majority groups in the Southeast Asian lowlands have managed over centuries to predominate and impose their political, socio-economic and religious powers onto ethnic upland groups (Russell 1989; Dove 1993; Evans 1998:152; Condominas 2001:20; 2003:21; Trakarnsuphakorn 2003). In many instances indigenous peoples are struggling for identity while being heavily subjugated. Often they therefore continue to live according to their own social, cultural, and economic traditions rather than with those of the country of which they form a part (Kuhnlein and Receveur 1996; UNDP 2002).

At the same time, many authors have pointed out unequivocally that the various ethnic groups possess comprehensive and scientifically accurate knowledge of their environments (Berlin and Berlin 1983; Antweiler 1995; Silitoe 1998b) and of their indigenous food (Hladik, Linares *et al.* 1993; Johns, Chan *et al.* 1994; Wilson 1994; Kuhnlein and Receveur 1996; Kuhnlein 2003). For native foods and nutrition worldwide there has even been some conjecture about the benefits that could be derived by industrialized countries (Brand-Miller and Holt 1998; Cordain, Brand-Miller et al. 2000; Cordain, Watkins et al. 2002; Ogle, Tuyet et al. 2003).

In the upland development schemes however, this local knowledge has until now been left untapped (Wangpattana 2002; Trakarnsuphakorn 2003). Concurrently, for tropical forest areas, conservation has become the main focus, rather than development (Margoluis and Salafsky 2001), sometimes to the extent that it has reduced people's livelihood and food security (McNeely and Scherr 2003:5). Hitherto, the application of orthodox concepts of food security to the Southeast Asian uplands, being scarcely congenial, poses an ongoing conundrum.

2.1.3 Nutritional situation

Generally a comparison of current estimates of stunting and wasting reveals that areas rich in cultural and biological diversity show the highest levels of poverty coupled with mal- and undernutrition (Vandermeer 1997:123; Braun 1999; Mainka 2002:45; McNeely and Scherr 2003:45). Mainka refers to FAO which has shown that the percentage of malnourished children in any one country is positively correlated with the number of people per km^2 of forest.

Ergo, it appears that indigenous people living in tropical forest areas are most at risk (Johns, Chan *et al.* 1994; Kuhnlein and Receveur 1996; McNeely and Scherr 2003:45). Many case studies have shown that once traditional tropical food systems are disrupted, protein-energy malnutrition and micronutrient deficiencies become the main prevailing nutritional problems (FAO/IRRI 1993; Omori and Greska 1996).

Nutritional status is often used as the indicator of food security. In general, the nutritional status is an immediate function of two determinants: dietary intake and health (Gibson 1990). Both are influenced by underlying and basic causes that vary between different cultures and regions. In terms of health, high frequency of diarrhoeal and respiratory diseases among young children in developing countries are both a major contributor to malnutrition and a consequence of lowered immunity in an unhygienic environment (Scrimshaw 2000). In relation to dietary intake, calories, fat, protein, iron, zinc, B-vitamins, vit A and β-Carotene, as well as iodine have been identified as critical in most developing countries (Gillespie and Haddad 2001). As such, the concentration of malnutrition in Asia is greater than anywhere else on earth (Gillespie and Haddad 2001).

Health and nutritional status are seldom delineated for ethnic groups; mostly available are national averages or regional statistics. Moreover, because of definition, measurement problems, and inadequacy of data, it is difficult to know how many people are affected or by which type of mal- or undernutrition, (Kracht 1999:56). In addition, various studies suggest considerable variations in the prevalence of malnutrition, diarrhoea, malaria, and bacterial and fungal infections, depending on agricultural productivity and the season. The highest levels of malnutrition appear in the months prior to harvesting (Gibson 1990; Hassan, Huda et al. 1995).

With so much still inconclusive, it is reasonable to follow Kracht, who suggests that the analysis of trends is the most useful tool in assessing future prospects (Kracht 1999:57). As such, health and nutritional problems were different in the past, with their underlying basic causes varying considerably from today (Pelto 1992). Some authors suggest that until recently many indigenous people did not show clinical signs of mal- or undernutrition (Truswell 1977; Holmes and Clark 1992; Kuhnlein and Receveur 1996). There are various accounts of the good health status of unacculturated ethnic groups living in tropical forests. Typically, they show the marked preponderance of infective over degenerative diseases (Polunin 1977; Popkin 2001) and low levels of parasites such as, for instance, *Ascaris lumbricoides* (Polunin 1977).

In Southeast Asia many ethnic groups have developed comprehensive traditional knowledge systems (Cunningham 1970; Baird 1995; Ogle, Tuyet et al. 2003). The current loss of biodiversity and traditional knowledge, however, risks losing potential for improving human health but is generally unappreciated by policymakers (Grifo and Rosenthal 1997:27). Consequently the same forces that are causing biodiversity loss in agroecosystems are responsible for much of the negative change in human health (Vandermeer 1997:111).

In this work the author will argue that pervasive delocalization in tropical forest areas is associated with change in the nutritional and health status of the ethnic minorities living there. The idea that traditional societies are lacking ideas about healthcare, and could exclusively supplied by modern medicine must certainly be debunked (Jones 1977:247; Laughlin and Fairfield 1997:164).

2.2 THE STRUCTURE OF TRADITIONAL FOOD SYSTEMS

Taking into account the high diversity of traditional food systems in tropical forest areas in Southeast Asia, this chapter embarks on some general characterisation. As argued in chapter 1, this work focuses exclusively on food systems located in forest belts with traditionally and contemporaneously high biodiversity and rich wildlife resources. Excluded from the following discussion are those areas which, due to high elevation, or environmental disruption, have low large-bodied mammal populations. When compatible with the Southeast Asian context, the author has also drawn upon references from other parts of the world.

Kuhnlein (1996) defines traditional food systems "*as being composed of items from the local, natural environment that are culturally acceptable*". As such, traditional food systems show a low level of pervasive delocalization. The term "pervasive delocalization" summarizes a series of processes that make up the main elements of what is often referred to as modernisation. Pervasive delocalisation is mainly understood as a shift from local autonomy towards a growing dependence on a worldwide system of resource allocation and political power (Pelto 1992). Pelto refers here to Poggie and Lynch[14] (1975:vi), who describe delocalisation as a "*chain of complex events that result when food, energy, and services that had formerly been provided within the local setting are transformed into the* [sic] *market exchange commodities*[15]".

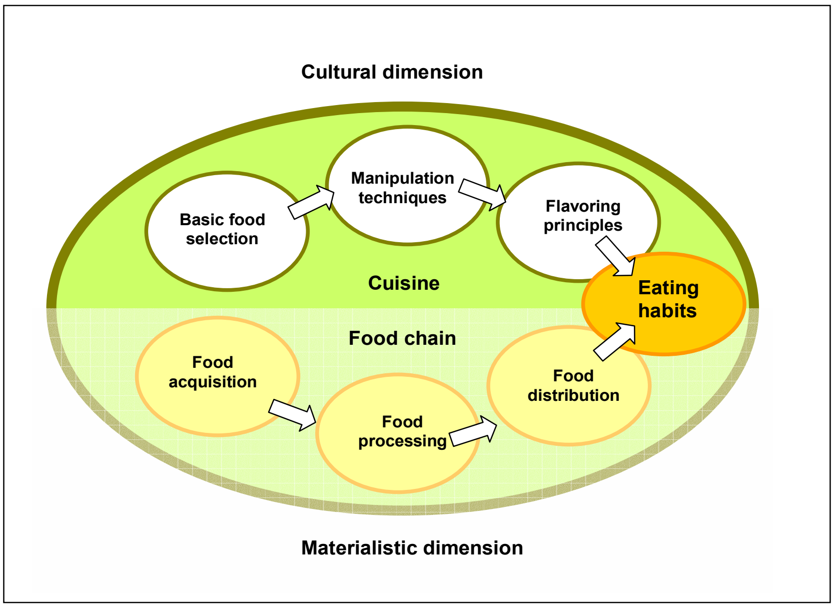


Figure 1: Framework of the seven elements of a traditional food system*

*Eating habits are separated since they overlap both dimensions.

Source: Own production

In the literature there are various accounts of food systems, however, structurally they never combine the materialistic and the cultural dimension. The author therefore has developed her own framework comprising of seven elements; within this framework traditional food systems can structurally be discussed (see figure 1).

[14] *See: Poggie, J. and R. Lynch (1975). Understanding modernisation. Westport CT, Greenwood Press.*

[15] *The trend develops into a situation, in which most of the food eventually originates from sources outside the local region.*

Universally, food systems interrelate all food issues from procurement to consumption (Leitzmann 2003, Pelto 1992). As such, Pelto conceptualizes a food system as being composed of two basic dimensions.

The first dimension is materialistic. It comprises available foods and the technologies that support each stage along the food chain. These stages are 1) food acquisition, 2) food processing (including preservation and storage), 3) distribution, 4) and eating habits.

The second dimension is cultural, and consists of the ideology related to food which can be called cuisine. It defines what is edible, and when, how and where specific food is eaten (Pelto 1992). This also encompasses all related regulations and activities. Following the definition by Rozin (1982) cuisine summarizes aspects of 1) basic food selection, 2) manipulation techniques, 3) flavouring principles, and 4) eating habits - as such, eating habits overlap both dimensions.

Contrary to the food chain, the cultural dimension is often neglected in development research; classification into measurable indicators is mostly incomplete (Krahn 2000). Despite its importance, relatively little is known about culinary behaviour. Vocabulary and methods are highly inconsistent (Marshall 1995). As Rozin states we can describe with reasonable accuracy which foods a given culture eats and how often, but we are still far off understanding the cuisine, with all its inevitable intricacies and subtleties. Overall the author now attempts to accommodate all these elements in her framework.

2.2.1 Elements of traditional food systems

2.2.1.1 Materialistic dimension

Food acquisition

In traditional tropical food systems, food acquisition can be pigeonholed as a means of production in agroecosystems, namely through shifting cultivation as well as hunting, fishing, and gathering edible forest products, but also including livestock production and gardening. Kinship solidarity, food exchange, and market purchases further extend to the methods of food procurement. Customary food consumption is characterised by flexibility, buffering, and by several levels of diversity in order to achieve stability and productivity within the prevailing environmental constraints.

Even today, shifting cultivation is the most widespread traditional farming system in the tropics (FAO 1984; Norman, Pearson et al. 1995; Rerkasem and Rerkasem 1995). It is estimated that this system currently supports between 300-500 million people worldwide (ODI 1998). Shifting cultivation has been practised for centuries (Warner 1991; Chamberlain and Phomsombath 2002). Often called "swidden", it is a land use system based on a year-round, largely self-contained and ritually sanctioned way of life (FAO 1991b; Anderson 1993; Simana 1997). In Southeast Asia dry rice is the predominant staple complemented by other grains, roots and tubers, vegetables and fruits. What cannot be produced in the swidden is gathered in the forest (Pelzer 1978; FAO 1989; Anderson 1993; Hladik, Linares *et al.* 1993; Yen, Duc *et al.* 1994; Ireson 1996; Clendon 1998; Kunarattanapruk, Chokkanapitak *et al.* 1998). In the past, this type of farming provided sufficient food all year round. However, seasonal shortages did occur regularly (Young 1961; Izikowitz 2001, first 1951). Although successful in the past, due to demographic and production pressure, systems of shifting cultivation came severely under stress over time (Rerkasem and Rerkasem 1995). Their development remains a contentious issue (see chapter 2.5.1).

Hunting and fishing is another indispensable element of traditional food systems, especially for upland peoples (Williams-Hunt 1952; Young 1961; Redford, Godshalk *et al.* 1995; FAO 1995b; Robinson and Bennett 2000; Tungittiplakorn and Dearden 2002; Johnson, Singh *et al.* 2003). For many forest dwelling communities, hunting techniques are more elaborate than agricultural techniques (Izikowitz 2001, first 1951:148). Wildlife harvests have produced a remarkably regular input of animal protein to the community as a whole[16] (Dwyer 1985) and has improved the diet to a considerable degree (Tayanin and Lindell 1991:15). Up until now however, hunting activities are very poorly understood (Redford, Godshalk et al. 1995; Peres 2000). And there is the common developed-world conviction that subsistence hunting is evidence of "underdevelopment" (Redford, Godshalk et al. 1995).

Besides hunting, ethnic people were successful in developing livestock production. For many ethnic groups in Southeast Asia, the possession of large numbers of buffalo provides a means to obtain economic and social prestige. Their ritual slaughter aims at attaining ritual power (Kirsch 1973, Chamberlain 2003).

Purchased food, besides salt, is, and was, rather unimportant in traditional diets. When crops failed, wealthy households were often prepared to sacrifice property for cash, but many, especially the less well off, took to a diet eked out by eating alternative forest food rather than purchasing food (Freeman 1955). Between neighbouring villages there was a kind of petty trade, which however insubstantially did contribute to food acquisition or the generation of income. In some cases wage labour also yielded substantial amounts of staples, salt, etc. Generally, supply chains were short, the number of food miles low.

In contrast to market dependent societies, many self sufficient (or near self sufficient) indigenous groups use gifts as a kind of kinship solidarity often contributing to food acquisition, especially meats. Rice, however, is only shared with close kin.

Processing and distribution

In the distant past, trade was chiefly based on a complex barter system (Condominas 1977:13). Even today, traditional food systems show scant affiliation with the cash economy, in fact most agricultural production was and is still used for their own consumption (Young 1961:73; Kunstadter 1965; Pelto and Vargas 1992; Johns, Chan *et al.* 1994; Izikowitz 2001, first 1951).

The tropical climate is unfavourable for food storage. With the need to store at ambient temperature, only food with low moisture content, such as cereals and dried fruits, vegetables, and powdered roots and tubers (RTs), can be kept in reserve. Under poor storage conditions, large food losses can occur due to a number of biological agents (FAO 1988).

Traditional societies usually prepare large amounts of foods to be eaten together with close kin. The importance of food exchange has already been mentioned in relation to food acquisition, but can be further extended to include kinship solidarity. Membership of a consumption unit is therefore a chief means by which individuals can gain food security. Consumption units are kin-based, but outsiders can negotiate membership (Beckerleg 1995). Many authors have argued that effective local food sharing mechanisms are vital to long-term nutritional benefits (Holmes and Clark 1992; Beckerleg 1995). The apportioning of food also has had very strong effects on the social organisation within the group (Truswell 1977:214). Food from plants is not customarily shared to the same extent as meat. Communal feasting on occasions such as marriage, birth, and death, or to appease the spirits is well anchored in many cultures. Festivals also often initiate a role-reversal, with men taking over the cooking duties as reported for the Akha in Thailand and the Gimi of Papua Guinea (Falk 1994:8). This can be attributed to the fact that during festivals mainly meat is consumed.

---

16 *Before the introduction of guns, ethnic minorities employed various forms of traps and snares such as spear traps, booby traps, cage traps for big felines, spring pole snares, dead falls, snap traps, etc. together with fishing traps, weir traps, casting nets, creels, etc. In the past, the Khamu in Laos even set traps for insects such as for the mole cricket, bugs, mantids, grasshoppers, and weevils (Tayanin, Lindell 1991).*

2.2.1.2 Cultural dimension: Cuisine

Every culture has a unique alimentary code or a sense of taste which determines the "*mouth of the community*" (Falk 1994). Cuisine describes salient choices of foods and manipulations involved in the formation of a meal (Rozin 1982). All cuisines, like other cultural systems, are sets of rules or prescriptions about how to organize knowledge, beliefs, or behaviour. As mentioned before according to Rozin variation in cuisine depends on four fundamental elements.

Basic food selection

The first crucial element in cuisine is the food itself. Basic food selection determines all other elements in culinary behaviour. Universally, food selection is imbedded in a culture's belief system; according to which food nurtures both the physical and the spiritual well-being (Yen Ho 1985:8). Cultural identity is shaped mainly through rejection and acceptance of foods. Food taboos constitute the dominant example. For areas with high food uncertainty, the myth that people eat almost everything which is not toxic[17] must be debunked from an anthropological viewpoint. In reality, food selection is rigorously made (Rozin 1982; FAO 1989a; Brand-Miller and Holt 1998).

The basis for the selection of foods by a culture is dependent on a wide variety of factors such as availability, environmental variables, ease of production, nutritional costs and benefits, taste, custom, and religious or social sanctions (Vos de 1977; Rozin 1982). In this context many authors have shown that taste is more important than the ease of procurement; a fact, often neglected in nutrition interventions.

In a more pragmatic way many writers also stress the concept of optimizing energy intake to energy expenditure, generally known as the optimal foraging strategy (Winterhalder 1981; Hawkes, Hill et al.; Dufour 1983). In his analysis Cordain (2002) calculated energy return rates (kcal/h) for selected wild foods. Highest rates show big mammals[18] (e.g. 16,000–32,000), medium rates small mammals[19] (e.g. 2,800-6,300), birds (4,800), and fish (2,100). Low to medium rates were identified for wild roots (1,200-6,300) and very low rates for other plant foods (100-1,500). Indeed, this corroborates the reports of anthropologists and conservationists who argue for the high preference of large-bodied mammals over small-sized animals.

Several studies have also shown that the various categories of plant foods were not randomly gathered (Cordain, Brand-Miller et al. 2000). Typically, despite a broad plant food base, only a small number of species are regularly consumed. These are usually those providing the greatest ratio of energy intake to energy expenditure (Cordain, Brand-Miller et al. 2000).

Manipulation techniques and flavouring principles

Further differences in cuisine evolve through manipulation techniques and flavouring principles. A good example is the preparation of meat. Many ethnic groups relish the consumption of raw meat. But there are those, such as the Mlabri in Laos and Thailand, who do not eat meat raw. Instead they mainly roast their meat on wooden skewers with large pieces being put directly into the fire. Fine stripes of meat are cooked in bamboo tubes. They only cook food for consumption and make no attempt at food preservation techniques such as smoking or curing (Surin Pookajorn 1992). The Karen subgroups of

---

17 Some plants contain a multitude of compounds which make them unsafe for human consumption: hemagglutinins, enzyme inhibitors, cyanogens, antivitamins, carcinogens, neurotoxins, allergens among others (Draper 2000: 1471).

18 Based on antelope, deer, and bighorn sheep.

19 Based on small and large squirrels.

Sgaw and Pwo indicated that it was generally preferred to boil their food stuffs, so most meals were soups. Even after roasting meats, they still slice and boil it afterwards (Omori and Greska 1996). Holmes and Clark (1992) report on the preparation of "meat mashes", especially bird flesh.

The type of manipulation employed does not only determine taste, but also significantly influences nutrient loss, especially through various applications of heat (Bognar 2002). In traditional food systems women have often developed an array of preservation techniques such as pickling, drying, fermenting, etc. These foods are usually prepared for the planting and pre-harvest period, seasons during which food is usually short. In the distant past, meat was often kept for the sowing period, i.e. when there was little time for hunting (Young 1961:20).

People will go to quite extravagant lengths to attain the means of providing what they regard as a good flavour. The salient character of flavour principles and the regularity with which they are used by individual cuisines affirm their importance as one of the great structural elements in culinary style (Rozin 1982). More than other elements in the cuisine, flavouring principles vary significantly between various ethnic groups.

2.3 TRADITIONAL DIETS

As mentioned before, eating habits touch upon both the materialistic and the cultural dimension of food systems. Individual eating habits can vary depending on sex, age groups, and social strata. Consumption per food group and the resultant nutrient intake are discussed in this chapter.

Discussing traditional diets, the author follows those who argue that in their intact state, traditional food systems provide essential nutrients within a holistic human ecological context (Johns, Chan *et al.* 1994; Wilson 1994; Kuhnlein and Receveur 1996; Draper 2000). The Iban in Kalimantan for example stated "*in the past, there was plenty to eat and plenty of fish and game to be captured in the rivers and forests. As long as there was plenty of fresh jungle it was a relatively rich way of life which could support energetic and virile people*" (Morrison 1966:7).

Structurally, there is no traditional Southeast Asian diet per se. However, the diets of ethnic minority groups in uplands are fundamentally different from lowland majority groups having access to the markets. Up until now, the diets of ethnic minority groups are almost unrepresented in national statistics such as in the FAO's food balance sheets. One special issue is the unrecorded high consumption of forest plants, wildlife, wild fish, and other aquatic animals (OAA).

For the purpose of this work the author will use five points to earmark traditional diets.

Firstly, traditional diets show a high dietary breadth. Many studies reveal that local people in tropical forest areas gather, hunt, fish and cultivate many different types of food (Mungkorndin 1981; Kunarattanapruk, Chokkanapitak *et al.* 1998; Moreno-Black and Somnasang 2000; Kuhnlein 2003). A study of five community areas in Southeast Asia revealed 716 species of edible foods (Kuhnlein 2003).

Secondly, uncertain and fluctuating food supply, often a short supply in the main staple, is one of the pervasive problems in traditional upland food systems (Huss-Ashmore and Thomas 1988). Consequently, subsistence societies often have an array of strategies for combating food crisis, these allow them to continuously anticipate and plan for scarcity (Huss-Ashmore and Johnston 1994; Moreno-Black and Somnasang 2000). In this vein, collecting wild foods is of major importance (Moreno-Black and Somnasang 2000). In India, Malaysia and Thailand, about 150 plant species - representing nearly one-fifth of those consumed as food in these countries - have been identified as sources of "emergency" crops (FAO 1992).

Thirdly, many forest foods from both animal and plant origins make important contributions to nutrition (Ogle 2003; Wilson 1994; Draper 2000; Kuhnlein 2003). The variety of wild foods often contrasts with the relatively narrow selection of crops produced by agriculture and livestock (Brand-Miller 1998; Kuhnlein 2003; McNeely 2003). Thereby the dividing line between "domesticated' and "wild" is often imperceptible (Mungkorndin 1981; FAO 1996). As early as 1979, Fleuret remarked that the labelling wild food as "supplementary" was inappropriate, as it implied that they were peripheral to the diet.

Indeed, in many areas wild foods have become a standard component of the diet - even during times of sufficient reserves (Mungkorndin 1981; FAO 1992; Huss-Ashmore and Johnston 1994). Also, in many areas wild foods are especially relished within those poorer strata of communities (Kunarattanapruk, Chokkanapitak et al. 1998). In many traditional diets wild foods make up the lion's share of the daily vegetable consumption (FAO 1989a; Ogle, Tuyet *et al.* 2003). Hitherto, wild foods have been an underreported but essential source of food.

Fourthly, in many cultures, the borderline between medicine and food is unclear (Estes 2000:1534). In traditional diets, many of the consumed wild plants and animals also have therapeutic functions (Vos de 1977; Sulavan, Kingsada et al. 1995; Brand-Miller and Holt 1998; Ogle, Tuyet et al. 2003). Certain foods stimulate appetite, help the body to utilize nutrients in food, and fight infections (FAO 1989a), acting mainly on the immune-system and gastro-intestinal tract. They can also offer treatments for the most common ailments and correct micro-nutrient deficiency (FAO 1996; Ogle, Tuyet et al. 2003). The usage of traditional medicine however is rapidly changing. Nowadays most people attend one of the clinics when they are ill. Folk medicine does, however, still persist (Baird 1995; Estes 2000; Ogle, Tuyet et al. 2003).

The last feature to note is seasonality, which to a great extent determines variations in the diet of indigenous people (Hassan, Huda et al. 1995; FAO 1996). According to FAO (1996), this is seen by many as a constraint. The author, however, holds the view that a spectrum of various foods at different seasons proliferates dietary breadth and also as a corollary nutrient intake. Forest foods provide a year round safety net in lean periods such as the pre-harvest time when stored foods are finished (FAO 1996). Many authors have shown that the collection of edible forest products and hunting frequently peaks during this period when staple supplies are low (see Dufour 1983; Kunarattanapruk, Chokkanapitak et al. 1998). The seasonality of mammals, fish, OAA, birds, and insects also complement each other.

2.3.1 Food groups

Nutritionists usually break down diets in food groups to: 1) staples, 2) vegetables, 3) fruits, 4) foods from animals including meats, fish, and dairy products, 5) oils and fats, and 6) legumes. Dealing with traditional diets in tropical forest areas, the author makes the following minor modifications to the standard categories. As such, "staples" not only include cereals but also roots and tubers both domestic and wild, together with starchy stems, fruits, and bulky vegetables, the so called "filling" or "hunger foods". The banana therefore counts here as a staple rather than as a fruit. Under "vegetables", domesticated vegetables, wild leaves, sprouts, stalks, mushrooms, and flowers are summarized. Wild leaves are extended to include buds, pith, and little stalks; flowers include blossom and pollen. "Fruits" also comprise nuts and oilseeds. "Meat" embraces both domestic livestock and wild meat. As such, game meat not only includes terrestrial mammals and avian species, but also amphibians, reptiles, and insects. Animal lard is also put into this category. "Fish" constitutes a separate category and includes: snails, crabs, shrimps, and crayfish. Dairy products and pulses play a minor role in ethnic minority areas in Southeast Asia. Finally, the author introduces a new food category: "saps and gums". This does not include nectars, which are listed as parts of flowers under "vegetables". NB: the group of fats and oils is excluded here, since ethnic groups rarely purchase lard or vegetable oil.

Staples

Staples are the mainstay of traditional Southeast Asian diets, both in volume and calories. In the past, besides rice and corn, there was a wide variety of cereals including millet, fox millet, job's tear, sorghum and other coarse grains (Pelzer 1978; FAO/IRRI 1993). Now, where it has become available, rice is the preferred cereal (Yen Ho 1985:50). Often, rice is considered as a superfood because of the mystical and reverential respect in which it is held (Wilson 1985:66). Many of the ethnic groups believe that rice possess a soul[20] (Izikowitz 2001, first 1951:245). For ethnic minorities in Asia, rice consumption varies considerably, ranging from 37-700g per day, (Gupta 1980; Yen, Duc et al. 1994; Hassan, Huda et al. 1995), often it provides more than 90% of caloric energy. The energy dependence on rice in South and Southeast Asia is higher than the energy dependence on any other staple in any other region in the world (FAO/IRRI 1993).

Under conditions in which other crops may fail, the production and the use of roots and tubers (RTs) plays a significant role in traditional food systems[21]. This is seen for instance, in remote, often marginal areas with particularly low income levels and limited access to farm inputs (Scott, Rosegrant et al. 2000). Foremost in terms of consumption are cassava, potato, sweet potato, and yams. Other prominent roots and tubers include cocoyam, ginger, taro, and yam bean (Wilson; Scott, Rosegrant et al. 2000). Wild species that stand out are the *Dioscorea* species (wild yams) (Missano, Njebele et al. 1994).

When classic staples are short, forest foods such as starchy stems and fruits are used as substitutes (FAO 1996). Here, the borderline between "filling" and "hunger" foods is a slim one. While jackfruit, banana, the stem of the sago palm, the heart of the banana tree, rattan, and bamboo shoots are quite common staples, culture specific usage of various seeds also exist (Krahn 2003b). Starchy seeds can also provide bulk, such as from the breadfruit as used in Papua New Guinea (Townsend, Liao et al. 1973). But also leafy vegetables can serve as filling food. The wild *rau tau bau* was for instance used as staple in the Viet Nam War but is still eaten today by local Ta-Oy villagers (Hatfield 1998).

Vegetables

As the base for soups, stews, and relishes or eaten simply raw, vegetables (especially the wild species) add flavour to otherwise bland staples, making them more palatable and accordingly encouraging consumption (FAO 1989a). Various studies estimate a low daily intake to be around 10g to 30g and a high intake to exceed 250g. In days when meat is absent, vegetables are used as substitutes, e.g. mushrooms or bulky green vegetables such as ferns or *Cruciferae* species. *Rau ua*, a small leafy vegetable, was also used as a water source (Hatfield 1998:4). Flowers, pollen, and nectars also feature to a small extent in traditional diets and can give a strong aroma to food.

Fruits, seeds, and nuts

In Southeast Asian uplands, fruits typically planted in or around the swidden areas include pineapple, banana, and sugarcane. More recently gardens have been developed in which some papaya, mango, guava are planted. The idea of rich tropical gardens with high a variety of planted fruits is more so a picture of the lowlands. Contrasting to the small number of cultivated fruits, there are hundreds of edible species of wild fruits (FAO 1989a; Kuhnlein 2003). Many have taken the view that the consumption of wild fruits is severely

---

[20] *For them it is the spirit which allows them to grow the rice and not the government.*

[21] *Cassava is of special importance because it can be cultivated under near drought-like conditions. It can be harvested when cereals are seasonally in short supply and often in water-scarce areas where irrigated rice cannot be cultivated - such in the uplands (Scott, Rosegrant et al 2000). Often, RTs can be stored in the ground (FAO 1998). They do, however, require time to be found and dug up, and often involve extensive processing such as soaking and prolonged cooking (FAO 1989).*

underestimated (FAO 1988), as fruit intake is very difficult to record, being predominantly consumed as snacks mainly by children or women (FAO 1996). In nutritional studies, their consumption is often summarised in the category of vegetables and can later not be quantified.

In the absence of markets and manufactured oil, fat intake through nuts is of tremendous importance. Although fat intake in the uplands is mainly sustained through wild meats, it is completed by oilseeds such as sesame, sunflower, groundnuts, pumpkin and melon seeds, almonds, other wild nuts, and fatty fruits (FAO 1988).

Meat

In the past, for many ethnic groups plant foods were a supplement rather than an alternative to animal foods (see e.g. Brand-Miller and Holt 1998). While for hunter gatherers the quantities of meat intake have been corrected upwards, the contribution of meat to energy content and mineral intake of ethnic people in forest areas is still inclusive.

Notably, in traditional food systems, livestock cannot be thoughtlessly squandered; its consumption is often obstructed, as consumption often only follows ceremonial slaughtering (Young 1961; Kirsch 1973; Vos de 1977; Dwyer 1985; Condominas 2003). Ritual feastings however, which were in the past part of the traditional Southeast Asian agricultural calendar, provided the opportunity for all community members to consume high amounts of domestic meats (Rappaport 1968; Kirsch 1973). In Amazonian groups, the intake of pork during festival weeks rose to 56 g/cap per day (Dwyer 1985). Condominas (2001) describes the past killing of up to 30 buffalos per festival in Upper Kaleum in the Lao PDR and Viet Nam.

In daily life, wildlife was - and still - is the major source of animal protein; a fact that has stood for 40,000 years (FAO 1989a; Redford, Godshalk *et al.* 1995; FAO 1995b; 1996; Bennett and Robinson 2000b; Mainka 2002; Rao and McGowan 2002). In particular the poorest families depend on wildlife (FAO 1995b; Davies 2000). In at least 62 countries in the world, wildlife and fish contribute a minimum of 20% of the animal protein in rural diets (Bennett and Robinson 2000b), despite being largely unrecorded in national statistics.

Unlike domestic livestock, wildlife derives from an enormous variety of terrestrial mammal, avian, amphibian, reptile, and insect species. Consumption ranges from 2g with the Sanio-Hiowe in Papua New Guinea[22] (Townsend, Liao et al. 1973), to 20.2g in Nigeria (Hartog den and Vos de 1971), to 10-150g in Northern Congo (Auzel and Wilkie 2000), to 34.8g (including fish) in the Huai Nam Un Wetland in Thailand (Choowaew, Chandrachai et al. 1994), and up to 60g in Latin America for ten indigenous groups (Bennett and Robinson 2000b).

In the investigation of 955 evening meals of Sarawak's and Sabah's indigenous people, they had game meats in 37% of their meals, wild fish in 47% and other animal protein in 13%. In the same study in the uplands, with little outside access and large remaining areas of tall forest, 67% of all evening meals contained wildlife, a figure which increased to more than 90% in some months. For comparison, in 695 meals in areas with easy access and cash income only 15% of meals contained wild meat (Bennett, Nyaoi et al. 2000a). For Sarawak in Malaysia, Bennett and Robinson (2000b) suggest that subsistence hunters take a minimum of 23,513t of wild meat per year. Bennett suggests that in Amazonian Brazil, annually 3.5 million vertebrates are killed for food.

As "mini-livestock", insects have been vitally important in many traditional diets (Meyer-Rochow 1973; Sungpuag and Puwastien 1983; DeFoliart 1991; 1997; Yhoung-Aree, Puwastien *et al.* 1997). Allowing for cultural variance in edibility and consumption,

---

22 *This is twice as much as from pork, according to Dwyer (1985).*

DeFoliart (1997) describes the number of insect taxa for various countries ranging from 17 in Burma up to 80 in Thailand, and 200 in Mexico. Termites, crickets, grasshoppers ("flying shrimps"), beetles, ants, bees, mantids, cicadas, various larvae, etc. are all readily available sources of protein (DeFoliart 1997). Consumption figures range from 9-26g per capita per day, with the month of December showing the lowest consumption (Yhoung-Aree, Puwastien *et al.* 1997).

Fish

In Sarawak, in Malaysia, and in the Peruvian Amazon, 50-60% of animal protein is estimated to come from fish (Bennett and Robinson 2000b). For some indigenous Amazonian groups living near large rivers, fish counts for up to 85% of protein intake (FAO 1996). This is congruent with Dwyer (1983:343), who reported that for the Tatuyo in Northwest Amazon fish provides a mean of 7.8% of the energy supply, and an average of 57.7% of the protein supply (range up to 81.3%) (Dwyer 1985).

The tremendous importance of small, indigenous, freshwater species[23] is often overlooked. Statistics on these fish are scant (IIRR, IDRC *et al.* 2001:56). In a survey on the Lower Mekong Basin, daily average per capita consumption of fish and OAA was estimated to be 79g (raw, edible parts) (Toft Mogensen 2001). This study, however, focused mainly on the lowlands and did not differ between ethnic groups. Often, ethnic minorities in the uplands are far removed from the water courses; however, many authors have called for the reassessment of the importance of fish intake in diet (p.c. I. Baird 2003). Concurrently, despite rich aquatic resources (Warren 2000) food security projects are increasingly endeavouring to establish freshwater fishponds stocked with alien species (Hassan 2001).

Fat was not as critical in traditional diets as it is today, because then fat was consistently provided by wildlife, fish, OAA, insects and caterpillar consumption, and on festivals through high domestic meat consumption. Animal lard, especially from domestic pigs, but also from wild boars, ferret badgers, or other terrestrial animals was stored and later used.

Gums and saps

Saps and gums are tapped as beverages, often from jungle liana during work in the fields or while hunting and gathering in the forest. They are immediate thirst quenchers and provide readily available liquids, minerals, and sugars, especially in places where safe water is unavailable. The sap from the Palmyra palm (*Borassus flabellifera*) is tapped from unopened inflorescences, and can provide two litres of liquid (FAO 1989a). Wines from fermented palm saps are an important traditional beverage in Southeast Asia.

2.3.2 Nutritional value

While information is already limited on various aspects of the food chain and cuisine, nutritional information on traditional foods is even more scant (see Fleuret 1979; FAO 1988; 1989a; 1992; Kuhnlein and Receveur 1996). National food composition tables (FCT) are mainly comprised of cultivated fruit and vegetable species as well as domestic meats. Values of forest food may be available but are often fragmentary (FAO 1996; Brand-Miller and Holt 1998). Often analysis is only based on a single sample (FAO 1991). Vitamin information is the least comprehensive (Brand-Miller and Holt 1998). Information on prepared indigenous foods such as fermented foods is only accessible in grey literature. Taken together, nutritional values are mainly available for foods consumed by the majority groups. National laboratories have been mainly committed to research on pressing issues of larger population groups. Hitherto, this predicament has gone largely unnoticed.

[23] *Often smaller than 10cm. Observation with the Katu showed that most indigenous fish species were not longer than 6cm.*

Many authors have argued that some wild plant and animal species are exceptionally rich in key nutrients; often they show higher nutritional values than domesticated plants or animals (FAO 1989a and 1996), thus comparing favourably with foods imported through market networks (Kuhnlein 1996).

In addition, there are various potential errors in using food composition tables (Gibson 1990:61), making analysis of traditional diets an intricate question. Often food descriptions are inadequate, making it difficult to match the precise food consumed with the appropriate food item (Gibson 1990:72). Also it is often unclear whether analysis was based on dry or wet-weight matter, leaving desiccation levels vague. A lack of data often necessitates the use of reference data from species in the same family or genus. Nutrient composition of plants varies greatly due to harvest location, harvest time, soil type, and climate (Gibson 1990). Variations in the nutrient composition of meat are mainly associated with age, sex, and the diet of the animal (Clum, Fitzpatrick et al. 1996; Dierenfeld, Alcorn et al. 2002). Cordain concludes from this (2000) that differences in meats are only marginally related to species variety. Additionally, transport and storage in the tropical climate, together with preparation techniques, can lower the nutritional content considerably. As opposed to market dependent societies, many ethnic groups collect and eat vegetables on the same day, thus preventing nutrient loss. There is, consequently, an urgent need for investigation to evaluate nutrient loss in both cuisine and in the food chain.

For comparative analysis for a given ecological setting and ethnic group, it is possible to summarise for each food group the key species and their nutritional values into computed means for selected nutrients. Brand-Miller and Holt (1998) have compiled such means for plant species of Aboriginal Australians, later also adapted by Cordain *et al* (2000). For the Katu the author computed such means for all food groups, making a distinction between wild and domestic species (see Appendix 3). Results of the chemical analysis of Katu foods are presented in Appendix 2.

2.3.3 Nutrient intake

Due to the lack of data and the heterogeneity of ethnic peoples' diets, the following chapter has a tentative cast.

Until now there has been the pejorative attitude that people living in tropical forests suffered malnutrition mainly as the result of a poor wild diet. Conversely, others have argued that the original diets in subsistence food systems are nutritionally adequate (Oomen 1971; Truswell 1977; Dufour 1983; Dwyer 1985; Wolfe, Weber *et al.* 1985; FAO 1989a; Kuhnlein and Receveur 1996). This can mainly be linked to the high dietary breadth and also to the high nutritional values. At present, traditional diets are undergoing a rapid change, and as a consequence nutritional adequacy is shifting towards inadequacy.

In the past, during seasons when food was plentiful it can be assumed that caloric intake was sufficient. During lean periods, when non-favoured "filling foods" were consumed, it can further be assumed that caloric requirements were adequately met. Today, the ratio of carbohydrates to fat and protein (the CHO-F-P ratio) is recommended to be 55:30:15. In the past, in tropical forest areas the author suggests a diet high in complex carbohydrates and fibre and rich in animal fats and protein was available. The plants consumed were mainly wild and provided substantial proportion of complex carbohydrates. The fats consumed mainly derived from wild animal meat, with a significantly higher amount of polyunsaturated fatty acids than that in domestic meats. In addition, during festivals, substantial amounts of domestic meats were consumed. This high meat intake leads to the conclusion that they had a higher protein intake than today. Also, a variety of wild fruits and vegetables provided sufficient vitamins and minerals. For a mean of 53 ethnic groups of so-called "primitive societies" it was estimated that their diets on average provided

1,500mg Ca and 393mg vit C per day (Brand-Miller and Holt 1998), which is well above the Western RDA. Metz *et al* (1971) reported that the !Kung, hunting and gathering in Zaire, suffered from a low incidence of iron[24], folate, and vit B_{12} deficiency (Metz, Hart *et al.* 1972). This compares favourably with other more advanced groups, even economically underprivileged ones.

Inadequate nutrition, according to the author is mainly the result of disrupted traditional diets. As mentioned before, scholars have also started to argue that traditional diets may represent a reference standard for modern human nutrition and disease preventing mechanisms (Brand-Miller and Holt 1998; Cordain, Brand-Miller et al. 2000; Cordain, Watkins et al. 2002; Ogle, Tuyet et al. 2003). Wild foods especially with prospective anti-oxidative potential and other bio-active properties, e.g. phytochemicals found in fruits and vegetables, are the focus of ongoing research (Ogle, Tuyet et al. 2003).

The general prerogative view towards ethnic groups manifests itself in a lack in the comprehension of agricultural practices, hunting and gathering principles, and culinary behaviour. With the current nutrient analysis set, food insecurity cannot be sufficiently related to nutrient intake. For the majority of foods consumed by ethnic minority groups there is no reference data available, FCT are mainly focusing on the mainstream of society. A lack of comprehension regarding preparation stresses the need to further investigate ethnic people's culinary practices.

It is reasonable to hypothesize that a wider variety of foods usually provides a greater chance of obtaining all of the essential nutrients (Dewey 1979; FAO 1988). This might be particularly true for protein if supplied by plant sources, since complementary patterns of essential amino acids are most likely to occur through having several protein sources (Dewey 1979). A more varied diet is also likely to provide adequate weaning foods, critical in the prevention of infant malnutrition (Dewey 1979) as shown for instance by Omori (1996) for the highland Pwo and Sgaw Karen. From the view of food chemistry, the right variety and amounts of plant foods, can together provide nearly all necessary nutrients in adequate amounts (FAO 1988).

2.4 Dietary change

2.4.1 Defining dietary change

Many authors have argued that to appreciate the dietary patterns of the present, one must understand something about their evolution (Kuhnlein 1996, Johns 1994, Popkin 1994). Food systems and dietary patterns are never static. There is constant change for better or worse, activated by external influences (directed change) or by modification by the society itself (indirected change). Indirect dietary change stems from a series of breaks with the past which represent a measure of modernity, and show no linear or logical sequence. Direct dietary change is often the consequence of the development imperative, and concomitant food security strategies (Pottier 1999).

In chapter 2.2, the elements of a food system have been introduced. For the purpose of this work dietary change is understood as change in food group ratios and nutrient intake. Materialistic changes within the food system such as altering food acquisition, processing, and distribution, are termed as changes in the food system. The same is meant for cultural changes involving processes which take place "within the cuisine", including food selection, manipulation techniques, flavouring principles, and eating habits.

The author attributes the arbitrary use of the term dietary change in the literature to the lack of systematic information and the qualitative nature of data from anthropological

---

[24] *It should be noted that the authors observed an elevated iron intake from cooking pots.*

accounts[25]. In this work, the most important outcome of dietary change, nutrient intake per capita per day, serves as an indicator to discuss the research hypothesis. Structurally, the author extends her discussions on dietary change to include the determinants of transforming traditional food systems.

To begin with, following Johns and Chan *et al* (1994), we have to assume that traditional food systems will not be sustained in their traditional state even though some of the resources themselves warrant retention from a nutritional perspective. Ergo, the author recognizes the level of dietary change as a distinct development marker. This idea offers two advantages: Firstly, it reflects the people's attitude towards change. This draws from the notion that culinary behaviour serves to develop and maintain identities as noted in the very beginning of this chapter. Secondly, dietary change could serve to evaluate a people's potential to negotiate with prevailing outside forces in a rapidly changing environment. Here, the author starts from the premise of the success of past bio-cultural adaptation to attain food security as delineated in chapter 2.3.3.

2.4.2 Popkin's theory: Historic steps in food systems

As mentioned before, cuisine is one of the means by which cultural identity is developed and maintained. As a corollary, it is reasonable to contend that a heavily modified cuisine can be the result of substantial change. From the past until the present human diet and nutritional status have undergone a sequence of major shifts (Truswell 1977; Holmes and Clark 1992; Popkin 1994; Cordain, Brand-Miller et al. 2000; Popkin 2001:215; ODI 2003). Among others it was especially the mountainous regions which gave substantial momentum to the origination of food production. The main impulses did not generally begin in the lowlands (Rhoades and Nazarea 1991:217). Many areas however, which in the distant past were food abundant are today food insecure. More recently, the same phenomenon has prevailed in some of the tropical forest areas.

Despite the arguments presented in chapter 2.3, today's development discussions are mainly based on the erroneous idea that ethnic minorities in tropical forest areas have always been impoverished and suffering from various illnesses and a poor diet. As mentioned before, the major assumption for development is that these people have always eked out a miserable existence[26]. This notion is further exaggerated by the fact that national governments designate indigenous people as those most in need of public health services (Kuhnlein 2003).

Over the last three centuries, the pace of dietary change appears to have accelerated by varying degrees in different regions in the world (Pelto and Vargas 1992; Popkin 2001:427; ODI 2003). Change in food habits can occur relatively rapidly, particularly amongst the young (Draper 2000:1475). Many observers are concerned about the implications of change in food systems, postulating the argument that food is not simply a nutrient bundle but also a means of sustaining identity (ODI 2003).

Popkin (1994) introduces an overall concept of dietary change in five broad phases: 1) collecting food, 2) famine, 3) receding famine, 4) degenerative diseases, and 5) behavioural change. The five stages are not restricted to the periods in which they first arose, as they also continue to resemble certain contemporary geographic and socioeconomic groups (Popkin 2001:428). Popkin's concept focuses on large shifts in diet, especially in its structure and overall composition (Popkin 2001:427). Consequently, dietary transition is reflected in nutritional and health status, as well as in major demographic and socio-

---

[25] *For a description of why anthropological methods and data have not yet been better used in development discussions, see Krahn (2000).*

[26] *Present-day isolation however rarely implies similar isolation over past centuries, even for what are now regarded as the "most primitive groups". Carleton Gajdusek (1977) further concludes that "primitiveness" today may not always imply the existence of a similarly technologically impoverished, unadvanced, or illiterate culture in the past.*

economic changes. Popkin contends that it is important to note that the key focus on improved caloric and protein intake ignores many of the more subtle changes in nutrition which also occur with development.

Many tropical countries have undergone stage one and two and accordingly it seems appropriate to apply the stage of "receding famine" (phase three) to most of them. Popkin (1994) claims that during the later stage of phase three, social stratification began to emerge (Popkin 2001). For many countries this is still applicable today and marks the point where "real" poverty commences.

2.4.3 Change in traditional food systems and diets of tropical forest areas

Tropical forest areas are undergoing a rapid transition from subsistence to commercial agriculture (Pelto and Vargas 1992; Wilson 1994; Rerkasem and Rerkasem 1995; FAO 1996). In regard to the food chain, in many areas economic activities have changed from traditional activities - such as farming, hunting and gathering edible forest products - to that of wage earning and the purchase of food. Agricultural intensification is widespread. However, other areas, especially the uplands, are advancing more slowly. Villagers have continued their shifting cultivation systems and accordingly, incorporation into the market economy is only gradually progressing. Forests and gardens are still predominantly used for food acquisition. Nonetheless, collection, processing, and the preparation of forest foods are progressively being abandoned with the prospects of commercialization and the degradation of forest resources (Pelto 1992). In times of food crisis, people are tending to rely more and more on markets and food aid (FAO 1996). Traditionally, hunting was mostly for household consumption. Over time, traditional practices have gradually given way to more sophisticated techniques including the use of guns and wires.

With regard to cuisine, much of the distinct flavours of local cuisines depend on particular local ingredients, but many of these are tending to disappear as economic development commences. At the same time alterations in taste preferences occur as imported commodities become available (Wester 1996:55). Plants which have traditionally been used for foods and flavouring are often dropped from the inventory of substances generally regarded as palatable. Modifications in cooking techniques and recipes are interrelated to the transforming determinants of basic food selection. What should be inferred here is that flavouring principles and basic food selection will only change in the long term. The author therefore suggests that it is more likely that firstly new manipulation techniques will be adapted, followed by eating habits. Uniform flavouring principles often aid in the acceptance of new foods.

Changes in the traditional food systems induce dietary change. As such, dietary change is directly related to changes in food chain and cuisine. What is of special importance here is the change in the composition of diets (Popkin 1994). The author concludes that this is mainly the result of a change in the ratios of food groups. This notion derives from the argument that it is the composition of diets which has changed significantly over the last few years, while the energy content has not (Leonard and Thomas 1988). As a consequence, diets often become much less varied but become subject to greater changes. Often episodic periods of food crisis continue. At the same time some of the famine or filling foods are increasingly not available any more (Moreno-Black and Somnasang 2000). Various country profiles provide evidence to contend that decreasing diversity emerges as the most common causes of dietary deficiencies (FAO 1992; FAO/IRRI 1993).

In terms of food groups it can be summarised that an increase in the consumption of rice - but a decrease in the consumption of RTs, coarse grains, bananas, or other bulky foods - coupled with a lowered consumption of wild animals, vegetables, and fruits have resulted in a less balanced diet. In rural Bangladesh it was found that, although people were living in "modern" villages with a calorific, protein-rich rice diet and with wheat available all your round, a greater number of people were suffering from malnutrition than in "traditional" villages (FAO 1992). This was attributed to the lower consumption of foods other than rice and wheat such as roots, tubers, vegetables, and pulses (FAO 1992). Also in Bangladesh, Hassan *et al* have found out that villages with three rice harvests, tend to eat less non-rice foods (Hassan, Huda et al. 1995). The replacement of hand pounding by machine mills in rural areas has aggravated this problem (FAO/IRRI 1993). Excessive rice consumption has been acknowledged as a pervasive problem throughout Asia (FAO/IRRI 1993; Toft Mogensen 2001:63).

The consequences of a decreased consumption of wild greens are serious. A situation has been created whereby vit A deficiency commences despite the fact the edible plants capable of preventing it are readily available (Draper 2000:1473). There is however little information available on the impact of lower consumption of forest foods on diets, because the consumption of forest foods is generally under-reported, and nutrition studies do not generally address this topic specifically (FAO 1996).

Meat consumption has changed in dramatic ways over the course of human evolution (Larsen 2003). While wild meat yields can be assumed to be fairly stable over the year (Dwyer 1985), availability, however, depends on conditions in the forest. It has been shown that when favourite species are exhausted and needs cannot be met from livestock and fish, then prejudices against non-preferred species disappear and the people hunt and eat less selectively (Halle von 2002). Generally, in intact ecosystems there is a preference for large-bodied mammals. However, when these populations decline, a shift is seen towards an increased consumption of smaller game species such as rodents, squirrels, porcupines, bats, and mice together with birds, insects, amphibians, and reptiles (Vos de 1977; Johnson, Singh *et al.* 2003). By 2002, 24% of mammals, 12% of birds and about 20-30% of the main taxa of reptiles, amphibians and fish were under threat according to the IUCN Red List (Mainka 2002). Besides issues of conservation however, from the nutritional perspective, a decline in wildlife consumption has widely been unknown. Therefore livestock production is increasingly important (Berlin and Berlin 1983), but the literature abounds with accounts of failed projects to increase livestock production in tropical forest areas.

2.5 TOWARDS A MODEL OF DIETARY CHANGE

2.5.1 Determinants of dietary change

Traditional food systems cannot be considered as closed, self-sufficient entities, which can be explained in terms of the local ecology (Huss-Ashmore and Thomas 1988; Rerkasem and Rerkasem 1995). This chapter introduces a kind of framework that accommodates the complex influencing factors (see figure 2). It suggests four main determinants, namely 1) past bio-cultural adaptations, 2) environmental conditions of local habitat, together with processes of 3) national, and 4) regional integration. This framework has been adapted from Huss-Ashmore *et al* (1988:453), who applied it to the mountainous regions of Lesotho and Southern Peru. Each determinant poses a series of critical variables and interrelationships in a given food system (Huss-Ashmore and Thomas 1988:453).

The determinants which create major shifts in the food systems are hypothesized by the author to be linked with important dietary shifts. This relates to the idea that basic causes also affect the structure of diet, which in turn determines health and nutritional status. As many authors have argued before, social, political, and economic factors have a major influence on food patterns.

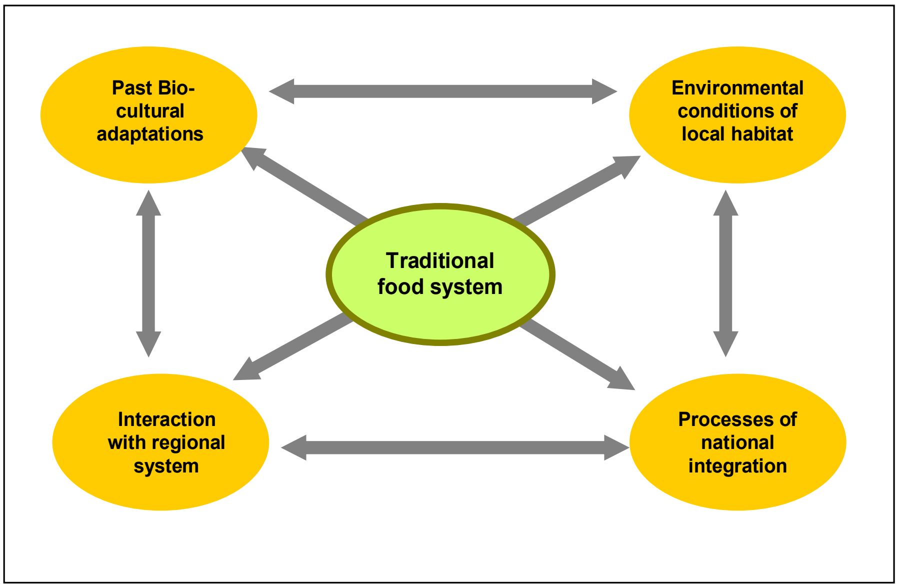


Figure 2: Determinants of dietary change

Source: Huss-Ashmore and Thomas (1988)

Past bio-cultural adaptations

In traditional food systems, past bio-cultural adaptive patterns still determine present day activities (Huss-Ashmore and Thomas 1988:454). As such, cultural adaptation intertwines with biological adaptation to the degree that they cannot be separated (Rhoades and Nazarea 1991:217). The resultant traditional knowledge does not only focus on the food chain but also on culinary behaviour such as processing, cooking, and utilisation. Over centuries these adaptations have guided people through survival worldwide. In the past, ethnic groups were especially successful in adopting new practices for their maximum benefit.

In this vein, there were those who rejected change and others who were quick to adapt to new technologies and information. To give some examples, for both the Lahu and the Lamet in Laos and Thailand it is reported that they admired but refused to adopt wetland rice production in the 1960s (Young 1961:21; Izikowitz 2001, first 1951:149). Similarly some of the Iban in Borneo refused to go to school and learn about improved methods of farming (Morrison 1966:185). The Dusun in Borneo, however, derived many practices and beliefs about wetland rice cultivation from swidden cultivation (Williams 1965).

In contrast to scientific knowledge, traditional knowledge is characterised through its dynamic nature and subconscious application. It is inherited by oral history and is often incomprehensible to outsiders (Antweiler 1995; Silitoe 1998a; 1998b). In this sense cooking a soup with very few ingredients constitutes as much a bio-cultural adaptation as planting a variety of crops on different soils and in different seasons. Culinary adaptation, however, is often dismissed. It can be assumed that in the past, ethnic minorities were apt in using various strategies to deal with uncertainty, seasonality and were thus able to attain subsistence security. In general, much of the traditional knowledge body has been irrevocably lost (Wilson 1994; Antweiler 1995; Kuhnlein and Receveur 1996; Silitoe 1998a).

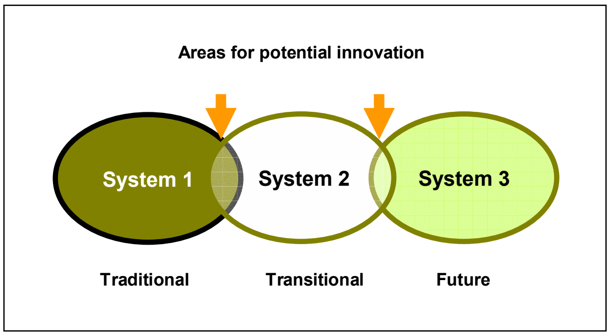


Figure 3: Dynamic nature through innovations at overlaps

Source: Silitoe 1998

The dynamic nature of adaptation is also changing (DeGarine 1988) as can be seen in figure 3. While some knowledge elements are discarded, new ideas to fill in the information gap are missing. Innovation of acquaintance is known to evolve at the overlaps of new and old (Silitoe 1998a; Oritz 1999). The rapid loss of local knowledge is therefore disastrous. In accepting DeGarine's viewpoint, one can therefore assume that many present ethnic groups either got stuck somewhere in between Popkin's phase two and three - from famine to resilient food crisis (see chapter 2.4.2), or are transforming backwardly.

Local environmental conditions

At present, tropical forest areas are experiencing severe environmental degradation. As such, habitat conversion and habitat fragmentation[27] are reported to have significantly influenced food acquisition (Lacher, Douglas Slack et al. 1999:148; McNeely and Scherr 2003). There is a general consensus that this is mainly due to changes in the methods of production together with population pressure. (Vandermeer, Noordwijk van et al. 1998; Lacher, Douglas Slack et al. 1999:143; Leakey 1999:137). Many authors have argued that the change from subsistence agriculture towards permanent market-orientated agriculture has traded innate sustainability for chemical and other inputs (Johns, Chan et al. 1994; Grifo and Rosenthal 1997; Leakey 1999). At present there is a deadlocked polarization of viewpoints.

One side supports the argument that shifting cultivation systems are primitive, inefficient, and environmentally destructive, and is calling for them to be abandoned[28]. Some even extend this argument, blaming environmental problems in the lowlands on shifting cultivation in the uplands (Forsyth 1999). The other side argues that such systems hold intrinsic potential for sustainability which should be further explored. What unites both viewpoints is that until now shifting cultivation systems have been poorly understood (Bass and Morrison 1994; Forsyth 1999). This is especially true for the lack of understanding of differences in practices and of ethnic groups. Moreover, there are those who infer that human intervention actually increased biodiversity in some areas, e.g. by systematically transplanting crops throughout the forest (Rhoades and Nazarea 1991:225; McNeely and Scherr 2003). Regarding opportunistic hunting there are also those who argue that traditional hunting practices have been sustainable, assuming an off-take of under 200kg/km^2 (Davies 2000).

---

27 Here defined by Lacher et al (1999) as the subdivision of continuous habitat over time through, for instance, expansion and intensification of human land use.

28 Often based on research during the 1950s or pre-determined results as written in the editorial of the Watersheed Vol 5 (1) 1999, page 2.

Indeed, increased economic pressures and new technological innovations can causes losses of biological diversity in the early stages of development (Lacher, Douglas Slack et al. 1999:148). In particular the greater penetration of the cash economy into upland areas is likely to heighten pressure on the environment, as upland farmers seek to expand the area committed to cash crops in response to emerging markets and an augmented demand for cash income (Pelto and Vargas 1992; Dove 1993; Rerkasem and Rerkasem 1995). Research in Malaysia's Pasoh Forest Reserve showed that, even after 40 years of recovery, logged forest contained only 61% of the plant diversity of the pristine forest (Lian 1996). Concurrently, this complies with marked reductions in wildlife populations with a quite consistent order of extirpation; only the species most resistant to hunting still remain in the vicinity (Lacher, Douglas Slack et al. 1999; Leakey 1999; Tungittiplakorn and Dearden 2002). As mentioned before, hunters became unselective, to the point of targeting even small prey of low return value per unit of hunting effort (Peres 2000). In 1932, for Central Thailand, Bhicharna recorded local people saying "*there used to be plenty of game there before the country was opened up for rice growing*" (Bhicharana 1932). This goes along with a decrease in the overall numbers of associated wild plants. In addition there is a steady trend in the development of staple monocultures, especially rice, which are vulnerable to crop failures (FAO/IRRI 1993; Draper 2000:1472). It must be noted that when native varieties go out of cultivation, a major future potential is lost (Gollin and Smale 1999).

Moreover, many researchers hold the failure of existing institutional arrangements as the cause of additional difficulties (Eggertz 1996). It has been observed in areas where the management of natural resources has been carried out by outside government agencies that practices have shifted away from traditional forms of natural resource management (Rhoades and Nazarea 1991:226; Dove 1993; Baird and Dearden 2003). Biodiversity loss has also been found to be caused by corruption (Smith, Muir *et al.* 2003).

What appends quite freshly to this situation is that the development goal of increased food production to match the needs of a growing population may often clash with the *in situ* conservation goals of preserving biodiversity (Rhoades and Nazarea 1991:215; McNeely and Scherr 2003). Traditionally, the conflicting issues of conservation and development have never been brought together (Davies 2002). However until now, no research has been undertaken to determine the full cost in terms of worsening diets and loss of income through forest loss (Pelto and Vargas 1992; Wilson 1994; McNeely and Scherr 2003).

Process of national integration

In the beginning of chapter 2 the author has shown that ethnic people in tropical forest areas, especially the uplands, often do not have the same economic mode of production as the majority groups living in the lowlands. As a consequence, perceived local and national needs rarely coincide (Kunstadter 1978; Rerkasem and Rerkasem 1995; Keyes 1997; Chamberlain and Phomsombath 2002). In the past, modernization has justified and added weight to the rights of the dominant groups to exercise their command over other ethnic peoples and to exploit their resources (Dove 1993; Wangpattana 2002). In this vein, development problems in the uplands have been exacerbated by attempts to address them using the development models based on lowland experiences (Taylor 1996). As such, social disruptions have been caused by the intrusion of outside forces.

Integration with regional system

While in the past changes in upland food systems were often associated with migration, war, colonialism, and acculturation, nowadays they are increasingly determined by access to land and natural resources, infrastructure, services and market commodities. Beyond these, processes of pervasive delocalisation have been introduced as a driving force as shown in chapter 2.2. This transformation is not always balanced and people's participation is often low.

There are various cases in which people were not granted rights and could not benefit from the services newly brought to remote areas (ADB/SPC/NSC 2001; UNDP 2002). Change in access to forests, has frequently been reported to result in less food availability and an income loss (Kunarattanapruk, Chokkanapitak et al. 1998). Increasingly however, intruding outsiders are competing for NTFPs and wildlife, and are depriving local people of their participation within the regional system (Dove 1993). The commercialisation of natural resources as a means of regional integration is therefore a two-sided issue for ethnic peoples, inevitable and necessary, but potentially harmful. It is potentially detrimental to rural people if it expands to the point whereby it negatively affects their food systems along with their diets.

2.5.2 Modelling dietary change

Anthropological literature abounds with qualitative statements that processes of acculturation bring about a series of health related problems for traditional peoples. Few studies however document the change in diets. There is still inconclusive evidence for a full nutritional assessment of traditional diets. There is a solid base in nutritional studies on hunter-gatherer diets, mainly to understand evolutionary processes. There is also a profound base of studies on rural cereal-based diets of agriculturalists.

The transitional stage, however, such as that of shifting cultivators before pervasive delocalisation is poorly documented in terms of nutritional analysis. The available accounts of anthropologists were not intended to calculate on nutritional adequacy and as a result cannot be used. Yet, it is exactly this stage, the author conjectures, which best serves to analyse the nub in the advent of dietary change. She relates this to the fact that innovations take place at overlaps in transitional food systems, as illustrated in figure 3.

The process of dietary change can either be positive or negative. There are also cases, where modernisation of the diet has neither caused a deterioration in nutritional status, nor produced a notably healthier population (Holmes and Clark 1992). She does argue however, that their collective transformation shows distinct trends which transcend geographic and cultural stratification, and which are presented here. A model for dietary change scenarios is presented in figure 4.

Positive dietary change

When local people lose their traditional food system, it is possible that circumstances can favour the maintenance of a positive nutritional status and good health, even though the intimate relationship between the people and their natural environment has been broken up (Kuhnlein and Receveur 1996). This is the case when the loss of nutritional quality with traditional food systems is countered by adequate income, the availability of new quality food and education (Kuhnlein and Receveur 1996; Pongcharoen 1998). This sanguine change can be defined as continuous positive dietary change. At the same time, several examples of negative dietary change have demonstrated positive rechange through cultural revival and the reintroduction of traditional foods (Kuhnlein and Receveur 1996) which the author defines here as new positive dietary change.

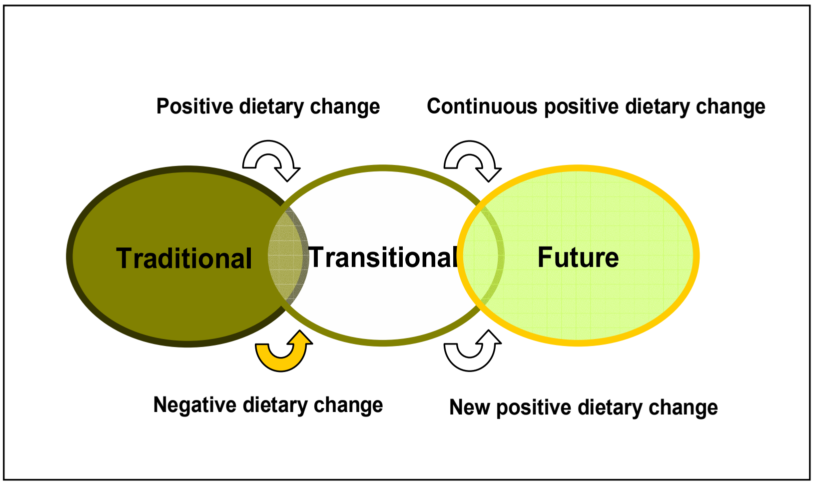


Figure 4: Model of dietary change in transitional food systems

Source: Own production

Negative dietary change

When a traditional food system changes, it is possible that circumstances induce a deteriorating nutritional status through inadequate nutrient intake and bad health. This is often the case when a traditional food system declines - but no new viable alternatives are found - or when the traditional food system cannot be maintained (Schlegel and Guthrie 1973; Dewey 1979; 1981; Thamam 1982; Bindon 1984; Lepowsky 1985; Leonard and Thomas 1988; Marten and Abdoellah 1988; Allen 1992; Johns, Chan *et al.* 1994; Kuhnlein, Recevuer *et al.* 1995; Rerkasem and Rerkasem 1995; Draper 2000). Often present shifting cultivators do not have the resilience to deal with various influencing forces. As stated before, with the decline of traditional food resources, its usage and understanding, potentials for nutritional and cultural benefit are irrevocably lost.

Many authors have argued that nutritional deficiencies such as of minerals and vitamins would not have occurred at earlier stages of development, but have only resulted from the development of agrarian societies with their predominantly cereal diet (Saraya, Tandon *et al.* 1971; Draper 2000). These negative nutritional outcomes are often severe, but are mainly left ignored. Food security strategies mainly venture from the assumption that traditional diets have always been insufficient.

2.6 LINKING FOOD SECURITY AND DIETARY CHANGE

Following the argument of chapter 2.4.1, the author proceeds from the premise that it is crucial to understand past dietary patterns and their antecedents to comprehend current nutritional problems in areas of tropical forests. Or, as Kuhnlein (1996) puts it, tracking changes will give insights into which manner of traditional food systems can be best utilised at the present time (Kuhnlein 1992). From a conceptual perspective, this matches the call to truly extend development ideas into the cultural dimension (BMZ 1996; Silitoe 1998b). This is virtually a conceptual translation of the development paradigms of low external input, help towards self-help, and sustainability (BMZ 1982; 1996).

If it is the aim to prepare the way for positive dietary change, then self-determination is needed so that people can negotiate for themselves in the rapidly changing environment, and express which elements of the cuisine and food chain to retain and which to adapt anew. According to the author a positive dietary change can be used as a precursor for food security. This calls for either sustaining continuous positive dietary change or transforming negative dietary change into positive dietary change (as was seen in figure 4).

2.6.1 The orthodox concept of food security

Policy makers are trained to think about food problems in developing countries in terms of food security (ODI 2003), but often without clarity, as these problems may be seen from different viewpoints (Braun 1999:41). Alongside aspirations from governments and development organisations, the local viewpoint rarely prevails.

The current concept of food security especially lacks comprehension of cultural factors which would help to understand the local perspective on food. As a result, current food security strategies seek to impose change in behaviour without seeking the people's understanding of why this is needed and why it would be beneficial to them (Schuftan 2000). In doing so, current food security strategies do not pursue any rudimentary explanation for nutritional problems over time. Instead, they prefer focus on the present. Experience has shown that this causes two problems. Firstly, increased food production does not automatically translate into enhanced and better food consumption (Ali and Tsou 1997). Secondly, without understanding the past concept of food security, one cannot separate historical from modern problems (e.g. estimating the extent of rice deficiency or loss of wildlife).

In this work the author deals only with the concept of food security at household level. Since the mid 90s, the shift from macro-level analysis towards the micro-level has been commonly acknowledged (Schulz 1999). Here, the author will follow the definition that food security (at household level) describes access to adequate food in quality, quantity, safety, and in a manner which is socio-culturally acceptable and thus to achieve a healthy life by all people at all times (Sen 1981). At the operational level, the institutions and agents targeting food security issues mainly use the nutritional status as described in the previous chapter as an indicator to assess the quantitative level of food security (Gibson, 1990).

2.6.2 Localized and external food security strategies

Over the years, various food security strategies for tropical rural areas have been developed, but not specifically for the uplands, or for certain types of forest, nor for ethnic people. Without aiming towards a proper recognition of the activities of food security strategies, the author makes a distinction between localized and external food security strategies. Localized food security strategies directly intervene at the food chain, nota bene they act on the levels of food acquisition, processing, distribution, and consumption.

Table 3: Causal relationships in localized food security strategies

Steps in food chain	Intervention
Food acquisition	Agricultural production (crops, livestock, poultry, aquaculture)
Food processing	Food fortification, formulated foods, processing
Food distribution	Income generation, introduction of market foods
Food consumption	Nutritional education, food aid, feeding, hygiene, (childcare, drinking water), health

Source: Own compilation

Table 3 provides an overview of the assumed causal relationships to augment food security. Taken together, localized food security strategies are hypothesised to lead to a) higher food quantity, b) higher food quality, c) higher food diversity, and d) better health.

However, some external development strategies can also impact on traditional food systems, even when they are seen as unconnected with food security by many of the development organisations (Krahn 2003b). The pervasive role of food in daily life, as described at the beginning of chapter 2, refutes those who deny this argument. However, current development organisations and governments persist on working on sector levels, assuming that everything which is not called "food security program" has nothing to do with food security (see also Krahn 2000). This includes policies for ethnic minority affairs, infrastructure, forestry and conservation together with national security concerns. The overall assumption is that upland areas must develop effective economic linkages with the national economy in order to enhance food security and income growth. External food security strategies can therefore be characterised as unintentionally targeting the food system, but even more so its influencing factors.

2.7 Conclusion

Southeast Asia is challenged to reduce its high levels of mal- and undernutrition, especially in the uplands and in the vicinity of biodiversity hotspots inhabited by ethnic, often indigenous people.

In the past, customary diets of ethnic people often met nutritional recommended daily allowances and contributed significantly to a balanced nutrient intake. Up until now the idea that people living in tropical forests suffer from malnutrition resulting from an imbalanced diet, has been based more on pejorative prejudices, than on scientific research.

Conversely, in many cases nutrient intake has only recently shifted towards a level below the recommendations. Institutions and agents involved in working with food security do not, however, sufficiently address the true causes and evolution of negative dietary change. As a result, many food security strategies necessarily have been proved fallacious, and run the risk of only a transient impact or of causing project failures. Moreover, the outline of most food security strategies has derived from ideas and experiences in areas penetrated by the cash economy and agricultural intensification. Despite their success in these areas, in applying the same principles to tropical forest areas inhabited by various ethnic people, it is likely that such policies do not harness the potential to facilitate positive dietary change.

It appears safe to surmise, therefore, that the intricate culinary principles of the diverse ethnic groups together with the unexplored nutritional values for wild foods, constitute a high potential which has until now been left untapped.

CHAPTER 3: TRANSITION IN THE LAO PDR

3.1 GEOPOLITICAL HISTORY

About 10,000 years ago food systems along the Mekong River (see figure 5) were established by people from the Austro-Asiatic Superstock - such as the Mon-Khmer groups - who are indigenous to mainland Southeast Asia (Schultze 1994; UNDP 2002). These food systems were mainly based on shifting cultivation and were intrinsically linked to spirit worship. In the 11th century groups from the Thai-Kadai Superstock emigrated[29] into this area and introduced wetland rice production (Rehbein 2004:31). It was not until the 13th century that, through the unification of the various mandalas[30] of Thai-Kadai groups, a 600 year old monarchy began. Later, following the transformation from Hinduism to Buddhism in the late 17th century, the Thai-Kadai groups had transformed Laos into an economic and religious centre for the whole of Southeast Asia (Jerndal 1998). This oft called "Golden Age" arose mainly in the lowlands.

Back in the 16th century the kingdom's expansive territories incorporated vast and flat areas suitable for irrigated rice production which are now today's Thailand (Korat Plateau) and Cambodia (Stun Treng) (Schultze 1994:200). However, through the geopolitical interests of Thailand and Viet Nam, and the desire of France to have access to Yunnan via the Mekong when it was in competition with British-Burma, at the turn of the 20st century, Laos was reduced to the present 237,000 km^2 mountainous territory (Jerndal 1998).

Figure 5: Map of the Greater Mekong Subregion

Source: PRSP-Watch/VENRO

Not seeing any economic benefits in the mountains, French Indochina never took great interest in the terrain. After the First Indochina War, this attitude persisted with the United States and Russia using Laos only for balancing political powers. They believed that the mountains were inhabited by hostile warrior tribes. Being drawn into the Viet Nam War, however, the mountains turned into a battleground. The indigenous groups were mobilized to support either the RGL (The Royal Government of Laos) or the armed wing of the communists, the *pathet lao*. Along the Ho Chi Minh trail network, the latter finally prevailed in 1975. While the lowlands transformed into cooperatives, the uplands served as an

[29] *There is an ongoing discussion on the origin of the Thai-Kadai groups. There are five hypothetical areas suggested: 1) Altai mountains, 2) Nan Chao (today's Yunnan), 3) Southeast China, 4) Northern Viet Nam, or 5) the present area (Rehbein 2004:35).*

[30] *Jerndal (1998) describes a mandala as a notion of the political situation in SEA, where states occupied vaguely defined geographical areas without fixed boundaries and where smaller centres tended to look in all directions for security.*

environmental larder for the socialist republic, and also supplied excessive timber to Thailand, China, and Viet Nam.

During the war many of the Southern groups of Laos had strong links with communist movements, especially the T'Oy, Taliang, Alak, Katu, and Laven - who were known as fierce fighters and were instrumental in defending the South. Despite the strong support these ethnic groups gave the communists, nowadays ethnic Lao from the Thai-Kadai group hold almost every post in the central government and many in the provincial administration.

Today, as well as having to cope with the emerging poverty, Laos is struggling hard with the reversion resulting from 11 years of a planned economy into an ASEAN orientated market economy. Nevertheless, ADB and WB indicate that Laos has become a geographical fulcrum and appears to be in a position to play a crucial role in the success of the GMS. In the author's opinion however, one should better argue that Laos is again at the mercy of political powers. The massive influx of foreign development assistance - coupled with the influence from the WB, ADB, and the European Investment Bank - appear like an aggravated revival of the past. Rampant exploitation of natural resources continues to serve foreign economic and political needs.

As a consequence, the GOL is once more caught in the web of international forces and a burgeoning development trap, leaving little space to serve the ethnic groups in the mountains, who once helped them into power. For many ethnic groups, the hope for improving their food systems in the uplands is becoming illusive.

3.2 Least developed country and the biocultural hotspot

Today, Laos is home to 5.4 million people. Currently growing at 3.4% (EIU 2003), the population is estimated to reach 10 million by 2030 (FAO 2003a). Population density is very low, on average 22 people per km^2. With a per capita income of 373US$[31] per annum, Laos is classified as a least developed country (LDC), being one of the poorest in Southeast Asia (EIU 2004a). Using the human development index, it ranks below Botswana and Swaziland and is now in 133rd place. Almost half of the population live below the government's official poverty line and 22% have fallen below the food poverty line (FAO 2003), which is defined as the level of income sufficient to buy 2,100kcal/cap/day (see Knowles 2002:27).

The cultural patchwork of Laos comprises 250 linguistic groups from four ethno-linguistic superstocks (UNDP 2002; Condominas 2003). The highest level of distinct ethnic diversification can be found in the uplands (UNDP 2002). Being shifting cultivators, most of the ethnic minorities continue to sustain their century old food systems and cultural belief systems within agro-ecological niches (UNDP 2002; Condominas 2003). The various ethnic groups hold a vast body of local knowledge comprising the use of plants and animals for food and flavouring, medicine, etc. The intimate relationship with the forest made them autarkic and prevented poverty, especially for those far away from any governmental support. To give an example: the high rate of autarkic peasantry in the past which acted as a buffer against the initial impact of the Asian crisis, and made the effect of the crisis less dramatic in Laos than in its neighbouring countries[32].

---

[31] *Illegal logging and and poaching of wildlife appear to obscure the data picture. Over the period from 1994/95 to 1998/99, the Lao Treasury has realised only about one-third of the estimated market value of the timber harvested. Values are lost due to excess logging waste, under pricing, and arrears (Worldbank 2001). As a result, it is reasonable to assume that the potential GDP is much higher than estimated.*

[32] *This only applies to the direct effect on Lao subsistence economies. The national economy suffered severely from the decreased direct foreign investments after 1997 (up to 50%), stimulating a fresh orientation towards Viet Nam and China at the expense of economic ties with Thailand, according to Lintner in FEER (May11, 2000).*

However, the Thai-Kadai groups exercise their political and socio-economic powers over the various ethnic upland communities (Evans 1998:149; Jerndal 1998; Chamberlain and Phomsombath 2002) and are specifically putting upland food systems under stress. It appears that what causes this dilemma is many upland cultures are conceptualised as backward and primitive (Evans 1998:150; Aubertin 2001; Condominas 2003:21).

At present, approximately 54% of the country is thought to be forested[33] compared to China (17.5%), Cambodia (52.9%), Thailand (28.9%), and Viet Nam (30.2%) (FAO 2003b). The objective to accomplish a forest cover of 60% in 2020 is unlikely to be reached (Worldbank 2001). Also, in contrast to development perspectives, bio-conservationists argue that Laos is far richer than its more prosperous neighbours (Chape 1996; Rigg and Jerndal 1996:145; Duckworth, Salter *et al.* 1999; WWF 2003a).

Indeed, Laos is one of the richest centres of tropical evolution; diversity and numbers of species in the biota are extraordinary (Gressitt 1970) especially in the mountainous areas (WWF 2003a). Laos harbours an extraordinary faunal and floral biodiversity in its forests, and is the most unspoiled example remaining in Southeast Asia (Gressitt 1970; Duckworth, Salter *et al.* 1999; WWF 2003a).

Laos' mountainous topography (80% of the land), its poor infrastructure[34], and its relative isolation from the world economy have protected its forest from the massive destruction of natural resources witnessed elsewhere in the region (Delforge 2001). The dissected mountains are mainly in the North and along the Annamite Corderilla at the Vietnamese border. In neighbouring Thailand, forests are now mostly isolated in a matrix of agricultural land. The potential of Laos' aquatic biodiversity is comparable to that of the Amazon (Warren 2000; WWF 2003a). In terms of rice varieties, Laos is the second richest country in the world (IRRI 2003). Still, the known number of plant and animal species is incomplete, and at the same time, Laos' forests are undergoing rapid processes of degradation (Duckworth, Salter *et al.* 1999; EIU 2004a) - especially since the mid 1980s (Krings 1999:75). The GOL's quota for the amount of timber to be cut in the fiscal year 2000/3 was reportedly exceeded by more than 30%[35] (EIU 2004a). At the same time, there is tremendous forest degradation due to shifting cultivation, estimated at 115,800ha in 1999 (Worldbank 2001).

Taken together, combining cultural and biological diversity, the LDC label should be connoted with "least damaged country" rather than least developed country (Delforge 2001). Until now, this non-monetary richness has been recognised by few, but is already fading due to cultural attrition and environmental deterioration. Moreover, as can be seen in the figure 6, also in Laos many districts of poverty have overlapped with biodiversity priority areas (WWF 2003). There is a consensus that the Lao PDR constitutes a classical example for a tropical country trapped in poverty and increasingly driven by outside forces.

---

[33] *Conflicting data, alternative definitions, and genuine changes in the resource base hamper the discussion of the size and condition of Lao forest resources (Worldbank 2001).*

[34] *War, accounting difficulties, and a lack of investment have resulted in an undeveloped transport and communications infrastructure. Out of a total road length of 24,000 km, 55% are earth roads, 29% gravelled roads, and 16% tarred roads (EIU 2003).*

[35] *This is mainly attributed to tax evasion (EIU 2004).*

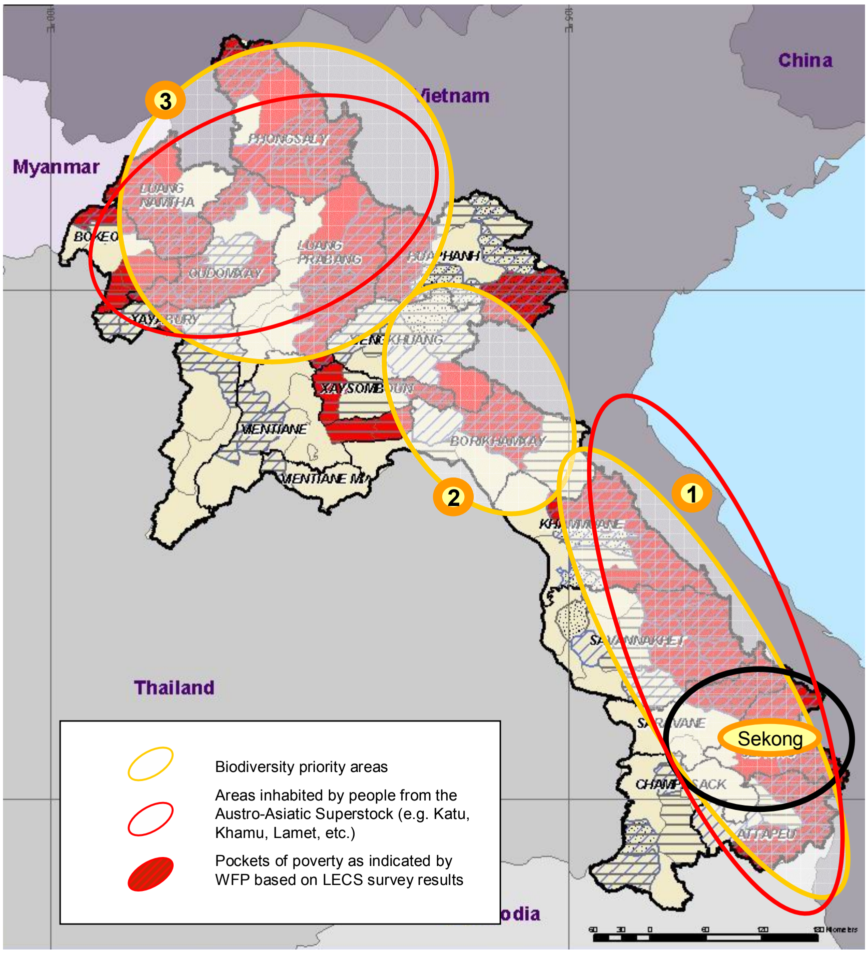


Figure 6: Overlap of poverty and biodiversity priority areas in the Lao PDR

Source: Modified map from WFP

3.3 Economy as a cargo cult

In classical terms, the economic structure in Laos is rudimentary. The backbone of the Lao economy is the agricultural sector. In 2001, it accounted for an estimated 50% of the GDP (at constant 1990 prices)[36]. Industry and services contributed each 25% to the GDP in 2002 (EIU 2004a).

In contrast to Laos' non-monetary richness, the country's monetary dependency is outstanding in the region. Over the last few years, aid per capita was higher than 60US$ (GOL 2002) which allows to finance most of the current-account deficit[37] (EIU 2004a). Some scholars argue that the GOL has developed a "cargo cult"[38] (p.c. H. Luther 2004). Notably, the financial management of the government[39] has managed to sustain its 30 year old one-party regime through rent-seeking of 10-20% in all economic activities and a

---

36 *With rice the most important crop grown in 80% of the cultivated areas (EIU 2004a).*

37 *In 2001, the ratio of debt to GDP was 149%, down from a peak of 195% in 1999 (EIU 2004a).*

38 *This term relates to the case of Papua New Guineans, who after having been provided with air lifted food aid, built miniature aeroplanes and consecrated them by rituals. These rituals were aimed at making the planes, which dropped the food, return. The GOL also behaves in a certain order to attract more foreign aid.*

39 *As the only permitted party in the country, the LPRP dominates the Government and bureaucracy in Lao PDR. Article 3 of the constitution defines the leading role of the LPRP in the political system. Almost all top government and administrative positions are occupied by members of the Politburo and by the Central Committee of the LPRP. Mass organisations serve to mobilise the population throughout the country and to make everyone toe the party line. Out of the 11membered Politburo, seven are generals and one is a colonel.*

black-market comprising of 60-70% of the economy (p.c. H. Luther 2004). In this context, illegal logging is of special importance - although its extent is far from being quantified (TRP 2000; Worldbank 2001).

The Laos economy is however increasingly contingent on its neighbours (Jerndal 1998), especially Thailand and Viet Nam, but also increasingly on China (EIU 2003; 2004a). As a corollary, Laos' own land assets, natural resources and energy are regionally dovetailed (Jerndal 1998). Besides environmental and socio-cultural disruption, dam policies in China and Viet Nam have already severely infringed on Laos' hydropower production. Stemming 33% of Laos export (EIU 2004a) the EIU reports a reduction of 15% from November 2003 to April 2004[40] (EIU 2004b).

It appears that with increasing involvement in the political economy of the Mekong Basin development, it is more and more difficult for Laos to sustain stability (Mitchell 1998:71; Krings 1999). Through the highly selective approval and allocation of aid money, the GOL is, however, able to exercise strong control on the sectoral and regional development portfolio. The cargo cult therefore appears to aim at preventing a second colonialization.

3.4 New type of poverty in the Lao PDR

Over time livelihoods in marginal areas have changed significantly. In this context most scholars argue that despite some reasonable progress (mainly in the lowlands) the uplanders have not benefited from the recent development processes (see UNDP/UNV 1997; Krings 1999; ADB/SPC/NSC 2001; Chamberlain and Phomsombath 2002; GTZ/GOL 2002; Goudineau 2003:35).

The first participatory nation wide poverty assessment, the PPA, has concluded that while overall poverty has declined, poverty in some areas has increased (ADB/SPC/NSC 2001). Poverty in Laos is a recent and not endemic phenomenon (see also UNDP 2002). Maladjusted land use practices and population pressure in combination with external factors such as - natural disasters, insufficiently implemented development projects, etc. - appear to have led to this new type of poverty (ADB/SPC/NSC 2001; UNDP 2002). In many cases resettlement efforts have led to a cultural hiatus (UNDP 2002; Goudineau 2003:35; Romagny and Daviau 2003). Moreover, the onset of large hydropower schemes, and even small-scale irrigation schemes were shown to have negative impact on local fishing communities (Baird 2001). There are many other studies which continue to show that poverty is commencing in the uplands (Ireson and Ireson 1991; Jerndal 1998; Krings 1999; Chamberlain and Phomsombath 2002; Knowles 2002; UNDP 2002; FAO 2003a).

The PPA further established that there is a strong correlation between poverty and ethnic groups in Laos, with the poorest villages being ethnic Mon-Khmer (Austro-Asiatic Superstock), who constitute 24% of the total population, and of whom, 53% are reported to be poor (ADB/SPC/NSC 2001). But success in the many projects and programs seeking to tackle the uplands' development is reported to be slow because of weaknesses in the GOL's capacity - and because of the sheer scale of the problems (EIU 2003).

In the past the uplands were not always impoverished, local natural resources often provided necessary trade commodities (e.g. wax, medical plants, animal parts, etc.). The early Lao kingdoms for instance were dependent on income from NTFPs harvested in the uplands. Also the former Indian and Angkor Empires were fully dependent on Laos' peacock feathers and other NTFPs (p.c. Patrizia Zolese, UNESCO 2002). Notably, the former kingdom of Luang Prabang was dependent upon rice supplied by the uplanders (p.c. V. Grawbowsky 2001). Copious trade commodities were also found in written accounts (e.g. Garnier 1996, first 1866; Cupet 1998, first 1891; Izikowitz 2001, first 1951).

---

[40] *Total electricity production, compared with the previous year. Laos' power production is mainly hydropower.*

Notably, Evers stated that in Southeast Asia the analysis of small-scale trade is "*beset by serious misconception and prejudices*" (Evers 1990:2). It is therefore likely that more evidence will surface which will show that ethnic minorities were not always disadvantaged and are now suffering due to a more recent phenomenon.

3.5 National nutritional and health situation

The health situation in the Lao PDR is often compared to that of the Sahel zone. The nutritional situation is also grim. The first ever national nutrition survey of children under five was conducted in 1993. From then until 2000, stunting improved slightly to 41%. On the other hand, levels of wasting have increased to 15% (MOH 2001). In this survey ethnic minorities were identified as high risk groups, especially those living in the midlands - such as the Mon-Khmer groups. A study by Kaufmann on the Khamu and Akha in Meuang Sing reported 70% stunting (Kaufmann 1998) which is far higher than the national average.

Iron, iodine, vit A, and B-vitamins have been identified as critical nutrients, but there is no clear statistical data available on the level of IDD, anaemia and vitamin deficiency induced diseases. For instance, before the "Laos National Vitamin A Survey" in 1995 (MOH, WHO *et al.* 1995), no detailed or countrywide information had been collected. To track the evolution of nutritional problems in the Lao PDR transpires to be a difficult task. Seasonality of malnutrition has not yet been studied in the Lao PDR, but along with a higher incidence of infectious diseases, such as diarrhoea and malaria, it can be expected to increase in the rainy season (FAO 2003a).

Health statistics have shown some recent improvements such as a reduction in the overall infant mortality rate to 96 deaths per 1000 live births (FAO 2003a). Infant mortality is however above - and life expectancy below - the averages for developing countries. Many ethnic groups still consider health and well-being as a consequence of spiritual balance rather than as a result of a sufficient food intake. The disruption of the traditional belief and medical systems, coupled with inaccessible health services, has left villagers in a vacuum which obliges them to cope with new diseases, which spread rapidly.

The author hypothesized that for the Lao PDR ethnic minorities living in forest areas it has become increasingly difficult to either improve or sustain their nutritional status as this status is directly related to their disrupted traditional food systems (Krahn 2003b).

3.6 Dietary change in the uplands

In the uplands, the traditionally low affiliation with the cash-economy in association with the low surplus continues to this day (Pelzer 1978; Rigg and Jerndal 1996; ADB/SPC/NSC 2001; GOL 2001; Worldbank 2001; Chamberlain and Phomsombath 2002). The Khamu[41] proverb "*money is our friend, but rice our heart*" expresses this situation and can be applied to most of the Lao uplands. Forest exploitation is one of the few available economic activities, including NTFP production which often stems more than 50% of income generation (Worldbank 2001). Having few market foods at their command many of the ethnic groups acquire most of their food from agroecosystems. As such, shifting cultivation (*hai*) is the predominant agroforestry practice (Bass and Morrison 1994; FAO 1996a; Roder 2001) with a high diversity in terms of techniques and crops (Gansberghe 1994; UNDP 2002), but connoted as being backward, and prone to natural hazards attributed to "*archaic techniques of cultivation*" (GOL 2000a). Similarly, one hundred years ago, the French Captains Cupet had the prejudiced argument that "[…] *at the beginning of the rainy*

[41] *An Austro-Asiatic group living in the North.*

season, the savage digs holes, with the help of a pointed stick, into which he throws the rice, without even taking the trouble to cover it up" (Cupet 1998, first 1891:155).

Hunting, fishing, and gathering edible forest products constitute additional core elements of the upland food systems (Håkangård 1990; Beer, Polsena *et al.* 1994; Foppes, Saypaseuth *et al.* 1997; Simana 1997; Clendon 1998; Denes 1998; Duckworth, Salter *et al.* 1999:19; Shoemaker, Baird *et al.* 2002; Johnson, Singh *et al.* 2003; Meusch, Yhoung-Aree *et al.* 2003). The contribution of forest mammals and birds to food security is higher in hilly areas away from water-bodies, whereas in areas near water-bodies the people consume more fish. The extent, however, to which wildlife contributes to local food security is largely unresearched (Duckworth, Salter *et al.* 1999:19; Johnson, Singh *et al.* 2003). GOL officials including police and army units, assigned to border posts and other rural areas hunt for subsistence in order to supplement their incomes (Duckworth, Salter *et al.* 1999:16,19).

Contemporaneously, most Lao upland cultures are undergoing a rapid process of transformation (Roder 2001:171-180; UNDP 2002; Rigg 2003) resulting in dietary change (Håkangård 1990; FAO 2003a; Krahn 2003b). While traditional foods are decreasing, and some have almost disappeared, new food items are finding their way into upland kitchens. In some areas positive dietary change appears to be occurring, whereas in many areas unexpected negative dietary change is apparent (Krahn 2003b).

There is scant published information on actual consumption levels in the uplands. Production statistics are also highly incomplete and obscure. A 1994 FAO study varied from official GOL's statistics by 20% for the harvest area and by 9% for the yields (FAO 2002). Until now, the FAO balance sheets are the only available data set indicating national food availability (per cap and per year). This is computed as a function of population and production minus exports, stock changes, waste, seed, and livestock feed, plus imports and food aid.

There are two reasons why the national data cannot serve to interpret changing food consumption in the uplands. Firstly, consumption of wild meat is not recorded: Food groups only comprise of domestic meats, offal, and fish. Vegetables and fruits are recorded exclusively from domestic production. Secondly, the national data appears to be biased in favour of urban foods, reflected for instance by the high consumption of vegetable oil (5g/cap/day). Thirdly, the missing data on the nutritional data of indigenous upland foods makes evaluation of dietary intake almost impossible.

In the uplands there are as many diets as there are ethnic groups, each responding to various forms of biocultural adaptation. These diets do, however, have some common features which are distinct from the diets of the lowlands with its wetland rice production. For the upland communities, besides glutinous rice[42] (*Oryza sativa*), and to a lower extent non-glutinous varieties, roots and tubers from garden and forest, together with corn make up a great share of the bulky food. In times of shortage, bamboo shoots, green leafy vegetables, ferns, mushrooms, wild stems and bulbs, bananas, jackfruit, etc. are eaten in greater amounts as filling food. The ratio of rice to non-rice staples always changes with the seasons and also has changed considerably over time (Krahn 2003b). In the past, many ethnic groups saved their rice for guests, festivals, and special occasions. Gansberghe (1994) reports on the former use of millet, sorghum, job's tear, and other coarse grains which have been almost reduced to insignificance today. Within the "rice frontier" there is a trend towards increased glutinous rice consumption.

Garden eggplants, pumpkins, beans, cucumbers, chillies, etc. form a big share of the vegetable foods, but people also frequently collect a wide variety of forest vegetables such as leaves, shoots, sprouts, mushrooms, flowers, weeds, flavourings, etc. (Håkangård 1990;

---

42 *Glutinous rice varieties abound from Laos and Northeast Thailand to the surrounding regions of Burma, Yunnan, Vietnam, and Cambodia, and even to the Dayak in Borneo.*

Ireson 1996; Simana 1997; Clendon 1998; UNDP 2002; Krahn 2003b). This consumption of wild greens is not restricted to poorer families exclusively, nor is it purely a means of obtaining nutrition during times of scarcity (although this is common practice) rather, the consumption of wild greens is an integral part of the diet as a whole. Conventional studies on nutrition often fail to grasp this point (p.c. J. Foppes 2003). Even today, a wide variety of forest fruits are collected besides nuts. In the past, however, forest fruits were of more importance than they are now. Garden fruits are increasingly planted, with the banana playing an exceptionally important role (Krahn 2003b).

Most animal protein consumed in rural households comes from captured wildlife, including fish and invertebrates (Krahn 2003b). Environmental degradation has however already resulted in a lower harvest (see Håkangård 1990; Clendon 1998; Duckworth, Salter *et al.* 1999; Marris, Hedemark *et al.* 2002; Johnson, Singh *et al.* 2003). In the past, many ethnics relied on high amounts of large-bodied wildlife such as wild boars, civets, muntjac or deer, porcupines, ferret badgers, macaques, langurs, gibbons, big cats, bears, serows, and wild birds. In contemporary food systems, the consumption of smaller mammals such as rats, shrews and squirrels, as well as amphibians, reptiles and other aquatic animals has gained momentum. WCS has observed in the Luang Namtha Province that small animals from the nearby forest form the main share of the wildlife in local diets, while bigger mammals are hunted less frequently and in the more distant forests (p.c. Johnson WCS 2003). As in many other Southeast Asian upland cultures, livestock, especially buffalo, plays a significant role in yearly rituals (see Kirsch 1973); its consumption is however still limited. Some studies show a respective ratio of wildlife to domestic meat, e.g. that of Foppes with 82:18 (Duckworth 1996).

In Laos there is evidence to argue that with moderate rice consumption and a high variety of staples together with a high consumption of wildlife, vegetables, and fruits, the traditional upland diet was nutritionally adequate. With the added problem of forest degradation, there is increasing evidence that specie variety is on decline, resulting in the diminished use of wild plants and animals as food and medicine, causing greater dependence on cultivation and domestic animals. It can be assumed that formerly adequate diets change towards inadequacy in terms of energy, mineral and vitamin intake.

3.7 Development vision 2020 and the concept of food security

In 2020, the GOL aims to graduate from the status of being one of the least developed countries (LDC), as specified by the 6th Party Congress in 1996, and in order to fulfil the millennium development goals (GOL 2003a). The socio-economic development plan 2001-2005 established eight development programs.

While the program on food production, the stabilisation and reduction of shifting cultivation and the land allocation scheme are aimed at having a direct impact on the food chain, the other programs are intended to touch it more indirectly, namely through programs for commercial production, infrastructure, rural development, human resources, foreign economic relations, and service development. Issues of ethnic minorities, resettlement and cultural heritage - for which no development program exists - can be related to the impact on the cuisine of Lao food systems.

Increasingly, the GOL is attempting to expand its development efforts away from the lowland water bodies of the Mekong into the uplands. As such, the National Poverty Eradication Program (NPEP) of 2003 outlines its vision of how to alleviate poverty in the upland areas. To translate all this into practice, the GOL continuously relies on foreign aid. As such, pursuing food security is a major element of the "cargo cult".

The food security strategies in the Lao PDR involve three stakeholders. Firstly, there are the villagers at whom the food security strategies are directed. Secondly, there is the GOL from whom these food security strategies mainly derive, and thirdly there are various foreign development organizations who also work in close alliance with the GOL. Despite high levels of foreign aid, various development organizations are not able to assertively discuss any development strategies, which have not been anticipated by the GOL. Firstly, as opposed to other countries, there is no open dialogue between the GOL and the various development organisations. Secondly, there is high donor competition for sectors and districts. In this situation, there are also no local Lao NGOs to challenge the current development processes.

As a result, each organisation has set up individual country strategy papers, or development assistance frameworks, making it increasingly confusing to be able to pull together the various parallel ideas and subsequent activities. There is no clear concept of food security by either the GOL or the foreign development organizations (Krahn 2003). From the GOL, as a benchmark, there is the "Lao PDR food security strategy in the period of 2001–2010" established by the MAFO under the Viet Nam Lao Cooperation Program. It starts from the premise that "*food security is not firm yet*" (GOL 1999). As a result, the Vietnamese Lao Cooperation Program has outlined three phases towards achieving food security, phase one from 2001-2005, phase two from 2005-2010, and phase three from 2010 to 2020. They all detail rice production and stabilisation as the major goal, tentatively 450-500kg of paddy (per cap and per year) in phase one and a steady 500kg in phase two, allied with augmented trends in food circulation. Energy rates should rise from 2,100-2,300 kcal (per person and per day) to 2,600-2,700kcal between phase one and phase two. Only for phase three, however, is nutrition security mentioned, being labelled as an achievement for 2010-2020.

Foreign development organisations commonly share the view that food security is only achieved if rice security is achieved. IFAD for example proposes "*increasing household rice production is the most effective way of achieving food security. The project's focus on this sector should be continued until this objective has been reached, rather than diversifying into other crops and agricultural intervention*" (IFAD 2002). Contemporaneously, rice sufficiency ranks highly on the agenda of poverty eradication. For those areas therefore with insufficient rice production, such as the uplands, economic means are intended to be ameliorated in order to be able to purchase rice. However, the options available are limited by the market opportunities and there is little chance that any of the technologies offered will be adopted on a significant scale. Conversely, ethnic communities have a comparative advantage for livestock, timber and NTFP production, but generally lack the necessary resources to make long-term investments (Beer, Polsena *et al.* 1994; Roder 1997:155; Cupet 1998, first 1891; Nurse and Soydara 2001; IUCN 2002).

At the kitchen level, different food security ideas prevail: *kin kum, kin seb, kin sombun* extending towards the cultural dimension of a food system. *Kin kum* addresses rice sufficiency, *kin seb* means delicious food and *kin sombun* expresses the idea of having a "complete" meal.

3.8 The Sekong Province

The Sekong Province is located in the Southern Lao PDR, bordering Viet Nam (East) and three Lao Provinces, namely Champassak (West), Salavan (North), and Attapeu (South). Sekong is the second smallest province in the Lao PDR (7,665km^2). Its area was carved out of the Provinces of Salavan and Attapeu in 1984. It is still very inaccessible and shows an extraordinary cultural and biological diversity. Administratively, the Province of Sekong is subdivided into four districts, namely Thateng, Lammam, Kaleum, and Dakchung (UNDP 1997a).

Sekong has the lowest number of people (76,836 in 2003) and the lowest population density of any province in the Lao PDR with on average only about 10 people per km^2. Livelihoods in the province are intrinsically linked with its low population density and forest quality, in particular in Kaleum (Beer, Polsena et al. 1994). The province is still in every sense traditional. Acculturation for example is slow, especially by comparison with other provinces of Laos or in the region.

Linguistically, the ethnic groups in Sekong, which account for 97% of the population, have until now retained a high level of socio-cultural cohesion and belong mainly to the indigenous Austro-Asiatic superstock. Of the 14 to 16 Mon-Khmer ethnic subgroups the Katu form the biggest group with a total number of approximately 16,700 people, counting for 23% of Sekong's population (NLHS 2003, data unpublished). There is the common view that it is the remoteness of Sekong which have marginalised these ethnic groups (GOL 2001).

The Province of Sekong is part of the Annamite Cordillera[43]. As a result, 60% of the area is mountainous, 35% is plateau and 5% consists of plains, leaving many areas inaccessible especially in the rainy season. Kaleum's mountains are highly dissected. Official GOL statistics classify 54% of the Sekong Province as forested. The forest types are as follows a) mixed deciduous (76%), b) semi-evergreen (13%), c) mixed hardwood-conifer (6%), d) dry dipterocarp (3%), and e) montane conifer (2%) (WWF 2003). The mountains still contain relatively large tracts of undisturbed forest as agricultural penetration is low (Schaller 1995). In 1996, the Xe Xap National Biodiversity Area (NBCA) was established as a protected area. Three more sites have also been proposed as NBCAs. From the 133,500 ha of the Xe Xap NBCA about one third lies in the Kaleum District. The Sekong watershed is the second largest watershed in the Lao PDR. Sekong's biodiversity has unique importance for conservation (Duckworth 1996, Schaller 1995, WWF 2003), but has not been well studied. While valuable timber is already being overharvested in other areas of Laos, logging is also increasing in Sekong with the logging quota soaring from 10,000m^3 in 2001 to 28,000m^3 in 2002 (WWF 2003).

Nationally, the Sekong Province shows the highest percentage of villages practicing shifting cultivation. Wetland production is low, in particular irrigated wetland rice production (only 200ha). Average rice yields are estimated at 2.43t per ha (GOL 2000a) or at 1.2t per ha by the SEP DEV evaluation (GOL 2001) with a concomitant low rice sufficiency; a situation prevailing since the 1970s (GOL 2000b). The fact that most of the ethnic groups are not yet affiliated with the cash economy and are still highly reliant on forest and fields is mirrored by an average per capita income of 120US$ per annum (GOL 2000a). Few reliable statistics exist on the health problems of Sekong. The official view is that the province's health and nutritional status is lower than the national average. The GOL associates this fact with Sekong being an isolated province, and a predominately rural one (UNDP 1997a).

3.9 Conclusion

Despite high levels of poverty and mal- and undernutrition, Laos is a country rich in biological and cultural diversity. Nevertheless, up until now, Laos' non-monetary richness has been recognised by few, but is already fading due to cultural attrition and environmental deterioration. As a consequence, the GOL is losing its own potential for reducing Laos' high rates of mal- and undernutrition, in particular with regard to the high state budget deficit, inaccessibility, and challenges in human resource development. Conversely, the high level of foreign aid appears to be based, at least regarding the local food base, on questionable assumptions and might well sustain the government's cargo cult. Compared to other countries in Southeast Asia, the ever low population and

[43] The Lower Mekong forms a forest complex with four eco-regions, including a high number of habitats and species found nowhere else on earth. The four eco-regions are: 1) The Greater Annamites, 2) The Central Indochina Dry Forests, 3) the Lower Mekong Floodlands, 4) the Cardamom Mountains (WWF 2003a).

comparatively low production pressure in ethnic minority areas still appear to provide the opportunity for the sustainable usage of local food resources (except rice production).

The Sekong Province seems to represent an aggravated version of the national issues. An extraordinary biological and cultural diversity contrasts with high levels of poverty as well as mal- and undernutrition. Given its strategic location, the province is increasingly being forced to arrest environmental degradation. While until now the rich forest resources have sustained most of Sekong's local food systems the current development dynamics have the potential to wreak havoc on the fragile ecosystem and threaten the food chain and cuisines of the various ethnic groups.

CHAPTER 4: THE TRADITIONAL AND THE CONTEMPORARY KATU FOOD SYSTEM AND DIET

In this chapter the changes in the Katu food and diet system will be described. The author will employ her own framework dovetailing seven elements (see figure 1). Firstly, the food chain, the materialistic dimension, will be described, comprising food acquisition, food processing, and food distribution. This will be followed by a description of the cuisine, the cultural dimension, including issues of food selection, manipulation techniques, and flavouring principles. Notes of eating patterns are also integrated, but these are mainly separated into chapter 4.5.

4.1 THE KATU

4.1.1 Ethnographic introduction

In order to understand the Katu food system better some brief ethnographic notes are given, especially on social organisation and the belief system. While some might refute such an eclectic mix, a more detailed description would go beyond the scope of this work as mentioned in chapter 1. The information given here, unless otherwise indicated, mainly derives from the author's own observation.

Some anthropologists do not agree with the ethnic term *Katu*[44], but the people whom the author now calls Katu seem to share some common characteristics. Numbering about 15,000 people, out of the Austro-Asiatic Superstock the GOL recognises the Katu as a distinct class (Katuic) within the Mon-Khmer speaking people. Schliesinger notes the following synonyms Catu, Cotu, Cantu, Contu, Kadu, Kado, Kalto, Kantu, Ha, Ta Rieu, Ataouat, Attouat, Khat, Tu, Teu, Cao, Kao, Chatoong, Nguon, Thap (Schliesinger 2003:77). The first descriptions of the Katu originated from the French who tagged them as "*savages with two tails*" (*kha song hang*) as e.g. by Le Pichon (1938) or simply as *kha* (see Ngaosyvathn 1993:3). The name *kha song hang* was obviously given due to the tail-like appearance of the Katu loincloths[45] (p.c. "Ajan" Vipon 2002).

To the former Royal Government of Laos, the Katu had a bellicose reputation and were feared because of blood raids and their magic powers. Blood raids were reported as being part of the Katu system to appease the spirits, or as Hickey contends served "*for good health, abundant crops, and having enough to eat*" (Hickey 1993:119). Today, many people from the lowlands or Vientiane still fear the ritual power of the ethnic groups in Sekong. Allegedly, they still believe that the Katu, as well as other Mon-Khmer groups, are able to bewitch people e.g. with magic rhizomes (*van*). As a result, many governmental officials and other outsiders do not favour staying overnight in remote Katu villages.

4.1.2 Traditional social organization and belief system

The traditional Katu social relations involved complex networks of individual bonds, collective management of resources, and group decisions, often arrived at by consensus and involving the *sum arez*: the "village government" (p.c. "Ajan" Vipon 2002). The former nucleus of social organisation was the polygamous household. Various wives and their

---

[44] *The French Captain Debay of the Infanterie de la Marine, who in 1901 was commissioned to conduct a survey of the region provided the first descriptions of the Katu. In 1903, Sogny, a commandant of the Garde Indigene post at An Diem concluded in another survey that a population of about 10,000 people made up "one race", naming them the Katu. This label subsequently appeared in French sources and ethnolinguistic mapping (Hickey 1993: 110). According to Ajan Vipon, the Katu had never used the term before.*

[45] *However, short loin cloths were actually only worn by the men, the women had long woven sins. Their appearance of the Katu women is heightened further by the elephant tusks and silver French coins worn in long earlobes; the men's skin on the other hand was often extensively tattooed. The villagers reported that the women also had their teeth filed and covered with black lacquer.*

children, all married to the same man, lived together in a longhouse. Today, only a few men can afford polygamous relationships, the concept is also being rejected by the GOL. The men in TD reported that "*in the past, we men had up to eight or ten wives, but only if you were rich. Having many wives was a good concept. Each wife was able to work on e.g. 1-2ha, so the harvest increased with every new wife. In doing so, we men could afford not to work so hard in the field. Subsequently, there was more time for hunting and other activities. It worked out that the first wife stayed mainly at home. So, given a longhouse with 20-30 people, work chores were divided. Usually, only 3-4 people went to work in the fields every day*".

Up until now, life has been suffused with a spiritual dimension, which connects the Katu with nature in a unique way (see Sulavan, Kingsada *et al.* 1993). All aspects of life are interrelated like strands in a fabric of spiritual pattern. There is the belief that all components of nature possess spiritual forces which can influence health and the overall well-being of a village. As such, well-being requires the maintenance of a harmonious relationship between humans and a variety of spirits (*abui*). These spirits reside in various components of the environment, such as mountains, rocks, stones, tall trees, rivers, termite nests, rice fields, and the sky, among others. Agricultural patterns also relate to the ancestor spirits and the spirits in the house. In the past, ceremonies involving the sacrifice of buffalos (*bua joll*) were often performed. This was to ensure both the continued good-will of these spirits (for example to ensure a good crop) and to propitiate spirits who had been disturbed and had, as a result, caused some negative events such as illness, crop failures, low wildlife harvest, etc.

4.1.3 Advent of pervasive delocalisation

The Katu food system provides a good example for ethnic minorities living in Southeast Asian forests, whose traditional food systems are undergoing rapid change. In 1938, Le Pichon described the Katu territory[46] as a "relief of broken mountains; a confusion of mountains, the forest thick and sombre, […], the paths slippery and filled with leeches, plunging and replunging into rivers, scaling the steep mountain slopes" (Le Pichon 1938; see also Sulavan, Kingsada et al. 1994). Until the involvement into the Viet Nam War, the Southern mountains of Laos, were rather isolated from outside influences.

The advent of pervasive delocalisation started with migration. Traditionally, all of the Katu settled in the high mountains of Kaleum, which the author will refer to as Upper Kaleum. There is no official documentation of migration patterns into Lower Kaleum and other districts. According to the villagers, it appears that migration can be divided into two patterns: 1) within Kaleum from Upper to Lower Kaleum, 2) out of Kaleum to Thateng and Lammam. The first pattern started in the 1960s, mostly spontaneously. Then as a second step in the 1970s, villages started to move to the area which is today the Lammam and Thateng District. The official version of the GOL holds that the main impulses for migration were 1) rice and salt deficiency, 2) geographical isolation, and 3) poor health coupled with the lack of health services. Bombing and the effects of the war played a less important role (p.c. AjanVipon 2003). Additionally, from the time of the 1970s, when the forces of the *pathet lao* prevailed, until now, resettlement has been used as an instrument for rural development and political control (Goudinaux 1997).

Traditionally based exclusively upon shifting cultivation, the Katu are, at present, undergoing a rapid transition and are being coerced into sedentary agricultural practices and the adoption of the lowland mode of life. Only in disappearing pockets of isolation, deep in the mountains or far up the Sekong River towards the border of Viet Nam, are Katu communities still to be found living what is, essentially, the old "way of life". As one moves down the Sekong River, beyond the Southern part of Kaleum into the flat plains of

[46] *Le Pichon described the situation in the Central Highlands of Vietnam, which borders Upper Kaleum in Laos.*

the Lammam District or the Bolovan Plateau in Thateng District, one meets Katu communities who are struggling with changing livelihoods. In these areas rivers and forest have been heavily overexploited. Villages have been connected to roads for almost 25 years and known contact with governmental services and development organisations, amongst other outsiders. They have however only marginally been drawn into the credit and cash market economy typical of lowland life.

4.2 The research site

Field research was conducted in four villages, each representing a contrasting pole in the ongoing transformation of the Katu food system. The selected villages are all located in the Sekong Province, two in the Kaleum District, the third in the Lammam District, and the fourth in the Thateng District. As mentioned in chapter 1, other Katu villages were visited to identify trends, but their statistics are not presented in this work.

None of the four research villages were established before 1970. All four villages have their origin in Upper Kaleum close to the Vietnamese border and in close proximity to each other as can be seen in figure 7. The various and often contradictive accounts of village histories are summarised below into the most plausible version.

Ban Nong Bong – Ta Meuk (NB-TM): The former village Ta Meuk (TM) was situated close to the Vietnamese border in Upper Kaleum. In 1971, during the war and in association with severe rice shortages TM split with one part moving to Thateng. From there, with the bombings peaking in 1972, they moved to Lammam. In 1973, the rest of the village followed from Kaleum. In a severe epidemic in the 1990s many of the villagers died. As a result, the village location changed again in 1999 into the vicinity of the contemporary dwelling site. Later, these Katu moved again to their present village ground, the multi-ethnic Nong Bong (NB). There the author worked only with families originated from TM, which form a separate Katu subvillage (NB-TM).

Figure 7: Map of the research villages and migration patterns*

*Not including re-migration to old settlements (KD/KDM, Ban Chakam/TK)

Source: Modified map from UXO Laos

Ban Tham Deng (TD): In Upper Kaleum the former village Tham Pril (TP) had high strategic and cultural importance. After a great fire in 1997[47], the village head set out to consult Kaleum's district authorities, who allotted them the present day village settlement in 1998, called Ban Tham Deng (TD). This name refers to the limestone cave on the village ground. About half of the families of TP settled down together with three other Katu families from Kaleum (Ban Aroh, Ban Archel, Ban Loh). Even today families are merging in from Ban Tham Pril[48], which is three or four days walk away from TD.

Ban Thong Kai (TK)[49]: In 1974, due to the war and access difficulties in Upper Kaleum, all the villagers from Ban Kachen (or Kachinh) and Ban Rong together with families from a third village, moved into a village area close to Kaleum capital. The former Ban Kachen was a three hour walk away from TP. In 1982, more people left the new village location for Thateng after a severe buffalo epidemic. Under land pressure in 1997, another 15 families (26 people) went to Ban Chakam and Ban Kacheng, also in Thateng. At the same time, villagers crossed the river and moved to today's settlement (TK). This location was chosen because of its short distance to the district. In spring 2004, due to poverty one family came back from Ban Chakam to resettle in TK. This family reported that other families will soon follow. The GOL has an idea to resettle the villagers to a neighbouring Katu village, so that a school can be built, which is currently lacking in both villages. This idea, however, is being rejected by TK villagers, who highly favour the exceptional spot on the riverbank.

Ban Kandon Mai (KDM): In 1995, villagers were resettled by the GOL from the old village Ban Kandon (KD) in Upper Kaleum into today's village location in Thateng, as designated by one of the national development schemes. Indeed, after the war KD was not a single village anymore, but was instead separated into two clusters. Like TP, the village was well-known for its strategic and cultural significance and served as an economic centre. During the war it served as recreation centre for high ranking revolutionary cadres of the *pathet lao,* away from the mosquito infested lower jungles. In 2000, suffering from severe land pressure and poverty in focal zoned Thateng, 81 people went back to the old village location in Upper Kaleum, which still exists until today. KD is two days walk away from TP and a one day walk from TM.

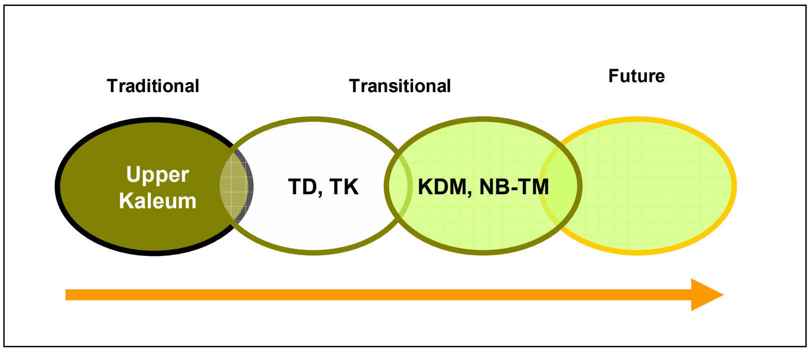


Figure 8: Continuum of the research villages

Source: Own production

---

47 Half of the village burnt down after the wind transported the fire from the farms to the village ground.

48 The village head from TP told the author during a visit to Ban TD that even more families intend to settle dow; newcomers are welcomed by TD villagers. The village has the capacity to absorb more people, land for wetland rice production, however, is already scarce.

49 The village is also often referred to as Ban Kok or Ban Thong Khon, which is the name of the former village on the opposite river bank.

4.3 CONTINUUM OF THE RESEARCH VILLAGES

The research villagers spread along a continuum (see figure 8). The old villages in Upper Kaleum can be described as traditional Katu communities, which to some extent is still the case today with the isolated villages TP and KD. From the four research villages, only in TD is the traditional economy of swidden farming, hunting, fishing and gathering edible forest products and other NTFPs still partly being maintained. In the three other villages KDM, TK, and NB-TM, transformation is far more pervasive. It should be noted that none of these villages are "modern" by any means. Transformation from a subsistence towards a market oriented food system is still absent. Also TD is undergoing rapid transition, but this is more subtle.

The continuum presented in figure 8 is maintained in the following descriptions and analysis. Before detailing in the next chapters the seven elements of the traditional Katu food system, table 4 aims to summarise some general characteristics of the villages.

Table 4: General characteristics of the research villages

Characteristics	NB– TM	KDM	TK	TD
Access	Good (all year round)	Moderate (all year round)	Difficult (dry season only)	Very difficult (dry season only)
Resettlement from Upper Kaleum	1973	1996	1974	1998
No· of people	250	794	83 (79)[4†]	159
No· of families as consumption unit*	40	88	14	26
Average family size	6.3	9.0	5.6	6.1
No· of houses	30	79	12	21
Electric rice mill	1 (broken)	2 (broken)	None	None
Electricity	1 Generator (broken), no water turbines	Irregular by mini water turbines**	Irregular by mini water turbines**	Irregular by mini water turbines**
Vehicles	1 Broken tractor, pushbikes	9 Tractors, pushbikes	Pushbikes	Pushbikes
Radio	0 (all broken)	4	0 (all broken)	1*** (unusable)
Tape recorder	Several	Several	1	1
Support from international organization	Completed	Completed	Never	Ongoing
Agroecosystem	Swidden and wetland rice production	Swidden and wetland rice production	Swidden and test for transformation	Swidden and test for transformation
Natural resources	Severely eroded	Eroded	Stable, partly eroded	Stable, but at risk
Marketing activities	Nil	Low	Marginal	Marginal

*Family units from type eating unit (*teng kin*) and not from type husband and wife (*pua mia*).
**Only in the rainy season; sufficient to power light bulbs. In Upper Kaleum, e.g. in Ban Laipoh, burning bark is often the only source of light; oil for lamps is very scarcely used.
***An ancient provision by the 1970s revolutionaries.

Source: Own compilation

NB-TM sits directly by a road from which villagers can reach the Sekong provincial market by bus or bicycle. KDM is in close vicinity to a road (one hour walk) from which a bus to Thateng market can be taken. The 63km road between Sekong town and Kaleum is only accessible during the dry season. In the rainy season Kaleum district is also not accessible by boat, often leaving it isolated from any form of food supply, medicine, or equipment. The many rapids make navigation on the Sekong River very hazardous. For TK and TD it is quite difficult to access any market, necessitating walking on steep terrain. In addition, the market in Kaleum, only established in 1995, appears to mainly serve the ACF and UXO team, together with the lowland officials seconded to the district. The market neither has the momentum to absorb potential food supplies from surrounding villages, nor does it provide sufficient food to potential customers. Indeed, the orientation towards moving to the Viet Nam border becomes obvious. For some Katu the border to Viet Nam or Thailand (Chong Meck) is more reachable than Vientiane. Also, the provincial market in Salavan compares favourably to the Sekong market. Prices there are considerably lower than in Sekong or Kaleum. Salavan's market also provides more goods than Sekong's market, including preferred items like E605 and high quality nylon for fishnets, etc. Therefore, instead of walking to Kaleum many villagers in TD and TK prefer to walk to Salavan, which is an arduous full day walk.

Table 5: Involvement into the market economy[i)]

[i)] Excluding the village heads who travel at least monthly to the district due to meetings with the GOL.

	NB-TM	KDM	TK	TD
	n=9*	n=10*	n=10*	n=10*
Annual visits to village's nearest market	3.7 times	n.d.**	3.8 times***	3.3 times***
Modes of transport	Walking, bicycle, bus	Walking, tractor	Walking	Walking****
Access to market	Easy	Difficult	Very difficult	Very difficult
Distance to market, one way (km)	3	19	6	17

*As mentioned in chapter 1, n indicates the number of families.

**N.d.=no data.

***Those villagers who visit Sekong or Salavan town do so less frequently, on average once every two years.

****The river *huay ai* has to be traversed on average 16 times in the rainy season, which impossible for women, the sick and eldery as well as children.

Source: Own compilation

Ergo, the present-day remoteness and innate self sufficiency in TK and TD contrasts with the road linkage and potential access to markets and services in KDM and NB-TM (see table 5).

TD has the best forest condition of all four villages, still comparing favourably with TK. Wildlife populations in TD are almost stable[50]. The complete faunal spectrum indicated in the appended food list is still available (see Appendix 1.2). Today, such rich wildlife populations are unparalleled in the region. A positive ratio of sink to source[51] can be attributed to the Xe Xap NBCA which extends far into Kaleum. Big bovines such as banteng and gaur have already vanished from within the village boundaries of TK, rare large-bodied mammals such as the *Felidae* and *Cervidae* species, etc. can, however, still be found. TK's area is dissected by many streams, providing rich aquatic resources. In both TK and TD, precincts of pristine primary forest can still be found. With NB-TM sitting directly by the road, its level of forest degradation is higher than that of KDM. Both KDM and NB-TM do still have some good forest patches in their village area, with a different canopy cover, where no agricultural production takes place.

The villages have been supported by the GOL and development organisations to various degrees. In 1981, in NB-TM the Vietnamese built a water canal. In 1991, pump wells were constructed by UNICEF[52]. In 1999, the Japanese development organisation (JEICA) provided the village with school utensils and dress, followed by the construction of two fishponds. In 2000, another fishpond was built together with the reservoir for irrigated rice

[50] *The author's descriptions are limited due to being those of a nutritionist. Estimations are not aimed for comparison and only serve for the purpose of this work.*

[51] *Source-sink models are designed to examine animal population dynamics over large spacial areas. Sink areas experience population losses through mortality and emigration of animals while in source areas the relationship is reversed. For a stable population enough animals must migrate from the source area to the sink area. It is however more a theoretical construct than an instrument for empirical studies. See Hill and Pawde (p.80) in Bennett and Robinson (2000): "Hunting for sustainability in tropical forests". Hill and Pawde refer here to Pulliam (1988): "Sources, sink, and population degradation." Am Naturalist 137 (suppl):50-6.*

[52] *The systems have broken down many times already, forcing the villages to return to the practice of bathing in the river, which is now a canal.*

production. This was a joint effort by the GOL and the government of Viet Nam. Then in 2001, UNICEF built latrines, which until now have not been readily accepted.

After resettlement, support for KDM started in 1996. This included various services from the GOL such as from the Provincial Department for Social Welfare, the Provincial Department for Rural Development (1996-1998), the Health Department (1996), the Department of Agriculture and Forestry and the Lao National Women's Union. They provided mainly materials like aluminium roofs, nails, rice seeds in the first two years, and food aid. The Lao Red Cross built the water pumps and an US organisation provided training in coffee planting. Also in KDM the GOL have built a reservoir for irrigated rice production.

TK has never been supported, except for some governmental rice aid in 1992 and 1993, during which each family received 10kg. After resettlement TD also received support from the GOL such as rice aid between 1998 and 1999, blankets, mosquito nets, crockery, and other items. In the year 2000, SEP DEV started their project activities, which began with the construction of the school and the gravity fed water system. Consequently, since 2001 activities have extended into the preparation for wetland rice production. To the author's knowledge, besides governmental information campaigns, no agricultural activities other than promoting wetland rice production have taken place in any of the four villages.

Table 6: Change in population numbers

	1960	1972	1975	1980	1990	1996	1998	2000	2001	2002	2003
NB-TM	500	170	n.d.	200	215	n.d.	n.d.	223	260	258	250
KDM	550	n.d.	600	n.d.	621	658	n.d.	841*	759	790	794
TK	n.d.	n.d.	350	180	113	n.d.	75	79	80	83	79
TD	500	n.d.	400	n.d.	300	250	n.d.	106	113	151	159

*In KDM 81 people went back to the old village location due to a lack of land.

Source: Own compilation

Besides population dynamics, village sizes alternately decreased and increased due to migration patterns (see table 6). The main reason for decrease was either a split in the village or a return to the old village location. Sharp increases were mainly due to the incorporation of new families. In the past some of the villages hosted up to 20 longhouses.

Table 7: Village area (in ha)

Area	NB-TM	KDM	TK	TD
Conservation forest (paa xa nuang)	1.5	8.14	563	275
____ forest (paa pong kan)*	100	30.25	333	280
Restoration forest (paa feun fu)	181.28	151.32	238	94
Cemetery	1	1	2	1
Production forest for SC and construction materials (paa palid)	1000	422	1859.25	35**
Area of agriculture (excluding SC area)	113.22***	61	125	429
Rivers, roads, rocks, etc.	1123	38	59	84
Village ground	1	6	2.75****	1
Total area	2521	811	3182	1199
Area per capita	10.1	1.0	20.0	15.2

*Production prohibited.
**Officially, SC area is listed under the official area of agriculture.
***Currently only 31.2 ha used. Villager's estimation indicates maximum usage of 70ha. Potential for gardening about 12ha.
****Official data, author's estimation 0.3ha.

Source: Own compilation

According to GOL policy, land allocation phase 1 has already been conducted in all research villages. Total village areas were defined and mapped; future production areas were classified. These results are provided in the table 7. Phase 2 however has so far only being started in NB-TM and KDM. There family plots have already been allotted. Villagers have however not yet received a certificate. The villagers' opinion about the classification is demonstrated in chapter 5. Villagers' information about the size of certain areas was inconclusive. They partly rejected to provide the official data, arguing that it is inaccurate. Officially, for NB only one official overall statistic exists, not taking into account the various subvillages such as for NB-TM. The data provided in table 7 is the villagers' own calculation which was approved by the village head of NB. Table 7 clearly demonstrates that TK has the greatest area per capita (20ha) followed by 15ha for villagers in TD. The area per capita of TK is double that of NB-TM and twenty times higher than that of KDM. The villagers' estimation of the good quality forest is mirrored in the share of forest types. Taking together *paa xa nuang* and *paa pong kan*, TK has an area of 900ha, which is almost double that of TD, more than nine times greater than NB-TM and more than twenty times greater than KDM.

4.4 CHANGE IN THE FOOD CHAIN

As the Katu are still not drawn into the cash economy, the food chain will only be described in relation to food acquisition. Structurally, the Katu food acquisition relates to three food commodities. Firstly, up until now, foods produced in the agroecosystems dominate, namely those from the swiddens (the system of shifting cultivation), the gardens, and the wetland rice fields as well as those from hunting, fishing, and gathering. Secondly, Katu kinship solidarity involves giving presents and exchanging foods with each other. Thirdly, to a small degree purchase of foods further contributes to food procurement.

4.4.1 Change in the agroecosystem

4.4.1.1 Shifting cultivation and wetland rice production

The Katu's predominant system of staple production is that of shifting cultivation (*hai*), and mainly involves dry rice production. In Lammam, wetland rice production (*naa*) was introduced in 1986, in Thateng in 1995, and in Kaleum at the beginning of the 2000s. While in most of the Katu villages in Kaleum, rainfed wetland rice production has not yet started (*naa pee*), systems of irrigated wetland rice production (*naa xeng*) are increasingly being promoted in Thateng and Lammam. Rice yields from *naa xeng* production are supposed to bridge the gap between August and September, which is before the harvest of the *naa pee* production. As stated in chapter 3, the GOL aims to stop shifting cultivation by 2010.

In NB-TM, all families are still engaged in *hai* production and only a few have started to practice *naa pee* production. So far, there has only been one family able to start *naa xeng* production and have abandoned shifting cultivation. In KDM, most families are engaged in *naa pee* production, and only a few still sustain their *hai* fields. In 2002, 13 families were practising *naa xeng* cultivation, but production came to a standstill in 2003 after the breakdown of the water pump[53]. In TK and TD, all the families are still engaged in shifting cultivation. As part of the SEP DEV project, a total of 10 pilot families have started transitory *naa pee* production in TD. Up until 2004 this had mainly involved UXO clearing and land levelling. But SEP DEV aimed to further assist in dam building and in the provision of seedlings. Nevertheless, during the month of the rainy season TD is inaccessible and no form of support can be provided. TK also wishes to start *naa pee* production, but there is no external support for activities such as UXO clearing. In 2002, the village head's family pioneered on a single plot; the rest of the village followed. In all four villages there are families who wish to participate in or extend their *naa* production; however there is not enough suitable land available.

Over time the structure of the swiddens has changed. Beside the rice plots, the farming of traditional big cassava fields has only been sustained in TD. In the three other villages, cassava is only planted in a small circle round the field or on an even smaller scale. Maize production, traditionally focussed only on stony soil patches has been relocated from the *hai* into the gardens. Moreover, amongst others the planting of coarse cereals such as millet (*khao fang*), of job's tear[54] (*mak deuy*) and of RTs has severely decreased. Over time, staple variety has decreased significantly.

In the following pages, the two different systems of *hai* and *naa* are briefly presented along their sequences of activities. Traditionally, phases of agricultural work in the *hai* were organised according to the moon (*kasaeh*) dividing the agricultural calendar into three

---

[53] *During the author's visit in spring 2004, the water pump had still not been repaired.*

[54] *In the past, the villagers recalled that TP and KD produced at least 1t of job's tear.*

seasons a) the cold season (*kasaeh agnaz*) - from October until January, b) the hot season (*kasaeh tchanon*) - from February until May, and c) the rainy season (*kasaeh boh*) - from July until September. Additionally, the Katu classified their agricultural calendar into different working seasons (see table 8).

Table 8: Traditional Katu agricultural calendar

Month	Katu month	Work
1-3	kasaeh tal	Selection and preparation of fields, firing farmland (odge areah) and weeding (tak aram)
3-5	kasaeh tcheuad	Sowing (ched peuy)
6-8	kasaeh a'hao	Weeding (tak lan)
9-10* (11-12)	kasaeh xao	Harvest (kat peuy)

*In September, the rice is surveyed for ripeness. Harvest begins in October. From December to January, no agricultural activities take place. The Katu agricultural calendar has therefore only 10 months.

Source: Own compilation

As the first step in *hai* cultivation, the Katu have to select their fields. Traditionally, there was no concept of landownership. In Upper Kaleum, the Katu were free to select any patch of forest. Cultivation of fields, which had formerly been used by someone else had to be negotiated. Field selection itself followed a detailed land classification system[55]. From the past until the present the Katu take great care not to encroach on areas with tall trees. The *tae aree* (*Ficus rumphii*) especially is believed to be an abode for spirits. If however, one of these trees does have to be felled, custom dictates that an offering has to be made[56]; a practice not sustained by every family. After the implementation of the GOL's land allocation scheme (phase 2) in the late 1990s, villagers in KDM and NB-TM now only have their allotted plots, often of a limited size - or with bad quality soil. In NB-TM there are nine families who have no land at all, because the construction of the reservoir meant that their allotted plots had to be flooded. In KDM, a lack of land has already coerced 81 people to return to KD (see also table 6). Others have been forced to rent land in the neighbouring village in order to be able to farm at all[57]. Villagers in TK and TD are still free to choose fields of any size within their village boundaries.

Table 9: Estimation of hai and naa field sizes (in ha) and walking distance (in min)

		Naa size	Naa distance*	Hai size	Hai distance*
NB-TM	n=10	0.61 (0.2 -1)	24 (5-40)	0.59 (0.2-1)	29 (5-50)
KDM	n=10	1.27 (0.6-1.7)	n.d.	1.63 (0.7-4)	26 (15-40)
TK	n=10	0.33 (0.3-0.4)	7 (5-10)	1.04 (0.6-1.5)	41 (15-90)
TD	n=10	0.5 (0.2-1)	52 (5-150)	1.07 (0.7-2)	70 (30-120)

*One-way only and villagers' pace of walking.

Source: Own compilation

Comparing the current and the former sizes of the *hai* fields, there is a general consensus that in Upper Kaleum, fields used to be more than four times bigger than they are at present (see table 9). Today, the greatest size of *hai* fields can be found in TD with an average of 1.07ha per family, ranging from 0.7ha up to 2ha. In TK there is a lower estimation of 1.04 ha, ranging from 0.6ha up to 1.5ha. In NB-TM, the average field size is

55 Upward extension was restricted, especially into those areas with unprecedented climates, steep terrain (due to the risk of erosion), and poor soil quality. Additionally, areas with strong winds were avoided (due to the risk of kernels being blown away). The Katu always tried to minimize the slashing of new forest and always used substantial areas of old fields (alai).

56 This requires asking the owner of the tree, the spirit (abui), for permission. In exchange the Katu offer a little pig or a chicken. The prayer expresses the necessity to fell the tree. After cutting they build a little house in the field for the spirit to "dwell" in.

57 With the price at 20,000Kip per year (about 2US$) for an average one hectare plot.

0.59ha with a 1ha maximum. Considering the big production units in KDM, the field size average of 1.63ha has to be carefully considered. When related to comparable production units in the other villages, the author suggests fields smaller than 1ha. Contrasting to this, in TD and TK, the size of wetland rice fields is much smaller. In NB-TM *hai* and *naa* fields are of equal size, in KDM the *hai* fields are slightly bigger.

The *naa* fields are usually in close vicinity to the village and walking there takes less time than it does to the *hai* fields (see table 9). The expansion of *naa* production, however, would require that any new arrivals to the villages were obliged to walk for more than two hours to reach their plot. The author wishes to restate here, that it is impossible to transport the necessary implements over the steep terrain, especially in the rainy season. This situation is prevalent in most of Kaleum and the other uplands in the Lao PDR.

After field selection, the preparation usually starts in February, comprising of three steps: a) slashing the undergrowth, b) felling, and c) cutting away branches of fallen trees. The next step is to fire the farmland; which normally happens in March. The firing of the farmland was and still is an important occasion. In the past, during these days it was taboo for outsiders to enter the village[58]. Usually, the day after a small offering is made.

When the fields have been prepared, the rice is sown - usually starting in May. Different methods were observed in the four villages. In TM-NB communal planting was practiced. The men walk in front with the dibbling stick, followed by the women, who as in many other parts of Laos, then place the seeds in the prepared holes. In TD and TK, men and women work separately, each with a dibbling stick and personal seed basket tied around their waist.

Table 10: Number of rice "varieties"[i)] planted in 2002 by target families

[i)]Variety names provided here are further subdivided by the Katu, but not documented. Katu varieties do not necessarily overlap with the scientific concept of rice variety.

		Hai	Varieties*	Naa	Varieties
NB-TM	n=10	1.8	tut**, krai***	1.1	dok kham, ae hok
KDM	n=10	1.4	terrang****, krai, kantu	1.4	dok kham, homali*****
TK	n=10	3.4	entuh, pleun, maang, kadoh, tarrxang, krrjoh, (prr)mat, arek, koch	n.d.	n.d.
TD	n=10	4.1	tut, ropaeng, pleun, apang, krai, mat, cherrat, bang fai, krrjoh, a-ut, drroh, cherrlaz, koch	n.d.	n.d.

*Glutinous rice varieties.
.**Tut*=*khao kang.*
***Krai*=*khao met ngai.*
****T*errang*=*khao tahan* and *khao dok kham* are provided by the GOL, obviously Thai rice varieties.
*****Non-glutinous rice variety.

Source: Own compilation

The Katu from all four villages reported that in the past in Upper Kaleum they usually planted more than five, and sometimes as many as eight rice varieties. The rice seeds were never traded outside, but always within the village - or with relatives. Here it appears that the often cited tremendous array of varieties is not found so much on village, but more on family levels. Today, TD uses an average of 4.1 seed varieties whereas seed use in NB-TM has declined to 1.8 varieties (see table 10). In NB-TM, many villagers are contending that many distinct Katu varieties have been irrevocably lost. Increasingly in KDM and NB-TM, alien varieties are used. In TD, there is only one alien variety, provided by the GOL probably through the SEP DEV project. In TK not a single alien variety has been incorporated. A full, but not yet exhaustive overview of traditional Katu rice varieties can

[58] *Usually, a taboo house or village is recognised by a fresh branch stuck into the roof. If found violating this taboo, villagers in TK in 2002 set a fine of 2,000,000 Kip, which is about the price of one big buffalo.*

be seen in table 11, each variety being distinct in planting time, but also in shape, colour, and taste.

Table 11: Overview of traditional Katu rice "varieties"

Rice "varieties"	Type	Planting (mo)	Harvest (mo)	Continued	Continued	Continued	Continued
adut, tut	Glutinous	6	10	**pin**	Glutinous	n.d.	n.d.
bang pai	Glutinous	4-5	11	**pleun**	Glutinous	6	10-11
cherat	Glutinous	n.d.	n.d.	**tarrang**	Glutinous	n.d.	n.d.
entuh, tuh	Glutinous	5-6	10-11	**tasang**	Glutinous	n.d.	n.d.
kadoh	Glutinous	5-6	8-9	**tcherlozz**	Glutinous	n.d.	n.d.
kajoh	Glutinous	n.d.	n.d.	**terrhut**	Glutinous	n.d.	n.d.
kapeng, roping, peng	Glutinous	5-6	8-9	**vaeng**	Glutinous	n.d.	n.d.
kariong, keuriong	Glutinous	5-6	9	**xang**	Glutinous	5-6	10
keua	Glutinous	4-5	9	**maang**	Non-glutinous	n.d.	n.d.
koh, koc	Glutinous	4-6	8-10	**mat akrul**	Non-glutinous	n.d.	n.d.
kray	Glutinous	n.d.	n.d.	**mat alir**	Non-glutinous	n.d.	n.d.
krueng	Glutinous	n.d.	n.d.	**mat apang**	Non-glutinous	n.d.	n.d.

Source: Own compilation

The ratio of glutinous to non-glutinous rice has changed over time. At the advent of the war, non-glutinous rice accounted for between 25-50% of the rice production. This figure has now been marginalised to between 2-7% in all four villages with the exception of TK (17% in 2001). High consumption of non-glutinous rice indicates a shortage of rice, since it can be prepared as a thick soup (*trrong*), into which other filling foods can also be added (see also chapter 4.5.2). It is less favoured and regarded more as "minor rice". The increasing propensity for glutinous rice was confirmed by Ajan Vipon, contending a former ratio of 1:2 of non-glutinous to glutinous rice for Upper Kaleum. It becomes obvious however, that robustness in planting cannot make up for the lower taste appreciation.

After the rice has been sown, other root crops, maize, vegetables, fruits, and tobacco are planted. Only in TD and TK however, sweet potatoes together with other RTs are planted along the riverbanks. Also, TD villagers have started to plant some of the wild root crops in their ongoing transitory wetland rice fields. During the months of the rainy season the tedious work of weeding occupies the schedule. The villagers reported that increasingly more weeding is needed than before (see also Roder 1997). This constitutes a real burden especially for women and children.

In September, the rice harvest starts and continues until October. In all the villages, various different harvest, threshing, and winnowing techniques were observed[59]. In Upper Kaleum, due to the different climate, the rice harvest came one month later, lasting from late October until late November. In November the seeds are then selected for the next planting season. After the rice harvest, vegetables also start to be harvested together with fresh RTs.

Table 12 presents the historical development of rice production. The overall trend in staple production outlined here is consistent with the author's observation in other Katu villages visited.

59 Most of the rice is threshed and winnowed in the field and is then brought back to the village storage houses. Only the very first rice is often threshed in the house by feet or tediously with a spoon. The author feels safe to conclude that the latter methods are more a kind of "ritual".

Table 12: Change in rice production[i)] as of total staple production[ii)] (in %)

[i)]Harvest of glutinous and non-glutinous rice.
[ii)]As total of rice, maize, cassava, taro, and sweet potato.

	1960s*	1973	1980	1990	1999	2000	2001	2002
NB-TM	37.6	43.5	66.3	81.8	88	90.4	93.6	90.5
KDM	50	50	n.d.	48.6	95.9	97.2	96.5	95.6
TK	n.d.	41.3	54.2	68.6	63.6	66.6	73.8	57.1
TD	39.4	38.2	n.d.	36.9	100**	38	52.5	49.5

*Average data in the 1960s as recalled by the elderly.
**Food aid from the GOL.

Source: Own compilation

In the past there were cyclic famines mainly to due natural disasters, which caused severe casualties. During famines, as with for example, one in the mid 1940s in Upper Kaleum, people died because there was "*basically nothing to eat*". During the war, villagers in TD recalled, "*lowlanders had about 7-8 months of rice to eat, while we uplanders had only 1-4 months. We had to work at night, and could not burn the field, for fear of being bombed. We were only able to produce a meagre harvest*" (compare also table 14). During the war time rice made up even less than 50% of cultivated staple crops. This meagre harvest had to be shared with soldiers from both sides, reducing supplies to a minimum. Villagers reported being intimidated by soldiers from both the *pathet lao* and the Royal Government of Laos with the threat of torture if they did not provide rice, alcohol, and livestock. For this reason, villagers hid food supplies in the ground. Roots such as *pong kleuz* and *pong atuz,* which could be harvested in great amounts without timely processing, were very important during the war. A lot of local knowledge on hunger foods and edible forest products was attained during that time. After the communists prevailed in 1975, none of the villages were affected by co-operation efforts[60], because their isolation kept them from being targeted and controlled. For the same reason, many villages in Upper Kaleum have, even today, not yet been targeted by GOL policies such as the land allocation process.

Traditionally, cassava has been the major staple after rice. In the 1960s, cassava constituted 25% of the harvest in TM, and around 37% in both KD and TP. At the beginning of the 1970s it made for about 28% in TK. Subsequently however the cassava harvest has declined, reaching a historical low in the early 2000s, ranging from 1-2% in NB-TM and KDM and 10% in TK. In TD production still accounts for about 45%. Cassava yields are much higher today than in the past. In Upper Kaleum, the rhizomes took about two years to reach an acceptable size, compared to today's eight months. Sweet potato and taro alike are now marginalised in production. What is interesting to note is that in TK sweet potato production has risen to 14%, mainly as a result of low cassava production.

Maize has also steadily lost its importance and only now are villagers becoming eager to increase production again. In NB-TM however, which has been able to sell some maize in the previous years, maize made up only 5% of their harvest, following a steady reduction from 38% over time. In KD and TP, which share similar geographical features, maize never made up much more than 10%. In TKK, maize counted for about 17-21% during the war and post-war period, which after a severe decline in the late 1990s rose again to almost 10% in 2001. The low production of maize in present-day TD as well as in KD and TP is attributed by the villagers to too much wind[61].

The situation today stands in contrast to the past. The trend of the late 1980s and 1990s towards an increased rice production has been arrested. It is only TD, which from 2000-2003 has been able to almost triple glutinous rice production from 11t to 29t where the

---

60 *The call for cooperatives was not sustained after 1978.*

61 *An explanation could be that deforestation has exposed the cultivated plots to the wind.*

trend continues. As a result, TD has also been able to reduce their non-glutinous fraction. In all other villages, prospects to increase rice production are not promising. The situation is similar in Ban Paxay, Ban Mai, Ban Laipoh, Ban Don, Ban Café, and Ban Beng. The author suggests here that during the first years of settlement rice production was maximized, but due to population and production pressure has since severely decreased. The change in staple production (nominal) of the four research villages from 1998-2003 can be seen in the Appendix 5.1.

Table 13: Rice[1)] production of ten families in 2002

[1)]Unhusked rice.

	NB-TM	KDM	TK	TD
Number of people	54	132	61	53
Rice total (kg)	15,700	40,000	8,600	11,600
Hai	5,700	15,500	8,600	11,600
Naa pee	7,900	20,000	0	0
Naa xeng	2,100	4,500	0	0
Rice total/capita (kg/year)	290	303	141	218
Rice total/capita range per family	100-833	67-750	107-300	115-750
Rice total/capita/day (g)	795	830	386	597

Source: Own compilation

If the village production data were broken down to per capita data, per capita production data from the ten target families (see table 13) would be roughly consistent with this data. Only in NB-TM, rice production figures generated from family data were considerably higher, if compared to the village production[62].

The overall trend in rice production is corroborated by the reports of rice sufficiency. What distils from table 14 is that obviously some families were adept in increasing their rice supply, whilst some were not. Many families are still in the situation of having only 4-5 month rice sufficiency. For some families there is a dearth of seven month in each year without rice, mainly as a result of production failures and harvest loss.

Table 14: Change in rice sufficiency at village and family level (n=10, in months)

	1960s	War period	1980s	1990	1999	2000	2001	2002
NB-TM total	3	6	12	12	5-6	5-6	5-6	5-6
KDM total	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TK total	6	1-3	2	6	8	8	3*	4
TD total	1-4	1-2	1-4	1-4	12	12	12	12
NB-TM families	3 (2-3)	2 (1-3)	5 (2-12)	4 (1-8)	4 (1-9)	6 (3-12)	5 (1-12)	7 (5-12)
KDM families	n.d.	4 (3-5)	4 (3-4)	3 (3-5)	9 (3-12)	7 (3-12)	8 (3-12)	7 (3-12)
TK families	2 (1-3)	3 (1-7)	2 (1-12)	2 (1-12)	2 (2-12)	3 (1-10)	3 (1-10)	7 (5-12)
TD families	n.d.	3 (1-6)	3 (1-5)	4 (1-8)	9** (3-12)	8 (5-12)	9*** (5-12)	10 (4-12)

*Villagers reported to have been affected by a severe drought.
**50% of the target families had rice for 12 month due to the food aid from the GOL, the others were still in TP and rice insecure.
***In 2001 and 2002, 60% of the families had 12 month sufficiency.

Source: Own compilation

Before concluding this section the case of the village PX, a neighbouring village of TD, should be mentioned. During her visit to the village in spring 2004, the author was told that in 2003 almost the total rice harvest had failed due to wrongly implemented wetland rice production techniques which had been introduced by SEP DEV but could not be

62 *This can be related to potential underestimation at village level, for instance to minimize the tax duties.*

properly monitored in the rainy season. At the same time, the villagers had significantly reduced their traditional *ha*i cultivation. Therefore, whilst also being short on cassava, almost all families had to rely involuntarily on forest root crops, including the most unfavourable *Dioscorea hispida*. Other crops such as e.g. *pong kleuz* and *pong atus* were not available anymore. As during many other occasions, the villagers from PX received a generous rice supply from relatives in TD. TK also makes up their rice quota by gift from relatives in TD.

The problem of labour constitutes a classical problem in shifting cultivation worldwide because it is tiring, especially the preparation of the fields before firing the farmland. The author however argues that the former social organisation (see chapter 4.1.2) allowed the stress to be buffered, especially for women. Unlike other groups the Katu never slept overnight in their *hai* fields. Instead the families set out very early, even before sunrise or literally "*before the first cockcrow"*, and came back after sunset, "*when even the dog is sleeping*". Villagers recalled, however, that they spent less time in the *hai,* allegedly to allow more time for other activities such as hunting and gathering, handicraft production, food preservation and food production, etc. Today many of these activities can not be retained due to a lack of time and an ever increasing physical burden: more weeding, more rice pounding, longer walks to gather fire wood and wild foods, longer hunting and fishing trips, double chores in *naa* and *hai* fields, to name but a few. The former organisation in extended households ruled the rotation of work chores and demanded that the first wife mainly stay at home. A further transition in workload pattern is likely to result with higher caloric requirements.

Current time expenditures of *hai* and *naa* production are indicated in table 15 and in the foot note below[63]. TD shows the best "time energy ratio". In 135 days TD produced 218kg of rice per capita. In NB-TM, which shows the worst ratio, in 79days only 106kg of rice was produced and not considering harvest loss.

Table 15: Time expenses in 2002 for different work phases in *hai* cultivation (in days)[i]

[i]Full day

		Clearing	Burning	Removal, weeding	Sowing	Weeding	Harvest	Total	*hai* prod/cap
NB-TM	n=10	22	1	17	1*	28	10	79	106 kg
KDM	n=10	20	1	16	6	23	19	84	117kg
TK	n=10	40	1	11	29	30	23	133	141kg
TD	n=10	30	1	23	25	27	30	135	218kg

*Communal work, whole village helps. Considering the help for other families, total time expenses can be expected to be higher than the 79 days.

Source: Own compilation

4.4.1.2 Fruit and vegetable production

In Upper Kaleum there was no concept of vegetable or fruit gardens (*atuang*). Fruits and vegetables were either planted in the upland fields (*araeh)* or picked in the forest. Besides school gardens, nowadays three types of additional gardens have emerged.

Firstly, there are big plots (4-15m^2) in close vicinity to the houses, these conform to the very basic idea of "home gardening" (as defined by FAO 1995a). They are often mutually cultivated by 4-5 families, but are not found amongst all families. Secondly, there are some "mini" gardens (1-10m^2) outside the village area, often along stream banks. Here mustard greens or corn are planted. The author found them only in TK and TD. Small maize gardens in TK were innovated to cope with rice shortages, providing maize as early as

[63] *For wetland rice production ploughing averages 23 days per family in NB-TM, mainly on stony soil, while in KDM it takes only about 6 days. Many families in NB-TM do not have a buffalo for ploughing, nor are they able to rent one. Rice planting lasts only one day for each family in KDM. The communal work in NB-TM lasts for about 25 days. On average, each family harvests for about 30 days in KDM and 21 days in NB.*

March/April. Nevertheless, this proved ineffective since most of the maize is reported to have been eaten by buffalos from the neighbouring village PX. Maize gardens were also found in TD, but have been abandoned since in terms of the extra workload they were not considered to be very effective. Thirdly, in KDM and NB-TM, mixed fruit and vegetable gardens were found to be integrated in the wetland rice systems, theoretically of a suitable size for commercial use.

In general, systems of gardening appear to be a highly individual affair, villagers being able to introduce new varieties and species. In KDM, e.g., 65% of all families have a garden near the house, 25% have a garden beside the *naa* fields, and 10% plant their vegetables exclusively in the *hai* field.

Traditionally, the Katu also have small herb gardens sitting in little bamboo baskets (max. 20cm diameter), erected on a stick. After the war these traditional baskets have often been replaced by B52 bombshells. They can be mainly found at the back of the house, or on the kitchen veranda. Taken together, families do not have more than one or two (maximum three) of these herb gardens.

Despite the Katu's wish to increase vegetable and fruit cultivation, production is often severely hampered. Besides destruction by wildlife, many families (in NB-TM almost 50% of the target families) report that many of the new fruit trees bear no fruit. In NB-TM only kapok and lemon trees show acceptable harvest levels. In NB-TM and KDM, chilli and tobacco production is also very low, forcing villagers to buy these major Katu necessities at the market, which contributes significantly to household expenses.

Moreover, in all villages there are some vegetable or fruit species which are not planted anymore because the seeds were lost (e.g. melon and *mak seuweu* in TK). As opposed to staple production, such vegetable and fruit seeds were lost involuntarily. Species of consumed garden vegetables and fruits will be discussed in chapter 4.6.1. The scientific names are provided in Appendix 1.1.

4.4.1.3 Collection of wild fruits and vegetables

In Upper Kaleum, wild fruits and vegetables used to be more frequently gathered than today. Coming from the fields on their way home, villagers in TD and TK still walk through forest patches to pick wild fruits and vegetables. In KDM and NB-TM, families mainly walk through their wetland rice fields, or through degraded forest patches in their *hai* area not providing such opportunity.

Indeed, in Thateng and Lammam district, "high" population pressure appears to have made the harvest unsustainable. Mainly species are reported to have been severely overharvested: such as bamboo, mushrooms, etc. In KDM and NB-TM, the remaining fragmented forest patches are very small, with few trees from which to pick the tender tips or fruits. Many *Diocopetera* species (*ala kawah, ala krrtoy, ala alaree*, etc.) have already become extinct. Women in NB-TM reported that in order to harvest forest vegetables, they have to walk at least 2-4 km, which in many cases do not overlap with their walking direction from the fields. Species of preferred wild vegetables and fruits are listed in Appendix 1.1 and are discussed in chapter 4.5. Estimated numbers of wild fruit trees are presented in table 35.

4.4.1.4 Livestock production

In the 1960s, the Katu mainly considered livestock as a family asset or as "medium for spiritual offerings" as was typical amongst the various ethnic groups in Southeast Asia (see also chapter 2). In Upper Kaleum the Katu accumulated wealth through possession of livestock and gongs. A person considered rich had accumulated 10-20 buffalos and about 3-5 gongs, which the son (preferably the oldest) inherited. Comparing this data with the current livestock statistics, this report reveals that the people in the past were much richer indeed. This argument is supported by the note that for a "normal marriage" the bride's price comprised about four buffalos, one collar (traditionally with 30 pearls), 1-2 gongs, one cooking pot, and some chickens, goats and pigs.

During the war period, however, villagers started to regard livestock as a potential means of obtaining cash. But until now, most of the Katu families do not classify livestock as a means of food production.

Table 16: Estimate of livestock production

	Village data									Family data			
	1960s	Mid 1970s	1980s	Mid 1990s	1996	End 1990s	2000	2001	2002	1995	2000	2001	2002
						Buffalo							
NB-TM	0	2	3	10	n.d.	30	25	30	30	8	11	13	11
KDM	31	74	151	157	28	n.d.	31	32	35	8	19	16	n.d.*
TK	n.d.	5	7	15	20	16**	15	10	10	16	12	12	13
TD	40	n.d.	60	n.d.	100	4	8	10	12	3	5	7	8
						Cows							
NB-TM	2	0	5	0	n.d.	0	0	0	0	0	0	0	0
KDM	5	7	201	209	47	n.d.	29	41	49	12	16	15	10
TK	0	0	10	20	22	n.d.	15**	10	10	14	9	10	8
TD	80	n.d.	100	n.d.	110	n.d.	0	0	0	1	0	0	0
						Pig							
NB-TM	10	5	30	20	n.d.	70	50	60	20**	15	15	19	22
KDM	350	440	500	470	35	n.d.	95	72	69	10	87	90	79
TK	50	10	50	60	50	n.d.	20	30	35	52	n.d.	23	29
TD	300	n.d.	400	n.d.	500	20	40	60	100	22	22	25	42
						Goat							
NB-TM	0	0	0	10	n.d.	20	30	40	35	0	2	4	3
KDM	15	30	400	300	47	n.d.	15	17	20	13	4	5	10
TK	0	n.d.	10	50	100	120	100	25**	15	50	10	13	10
TD	150	n.d.	200	n.d.	250	20	30	35**	25	12	8	21	20
						Chicken							
NB-TM	n.d.	50	60	70	n.d.	140	170	130	90	152	132	87	61
KDM	2000	2150	2300	3000	400	n.d.	970	790	750	65	381	321	350
TK	200	200	150	300	150	100	100	120***	80	178	85	96	120
TD	3000	n.d.	3500	n.d.	4000	100	200	400	800	160	226	275	386

*But significantly reduced, probably ten.

** Indicating years of diseases.

***Villagers had no rice bran to feed the chickens, since they were forced to buy rice in the district. Until 2002, many chickens therefore died.

Source: Own compilation

Table 16 clearly shows that development in livestock production has suffered frequent setbacks. In many cases, contemporary populations are lower than in the past.

In the past, KD and TP were well-known for their rich buffalo populations in Upper Kaleum. This contrasts with TKK and NB, which, with the exception of poultry, have never been able to produce significant livestock populations. Comparison with production between the village and the target families cannot be accurately calculated, since the family data set includes small animals. As a result, in the extrapolation the reader will find a discrepancy between pigs and chickens.

Calculating livestock production per capita, during the mid 1980s in TP and KD there were around 0.25 and 0.17 buffalo heads, which stabilised at around 0.25 buffalo heads in the mid 1990s. Through resettlement these figures have dropped to 0.04 and 0.08 buffalo heads per capita in 2002. NB-TM and TK, in contrast, started with low populations and now have around 0.12 buffalo heads per capita. Setting these data into a national context the author calculated that the contemporary Katu livestock production compares unfavourably with the national mean (see GOL 2000b).

Free roaming livestock was and still is in danger of getting killed by wildlife. For NB-TM it is reported that wild animals annually killed up to 20 buffaloes, 50-60 pigs, and around 80 goats. KDM recalled a total loss of 30-40 animals. For TP it is said that wild animals could kill as much as five buffalos, 100 goats, and 100 pigs, with the tiger being the major culprit[64]. Even today, wild animals claim occasional causalities; in TK for example, jackals killed three pigs in 2002. The most frequent animal deaths, however, occur when goats get caught in snares and traps. By contrast, in Upper Kaleum villagers still have to pen their animals in at night.

Moreover, the trend of increasing livestock disease is a matter of deep concern. NB-TM reported that in the past buffalo epidemics occurred approximately every ten years, compared to every two or three years nowadays. Chicken and pig epidemics also emerge more frequently than in the past. Unknown diseases especially render the villagers' traditional methods of treatment useless; the villagers are also still too far away from veterinary services. What is not indicated in table 16 is that in the period from 2003 to 2004 NB-TM lost almost their total pig and chicken population through disease, and therefore had to eat all the rest over a short time before it became spoiled (see also chapter 4.6.1 and 4.6.2). There is also the case of the village PX, to which the GOL provided 80 cows in 2000. By 2003, only 36 remained alive; the rest died of disease. While villagers in KDM and NB-TM buy some vaccines on a regular basis, and treat their animals with human medicines such as Ampicillin and Paracetamol, no livestock is vaccinated in TK and TD. This is true for most of the villages in Kaleum, excluding those where ACF works.

The provision of animal feed poses another conundrum. According to the Katu women one medium-sized pig needs about one kilo of cassava per day (unpeeled, raw), which has to be cooked, and then mixed with rice husks - and then the rice soaking water is discarded. In TK, where villagers are short of both rice and cassava, they cook wild vegetables such as *aneng* (*Nymphera lotus*), the leaves of *pong aloh* (*Dioscorea hispida*) or *pong aroh* (*Colocasia esculenta*) and feed them to the pigs.

Taken together, facing the new demands in livestock production, all the villages fall short on the livestock population numbers of the 1980s and early 1990s (except for buffalo and goat production in NB-TM). It is increasingly becoming evident that livestock production is progressively becoming hampered, rather than optimised.

4.4.1.5 Hunting and fishing

Hunting

The Katu agricultural production system - which might appear to some as archaic - contrasts greatly with their very sophisticated hunting system as will be presented here.

Like agriculture, hunting is necessarily seasonal, lasting from April through November, and possibly December. In between, until the beginning of the new rainy season, traps and snares are not set (*aluar*). Fishing activities are conducted all year round, but vary considerably according to season. Hunting and trapping appears to be a male affair, but women are involved in checking traps and snares.

In order to maximise energy efficiency, traps and snares (*perkazz*) are set mainly around the *hai* area, usually in very close proximity to each other. Within each year a designated area is declared as an individual's hunting ground, and is forbidden to fellow hunters. In Upper Kaleum the Katu were almost free to go wherever they wanted within sacred forest areas,

---

64 The data complies with the biography of Prince Pethsarat (published in English 2002:47) reports on the case in the 1960s, when one tiger killed 21 buffalos in one of the central Provinces.

and the cemetaries were the only taboo areas. Today the selection of hunting grounds often conflicts with classified conservation areas and hunting bans.

In the past, some hunting activities required considerable manpower, sometimes up to ten men, to carry out the tripping of tree trunks or the digging of pitfalls. Most communal traps have now been abandoned. Today, the concept of hunting in groups is looser and hunting has become more individualized. Usually, the men organize hunting groups of about 2-4 people, preferably consisting of close kin. Close kin and friends still share equipment such as head lamps, batteries, guns, fishing nets, etc. Traps are checked every day - or at least every other day. The most distant traps are checked once or twice a week. If the traps cannot be checked due to illness or distance, usually someone else from one of the hunting groups goes to check. Traps can be left unchecked for a maximum of 7-8 days before the meat is considered inedible. One specie of maggot is however considered delicious, eaten raw from the rotten meat.

Hunting methods follow a comprehensive analysis of an animal's habitat, eating habits, and migration patterns. Nevertheless, before the 1960s, certain animal and bird species could not be hunted due to inadequate equipment. Even today there are many animals which are impossible to hunt due to their speed. From such species (e.g. crows) only the young ones are caught. Other species are difficult to hunt, because of inappropriate bait - such as maize or rice - for catching otters or weasels. Traps are often either set at natural obstacles such as river crossings, tree trunks and narrow pathways, or new obstacles are erected (e.g. when building the *charrong, reua*).

Traditionally, after a big mammal is bagged, two small carved bamboo sticks (one looking like a spear, one like a cartoon ghost) are smeared with the animal's blood from its wound, and stuck into a nearby big tree. This is followed by a little prayer such as "*thank you, give to me again next time*". On to the animal's blood they glue hair from the nose, the ear, the neck, the tail, the eyebrow, and from the legs. For small mammals no such offering is made (e.g. a two year old young muntjac weighing 10kg). Past custom demands that once the prey was in the village an intricate system of sharing makes for high kinship solidarity. The carcass was dressed and, depending on its size, divided into various cuts, which were then distributed to as many families as possible. In TD and TK this practice still prevails. Some examples are provided in chapter 4.4.2.6.

Table 17: Traditional snares, traps, guns and other implements for hunting

[i]f=Family, v=village

Implement	Type of animal	Description[i]
abom, keloh	Rats, porcupines, squirrels, pangolins, snakes[65], birds[66]	Small log, normally with bait, (for snakes without bait), which is tripped to fall when the animal takes the bait. One type without bait (kelamm) is for snakes only.
adding, ding	Gaurs, bantengs, tigers, bears, deer, muntjacs	Very large log tripped to fall when the animal takes the bait. No containment such as a pit to trap the animal and prevent its possible escape.
agnoh	Frogs	Little traps for frogs.
AK47, Kalashnikov	All mammal types and large birds	The Katu know about 20 types of guns and rifles.
akoch	Macaques	Roofed structure with bait falling from tree.
aram, arung	Cave bats	Small wooden funnel which is put in entry of a cave to trap them.
aweat	Birds	Triangular bamboo snare up a tree.
biang, baeng, cherrdong, kanui (or zaet =metal)	Bintorungs, civets, rats, birds[67], squirrels, serows, deer, linsangs, porcupines, wild boars	Bamboo is strained, so that when it is touched, the animal is caught by the neck and suffocates, with bait such as cassava, with metal and ties. There are three types with varying heights: very high, medium, close to earth.

[65] *Especially phytons.*

[66] *Eg. wagtails, forktails, coucals, flycatchers.*

[67] *E.g. quails, partridges, jungle fowl, etc.*

Implement	Type of animal	Description[i]
chakat, naang	Bats in trees (e.g. banana, bamboo)	Folding net. When bats are disturbed, and to try to fly off, the net snaps shut on them. When harvested from bamboo trees, each tree provides about 10-20 bats
chedong krrjoh	Wild boars, ferret badgers, bear, muntjacs, serows, goars, tigers	n.d.
chedong saret	n.d.	Village affair.
cherrong, reua	Tigers, deer, muntjacs, wild boars	5-7 bamboo spikes with obstacle at inclination.
janarr	Birds	A glue is mixed out of different resins from big trees (kok hai, kok yang, Katu yee), and stored in a little bamboo tube. When the resin mixture has become sticky it is put on little sticks and laid out around water holes - especially in the dry season. The glue sticks to the feathers and the bird cannot fly away (NB). In TD and TK birds are trapped in this way on the maize plants, or on other fruiting trees. In TD, the glue is heated over the fire, and the sticks are dipped in, yielding "little lollies". Instead of resin, the ground bark from kok yang or kok tan (tom yiz) may also be used, which also needs heating.
keul	Rats, squirrels, frogs, birds, snakes	Stone tripped to fall, without bait.
kiap chekang	Small birds	Bracket trap on a tree branch which leads to a nest. Only in trees with fruits.
kiap cherrtuk, kiap krrsun	Birds, rats, squirrels	Bracket trap on the ground.
kiap kerrjoh, kiap ajall	Civets, macaques, squirrels	Bracket trap on a branch (often in lianas).
kodtch, enkeub	Macaques	Roofed structure with bait (e.g. maize) and a spring-activated door, capturing many animals at once.
koz	Wild boars and other	Hunting with spears, poisoned with the resin of the kok noong.
kreub	Birds	Nest with little red fruits (mak hai), or rice husks, a trap lid falls down, children's toy.
krrnoy, krrjoy	Squirrels, rats	Triangular trap on the earth, the animal is caught by the neck.
n.d.	Elephants (not deliberately hunted, only when destroying the crops)	A special pit is dug, which is small on the top. When the elephant falls down his feet do not reach the ground, making his head easy to reach. The elephant's trunk is cut off resulting in the animal bleeding to death.
n.d.	Muntjacs	When villagers hear the song of the muntjac, about 10 people set out to the forest to frighten the deer, which in turn is driven into a home-made net from fibre a of vines.
n.d.	Cave bats	A cave is closed with a big stone, leaving only a small exit, the bats are then disturbed which in turn fly to the exit. The bats are beaten to death with a stick. In the past 5-6 families went together to a cave, 1-3 times a year (esp. December), each time yielding about 40-60 bats per family.
n.d.	Larger mammals and birds.	Fence with intermittent traps, which can be as 200m long.
n.d.	All animals	Communal hunting raid for 3-5, usually 1-3 times year. Aimed additional meats for conservation such as fermenting or drying. Nowadays communal hunts mainly for fish or frogs yielding about in total 100-150 at one time.
n.d.	Cave bats	A fire is lit in the cave to disturb the bats. Escaping from the heat and smoke, they come down to earth where they are beaten to death with a stick.
n.d.	Flying squirrels	Flap on tree trunk for flying squirrels, 30-40/v, no bait.
n.d.	Leopards	The same soft log as used for macaques, but the construction is much larger, up to 5-6 m. Wild boar is used as bait.
n.d.	Macaques	A softwood log - such as the mai pong or the mai sod - is placed over a pit; a crack is sawn into the log. Food is placed on the log to lure the macaques. The weight of 3-10 monkeys would crack the log, and cause them to fall into the pit, which is spiked (about 200), size about 3x3m.
n.d.	Rats	Small traps for rats, 30-40/f.
n.d.	Small birds, lizards	Slingshot, only used by children and youngsters.
n.d.	Snakes	Snakes are hunted with a stick, there is no special trap.
panaen	Gibbons, muntjacs, langurs, deer, bears	Crossbow is used with poison (piz) from the kok tang or from two other trees (best harvested at full moon). The crossbow is made out of wood from the mai kaen, which is cut best between March and April.
panaen achem	Birds	Special crossbow developed for bird hunting.
panaen akut	Frogs and toads	Simple harpoon like gun (2m) developed for frog hunting, (two types differing in their trigger mechanisms).

Implement	Type of animal	Description[i)]
peloch	Small birds[68]	Blowpipe made from pieces of bamboo, used with arrows, the ends of which are attached with cotton.
podah, krrdiat	Birds, squirrels, small wild boar, pangolins, rats	Type of ground snare (also another type called kadoch).
prrkaeng, perkedth	Small rats[69], bamboo rats	Small bamboo snare in front of a rat hole which catapults the rat thus breaking its neck.
prrtaz	Birds, very young mammals	Bamboo ground snare which targets feet, on earth, best in September.
prrtoch	Small birds	Bamboo snare on the ground.
prrung, prrang	Bantengs, gaurs, bears, deer, muntjacs, elephants, wild boars Big cats	Pitfall type 1: With spikes (koz) inside, made out of a wood called ajul. About 2m deep and 2x2.5m long. Pitfall type 2: No spikes inside, animal has to be speared, a bait is used such as a pig or a buffalo.
rab		15-30 bamboo spikes without obstacle at inclination.
tahoh	Goars, bantengs, elephants	Arrow shooting device tripped by brushing against it. Will hit larger animals in the flank.
tee, ton	Tigers, deer, wild boars, muntjacs, gaurs	Very large log tripped to fall when the animal takes the bait. With containment such as a pit to trap the animal.
tonng or to	Rats, squirrels, birds[70]	Bamboo tube which contains a little bait, and snare inside.
wiat, chodth	Squirrels, otters, martens, weasels, birds, rats, civets, linsangs, macaques, porcupines	Triangular bamboo snare on the ground.
xing	Birds, rats, squirrels	Falling middle-sized log tripped to fall, bait of rice or cassava.
zrrrwiat (armoll or adok)	Wild boars, macaques	Wild boar: All men from the village set out for a two day hunting trip, to entrap a pack of animals in an ever smaller circle of fence (hardwood). Animals are finally speared. Macaque: Same as with the wild boar, but avoiding areas with high trees.

Source: Own compilation

Table 17 summarises traditional Katu hunting techniques; however it is far from being exhaustive. Some of the techniques are still employed, but many have already been abandoned: especially in KDM and NB-TM. Men in TD, TP, and KD still follow customary practices. The variety of hunting methods has however been reduced to some key methods (see table 18).

The introduction of guns (mainly AK47s) at the onset of the war in the 1960s, and the selective usage of metal in the 1980s have changed traditional hunting methods. This first led to a rapid decimation, followed by extinction of some animal populations. KDM reported that they had obtained guns in 1964, and by 1967 certain pheasant species had already become extinct. Today the village military force is still allowed to keep their guns for security, but it is officially forbidden to use them for hunting. Villagers are afraid of getting fined (approx. 1,000US$[71]). In NB-TM, the military fraction covering 20 people together with three defence soldiers, possess seven AK47s. Bullets can be bought at the market with one costing about 2,000Kip (as of 2003). Those who wish to have their own rifle can buy one in Salavan for about 30-40US$.

Elsewhere in Laos, the Katu have abandoned the use of bamboo snares in favour of metal snares. Because of a low cash income, however, many villagers in TD still use home-made strings and ropes from fibres of vines instead of nylon bought from the markets. KDM

---

68 *E.g. Babblers, spiderhunters, white-eyes.*

69 *E.g. Viventer species.*

70 *E.g. partridges and button quails.*

71 *For killing a Gaur the fine is about 6000U$ (as of March 2004).*

villagers, however, reported that "*animals, especially rodents, but also birds are able to bite through natural fibres. That is why we prefer metal and nylon tools*". Many villagers in NB-TM and KDM also abandoned certain traps and snares as they had not trapped anything. In every village however there are families who continue to use certain snares or traps with which they have had high harvest rates, and with which they have developed certain skills over the years. This applies especially to the small bamboo snares such as *kiap*, *prrkedth*, and *tonng*. Some utilities however such as the blowpipe and the crossbow cannot be built anymore in KDM and NB-TM, because large sized bamboo no longer exists.

Table 18: Usage of selected traps and snares by villages or families[i), ii)] in 2002

[i)] f=Family, v=village
[ii)] Average provided and range in brackets

Implement	TM	TP	NB-TM	KDM	TK	TD
	Focus group	Focus group	n=10	n=7	n=10	n=10
janarr	Every f	Every f	Few f	n.d.	n.d.	Few f
abom, keloh, kelamm	Incl. in keul	20-50/f		1.8 (1-7)/f	0	20-50/f
keul	30/f	30-50/f		13 (3-40)/f	1.5 (1-15)/f	10-30/f
xing	30/f	10/f	0	0	0	0
ading, ding, tee, ton	n.d.	10/v	0	0	0	0
AK47, Kalashnikov	n.d.	6/v	7/v	not asked	2/v	6/v
prrtaz	20-30/f	20-100/f	n.d.	n.d.	37 (20-105)	20-50/f
biang, baeng, cherrdong, kanui	20-30/f	20-50/f	n.d.	7 (2-15)/f	4.8 (0-30)/f	20-50/f
cherrong, reua	2-5/f	3-10/f	0	0	0	0
rab	10/f	10-12/f	0	0	0	0, but some others
kiap(all three types)	Total 100/f	Total 70/f	very few	Total 10 (5-30), with metal/f	Total 4 (0-20)/f	Total 4/f
kreub	10 /v	n.d.	n.d.	n.d.	n.d.	n.d.
panaen	n.d.	10/v (50/v in the distant past)	0	0	0	0
panaen achem	n.d.	10/v	n.d.	n.d.	n.d.	5/v
panaen akut	0	0	0	1/v	7/v	8/v
peloch	2/f	50/v		0.1 (0-1)	0	10/v
podah, krrdiat	10/f	3/f	0	0	0	0
prrkaeng, perkedth	10/f	10/f	0	0	0	0
prrtoch	7-8 /f	10-20/f	0	0	0	0
tahoh (ahoh)	20/f	2-7/f	0	0	0	0
tonng,to	100/f	50-100/f	0	0	2.5 (0-25)/f	0.5 (0-5)
wiat, chodth, aweat	5/f	10-50/f			0.5/f (0-5)/f	0
krrnoy, krrjoy	n.d.	10-100/f		0	0.2 (0-20)/f	4-7/f
prrung, prrang	n.d.	5/v in the distant past	0	0	0 (10/v in Ban Kachen)	0
kodtch, enkeub	n.d	10/f	0	4-5/f	0	0
akoch	n.d.	10/v	0	0	0	0

Source: Own compilation

In the past, the elderly reported that it was possible to catch wildlife every day, often ensnaring several animals with one trap. This becomes obvious when the various traps and snares are set simultaneously as mentioned before. Traps like the fence with intermittent traps (up to 200m) or the *kodtch* allowed the catching of more than ten animals in one day. Nowadays harvest rates are rapidly decreasing. Only villagers in TD do not acknowledge the problem of reduced wildlife populations. There, harvest rates have remained stable over the last five years. Changes in kill rates per species are presented in chapter 4.5.1.

In the past there were no genuine Katu taboos on a par with the current environmental laws such as seasonal hunting, etc. According to the villagers the abundance of wildlife did not cause any such necessity. The villagers also described 1) taboos for certain animals which were attributed with spiritual powers (e.g. the owl as the mediator between the spirit and the human world), 2) taboos for different working seasons, and 3) taboos for certain steps in the life cycle. Tentatively, the author contends that these traditional taboos were not so much rooted in environmental thinking, but in the wish not to offend the spirits and in turn to cause disharmony for the family. There is a strong belief in "omen animals". To give an example, the Katu in TD state "*when you go for a hunt and you find a dead animal directly on the path you are walking on, you have to turn back to the village. You also have to turn back, if you see a green viper (kaxeng charliang). If you do not return, your family is in danger of dying during the course of the next year*". Many of these taboos are still upheld, but they are fading rapidly.

Fishing

Both men and women fish - although angling is sometimes only undertaken by men. Children also take a great share[72] in gathering fish, tadpoles, frogs, toads, crabs, shrimps, snails, and water insects. The various Katu fishing utilities, such as nets and traps, are shown in the table 19.

Table 19: The Katu fishing implements

Katu name	English name	Description	Availability per family
bin, panang	Fishnet	Long fishnet, without metal, put up between the riverbanks	1-2, but a lot 0
kaduh	Fishnet	Long fishnet with metal.	1-2
embaeh, abaz	Fishing rod	Worm is used as bait (taloy)	1-3 (formerly 20-30/f)
enchoh	Fish trap	Round basket, exclusively from Apr-Nov	n.d.
arung, aruang	Fish trap	Penis-shaped basket, exclusively from Aug-Oct	total of 10-40/f
	Dam	Big dam in stream, with intermittent fish traps	village affair
N.d.	Dam	Small dam in stream, children's affair	n.d.
tum, doh	Fish trap	Bottle-shaped basket, exclusively from Oct-Nov	n.d.
prrhai	Fish trap	Special fish trap, which is installed in the river (maximum 2 m wide), from Oct-Nov	n.d.
aram	Fish trap	Long, round basket with worms in it.	n.d.

*Villagers in TD distinguish between *aruang* fish traps, which are longer than 1.5 m, such as *aruang enklang* and *aruang tahoh*. There is also another type called *aruang amben* which is only a bit longer than 1m. Each family also possesses other types called *aruang chimbok* or *a. cherrbock*, which are about 1m long. Smaller ones are *a. anuak* (0.3m) and *a. krrdoch* (0.5m).

Source: Own compilation

Nylon was not available before the mid 1970s. In the past, fish nets were meshed from vines such as *krrmeu klodth, ardoll*, or the leaves from pineapple trees. Fishing rods could also be made from these. In the past, otter whiskers were bound to the top of a fishnet as a talisman. "*We believed the fish is not afraid of the otter and the otter eats a lot of fish, so with the whiskers we will have good luck (tabot)*" as reported by Ajan Vipon. Metal for the sinker metal was formerly made from scrap metal extracted from bombs, crashed planes, or tanks. Nowadays, sinkers, nylon, and nets can all be bought at the market, however only a few can afford to buy them. Some men therefore simply set out with mosquito nets. Currently the major techniques employed are trapping and fishing with home-made nets.

[72] *Involving. between 2-5 hours per day.*

4.4.2 Change in the purchase of market foods

In Upper Kaleum the Katu were autarkic, producing most of their daily necessities on their own[73]. Besides exchanges with other villages, affiliation with the cash economy arrived with the French and also because of the emerging markets on the Viet Nam border (*Aloui Valley* close to TM), where mainly salt was obtained. In order to gain the necessary cash, the Katu first sold handicrafts and livestock, for which they got some gold from the French. In turn they transferred the gold for French Piaster which they could use at the Vietnamese markets. When the Katu had no items to exchange they engaged in wage labour, mainly in Salavan, Pakse, or Paksong. This mainly involved working in rice or coffee production. Work spans ranged from one month up to one year, enabling the Katu to purchase about 5-20kg of salt. With the onset of the war, and the penetration of soldiers into the mountains, the Katu became more deeply involved in broader exchange networks, and with the cash economy. Up until the mid 1980s, market orientation continued to be directed towards Salavan and Viet Nam.

Twenty years later the Katu food system is still autarkic; affiliation with both the local and the national economy has not expanded. Most of their food still derives from fields, gardens, and the forest. As mentioned in chapter 4.3 isolated TK and TD have almost no access to infrastructure or markets, whereas KDM and NB-TM do. The crucial point, however, is that the villagers are mainly lacking the income to buy any market foods.

4.4.2.1 Income generation

Table 20 summarises the Katu's trend in income development. While it is safe to conclude that there is a general increase in village incomes (prices adjusted by the village head), two issues are clear. Firstly, real incomes are very low. Secondly, there is a high fluctuation in village incomes: in some cases with differences of more than 100%. High fluctuation is associated with the natural cycles of NTFPs, such as malva nut (*Sterculia lynchophora*). Malva nut is reported to fruit only every third year and *kixi* can only be harvested every five years.

In Kaleum, villagers are highly dependent on opportunistic traders, mainly Vietnamese, who use the old Ho Chi Minh trail, with former vehicles from the Viet Nam War. Often, the Vietnamese are the only trading partners. The prices they paid to the farmers are often lower than a tenth of the national market price. In 2003, in the case of eagle wood (*Aquilaria spp.*), for example the villagers had to accept a price 4,000 times lower than the world market price (p.c. A. Jensen 2003). In 2001, a Vietnamese "rattan trader" promised TD that he would buy 3,000 trunks of rattan. The villagers cut the demanded amount, but the trader never returned. Storage during the rainy season destroyed most of the rattan, and prevented a later sale in 2002. According to the villagers the Vietnamese harvested some rattan on their own. In 2003, another Vietnamese trader wanted TD to sell high amounts of *ala chae* (unidentified wild *Ficus sp.)*, offering 120,000Kip for each big basket. To the author's knowledge up until spring 2004 that trader had not returned.

Taken together, none of the villages have any experience whatsoever in marketing and associated activities. Various unsuccessful attempts in NTPF marketing have left villagers highly suspicious, and in a state of distrust which will be difficult to overcome. In 2002, a Lao rattan trader spent two weeks in TD trying to engage them in a new rattan deal. The villagers however would not accept any such deal.

---

[73] Clothes were made from woven cotton (ameung), blankets also. Salt and ash acted as washing powder. Leaves were used as soap and shampoo. Salt was the only food item the Katu bought.

Table 20: Total annual village income[i),ii)] (in million Kip)

[i)]Only cash transfer (adjusted for prices), excluding exchange in cash.
[ii)]Documentation by oral history until 2000. Post 2000, the village headman provided some calculated estimates. There was no documentation neither at family nor at village level.

	1960	1972	1975	1980	1990	1996	1998	1999	2000	2001	2002
NB-TM	0.6	0.9	n.d.	1.5	3	n.d.	4.5	7	8	18	19
KDM	0.03	n.d.	10	n.d.	20	50	n.d.	n.d.	70	75	85
TK	1	1	n.d.	0.4	1	n.d.	3	5	2	3	n.d.
TD	1*	n.d.	1	1	1	n.d.	15	n.d.	20	40*	25

*Mainly wage labour in Salavan (30-40days).

Source: Own compilation

Table 20 shows clearly that KDM is the village with the highest real income. In 2001, TD's income of 40 million Kip was more than double the all-time maximum of 19 million Kip for NB-TM. TK always had a relatively low real income. In 2003, however with NTFP production the village income considerably increased to 8 million Kip. After resettlement KDM was able to more than double their village income. For 2000, the exchange rate of 1US$=10,000Kip can roughly be used.

Calculating the annual per capita income (2002) from the data for the ten families gives results of 81,000Kip in NB-TM, 144,000Kip in KDM, 248,000Kip in TK, and 291,000Kip in TD. NB-TM's income is forty times lower than the national average. In this vein, the author wants to emphasise that it is likely that there are many more villages in Upper Kaleum, whose income might be even lower than that indicated here.

NB-TM's meagre income mainly derives from livestock production (76%). In KDM rice is the most important commodity (57%). In the three other villages rice contributes less than 10%. In TD and TK, 99% and 84% respectively of income was generated from NTFP production. In total, NTFP production allows for higher real incomes in TD and TK than in KDM and NB-TM. This is certainly intriguing, considering that NTFP collection, often opportunistic, takes less physical effort than rice, vegetable, or livestock production.

NB-TM villagers claim that favourable NTFPs such as *kixi, mak chong, mak ngaeng,* and *dok khaem* are already overharvested, as are p*hak samek* and *phak xee*. For many years, they have been short on bamboo and mushrooms, and have tried to plant bamboo in their gardens for their own consumption. By contrast, *kixi* production in TK and TD still made for more than 50% of income in 2002. Many other NTFPs which have been overharvested in other areas in Laos can still be found in Kaleum, e.g. *ala peuy*. Many of the NTFPs have not yet been recognised as market commodities. Only slowly are TD and TK villagers beginning to recognise the market potential.

Wildlife was not mentioned in the interviews, but there is enough reason to assume that in TK and TD, a substantial amount of bones, gall bladders, or dried meat is opportunistically sold. Many of the big mammals which can still be found in TD are absent in TK, KDM, NB. The author wants to make a fictive comparison. In order to obtain 20US$, which is the price the villagers will get for a serow's gall bladder, villagers would have to sell more than 200 bundles of wild vegetables. Time and spatial expenses are also relevant. This argument can be extended to see that wildlife trading villagers might increase their food base as well as showing kinship solidarity by sharing cuts of meat. They might also be able to sell the serow's bones, blood, stomach, horn, faeces for an amount equal to the price of another 100 bundles of vegetables.

Livestock and vegetable production did not contribute significantly to income generation, even though they have an excellent infrastructure, the village of NB-TM obtained in 2002 a total of only 100US$ from sales of fruits and vegetables. In detail that was 35US$ from tamarind, 10US$ from chilli, 20US$ from maize, 20US$ from mustard greens, and 15US$ from bananas. All this food was sold in the village, instead of being brought to the market, since the villagers consider it too expensive to take the bus to the market.

KDM also only sporadically sells their fruit e.g. bananas, forest fruits such as *mak fay* and *mak ngeo* as well as vegetables such as *phak kat* and *phak salad*. Over time however KDM has traded rice as its main commodity (57%). In 2000 they sold about 10t of rice, in 2001 15t and in 2002 about 18t before the pump broke down.

Despite being severely short on rice, some villagers in TK sold a total of 30kg. This is also true for the very poor strata of KDM. Yet in the case of KDM, villagers have hardly any food to use as an alternative staple for their own consumption. The sale of rice even in times of severe deficiency is a country wide problem, indicating the deadlock of marketing potentials (p.c. M. La Rosa, CESVI 2003). For the Province Oudoumxay, CESVI reported that many villagers sell rice directly after their harvest for low prices, and are then forced to buy it back during times when prices are high. However, with the absence of portable commodities in Kaleum, many TK and TD villagers often sold their chilli despite being short of it themselves.

Table 21: Change in income generation in Ban KDM (%)

	1960s	1970s– 1986	1990s	1996	2000	2001	2002
Rice	0	0	0	n.d.	56	53	53
Livestock	17	20	35	n.d.	9	9	11
Handicrafts	67	50	55	n.d.	4	4	4
Others*	17	30	10	n.d.	29	33	32

*Including vegetables, NTFPs.

Source: Own compilation

The historical development of income generation in KDM is presented in table 21. The author tentatively suggests that this trend can be applied to other Lao upland areas. Handicrafts such as basketry, woven *sin*[74], etc. lost their share of about 50% of the income before resettlement in the mid 1990s and now accounts for approximately 4% of the income. In NB-TM, TD, and TK, income from handicraft can be assumed to be almost nil at the present. Handicraft promotion did reach Kaleum. TK women weaved 20 *sins*, but they were unable to sell a single one. Now the women are in debt for the money it cost to buy the fibres. Today, rice production accounts for more than half of the village income in KDM. The current contribution from current sales of livestock (10%) has not yet reached its level before resettlement (35%).

Until now, wage labour has not been developed as a means of obtaining cash. From 1999-2002, in NB-TM only 3-6 people worked outside the village, in KDM 56-71 people, and in TK and TD none. This data excludes those who left for study and governmental assignments e.g. to join the military. In NB-TM, the total additional income generated through wage labour was estimated to be approximately 50US$ per year.

There is an increasing polarisation of incomes in the study villages. The villagers, however, did not identify various forms of poverty *per se*, but they did make a distinction between those who have a ‘normal’ standard of living and those who are ‘better off’. The people of NB-TM attribute the growing income gap in the village mainly to reduced levels of kinship solidarity.

4.4.2.2 Expenditures

In summary, food expenses represent 56% of the “total expenses” in TK (70,000Kip/cap), 41% in TD (16,000Kip/cap), and 28% in KDM (22,000Kip/cap). Villagers in NB-TM show the highest real expenses with 92,000Kip/cap. Calculating expenses however was very difficult and the author here only included expenses for medicine, food and some

[74] *Traditional long skirt, hand woven from cotton.*

daily necessities. In case of illness, villages have expenditures not only for medicine but also for the ritual killing of animals. As means to obtain cash, often such livestock has to be sold. To give an example, in NB-TM one villager with an annual income of 81,000 Kip had to sell two pigs, one buffalo, one goat, and various chickens with a total value of about 2,000,000Kip for the treatment of his wife in 2000. On average of all villages medicine costs during the period from 2000-2002 ranged from 8-35% of the total family expenses. Despite high variations it became clear that the annual expenditures for medicine during this period were lowest in TK ranging between 5,000-7,000Kip/cap. By contrast, medicine expenditures ranged between 8,000-12,000Kip in TD, 10,000-17,000Kip in NB-TM and around 16,000-20,000Kip in KDM.

What transpires from table 22 is that in 2002 rice made up 94% of the expenditure in TK and 54% in NB-TM. Contrastingly, the share is close to nil in TD and KDM. In TD the purchase of salt and MSG[75] constitutes the greatest share with 80%, followed by 14% for oil, and some occasional sweets for the children. In TK and TD meat, vegetables, and fruits are never bought, which contrasts with KDM and NB-TM, where meat makes up about 17-19% of the expenditures.

Table 22: Market foods purchased in 2002 by target families[i)] (n=10 and in 1,000)

[i)]Real prices

	NB-TM		KDM		TK		TD	
	%	Range	%	Range	%	Range	%	Range
Rice	54	100-800	2 (4)	1,8-30	94	60-1,080	0	0
Meat	19	40-250	67* (17)	15-3,000	0	0	0	0
Vegetables	8	10-60	0 (0)	1	0	0	0	0
Fruit	3	5-30	0 (0)	0	0	0	0	0
Sweets	3	3-40	14 (37)	200-500	7	0-50	6	5-55
Salt, MSG**	8	25-50	11 (28)	13-99	16	30-100	80	50-200
Others, e.g. oil	5	20-30	6 (14)	12-60	2	0-65	14	15-40

*Including the purchase of a buffalo for three million Kip for one family. Taking 50,000Kip instead to modify and normalise results the figures are shown in brackets.

**The real price for salt is higher than that for MSG and considerably higher in Kaleum than in Salavan or Sekong town.

Source: Own compilation

The author noted that some families in TK did not purchase rice from the Kaleum market, but from other villagers who intended to sell their food aid, which was provided by an international development organisation (GTZ). According to the villagers the GTZ aimed at distributing the rice to orphanages in Kaleum (villages such as TP). However, by Katu custom, close kin take care of orphanages, secondly, the villagers were not willing to carry 20-30kg of rice up the mountains. This proves that villages such as TP do not necessarily need more rice. As a result, one TK family bought 120kg of rice aid for only 50,000Kip - four times less than the market price for new rice. Usually, if they need rice, villagers in TK buy at the market two year old year rice for half the normal price (e.g. 1000Kip/kg as of 2004).

With the beginning of wetland rice production, new forms of expenditures have also emerged. In NB-TM renting a buffalo costs 300,000Kip for each hectare or a tractor 3,000,000Kip (fixed rate per day). Conversely, in KDM renting a tractor costs only 60,000Kip. In addition, animal tax (2,000Kip per buffalo or per cow) and land tax has to be paid. In NB-TM, where villagers have no money, they pay in kind e.g. in rice. Ten *taang*

---

[75] *MSG, monosodium glutamate, is a synthetic "taste-enhancer" which, after its discovery in the 1940s, has found worldwide distribution. Since the 1960s however, many scientists have shown that the potential health damage could be caused by MSG and advised pregnant women and people with vitamin and mineral deficiencies to avoid it.*

unhusked rice were equal to 7,000Kip in 2002. In turn, officials could sell the rice for a higher price at the market. In the past, land tax had to be paid depending on the harvest, nowadays the calculation is based on the area. The new tax rate has already significantly increased from 30,000Kip per ha in 2000 to 80,000Kip in 2003. In NB-TM even those villagers whose land is flooded and unusable have to pay some tax.

Another new form of expense is the costs of milling rice. Those villagers in NB-TM or KDM who can afford it, often bring their rice to the rice mill to avoid the tiresome pounding which costs 1,500Kip/kg in Ban Ponh for NB-TM, but only 500Kip in KDM.

In the past, in Upper Kaleum, villagers could get all of their construction and building materials from the forest. Today, the construction of houses has put a heavy burden on the families in KDM and NB-TM, where they have adapted to the lowland style of the Thai-Kadai groups. The village head in KDM estimated his costs at around 3 million Kip including the purchase of one goat, one buffalo, three pigs, and construction materials (1,377,000Kip) - such as timber and corrugated iron. With the forest already severely degraded around the village he bought the *may bong* wood but got the *may yang* wood from the forest.

Comparing the expenditure data with the income data, average saving potentials are almost nil in NB-TM, moderate in KDM, and a bit higher in TD and TK. In general, in all four villages, low incomes are coupled with low expenditures and as a result low debt rates. However, villagers claim that debt levels are rising. Table 23 shows the debt of the target families by the end of 2002.

Table 23: Debt of target families by the end of 2002 (in Kip)

	NB-TM	KDM	TK*	TD
	n=10	n=10	n=10	n=10
Total debt	9.801 Mill.	13.972 Mill.	1.380 Mill.	12.776 Mill.
Range	0.171-5.8	0-7.155	0-0.5	0.004-2.272
Debt/cap	181,500	128,183	22,623	241,057

*In spring 2003, for many families the debt increased significantly due to house building, illness, and the death of relatives.

Source: Own compilation

The villagers are mainly in debt within the villages, and only on a small scale outside the villages (e.g. within the district). People either borrow money from their relatives or from the village head. Accordingly, net debt rates are almost nil. In the village there is no interest rate (compared to the interest of 10% at the Lao Farmer Bank in Sekong as of 2002).

4.4.3 Conclusion

From her retrospective analysis on the food chain, the author has shown in time-lines (1960s until today) that in terms of food acquisition the Katu had gained highly seasonal, yet stable food supplies in the past by the means of shifting cultivation, vegetable and fruit production, livestock raising, together with opportunistic hunting, fishing, and the gathering of edible forest products. Affiliation with the market economy was found to have always been low. In the past, however, handicrafts and livestock together with NTFPs provided the sufficient trade commodities to exchange for necessary commodities. Today, income levels were found to be far below the national average.

Generally, the Katu were found to have been coerced into changing their agroecosystems. It can be argued that increased wetland rice production, gardening and livestock production up until now have not been able to substitute for neither shifting cultivation nor the gathering of edible forest products, nor for the Katu's highly elaborate hunting techniques. With decreasing mammal and bird populations pressure is put on aquatic food resources. Moreover, it was revealed that the Katu have also not benefited from having access to infrastructure and markets, and through being in the vicinity of the provincial government. On the contrary, indeed in the more remote villages, trade in NTFPs, for which traders come to the village, has provided an increase in incomes in those two remote villages. Nevertheless, with the exception of salt and MSG, the purchase of food does not significantly contribute to the overall food acquisition.

4.5 Change in the cuisine

The Katu describe two feelings of being hungry. Firstly, there is short hunger *narodth pelung* and *narodth cha*, which express the need to eat. Secondly, there is *adog;* the long hunger. The author ventures to describe short hunger as a rumbling stomach between meals lasting for a maximum of a couple of days. Long hunger occurs over longer periods and causes hardship and disease.

Referring to Rozin (1982) and as described in chapter 2.2.1.2, unique cuisine depends on four fundamental elements, a) basic food selection, b) manipulation techniques, c) seasoning practices, and d) eating habits. While changes in the food chain as described in the previous chapter are evident, changes in the Katu cuisine are more subtle. Widely unrecognised, culinary transformation has taken place, which has deeply influenced the Katu's dietary change, but is more difficult to assess.

4.5.1 Change in the basic food selection

Based on the intimacy of their daily contact with plants and animals, the Katu have developed a strong relationship between cosmology, their biological environment, and potential food procurement. In contrast to other ethnic peoples who make food choices at the market, the Katu's shopping ground is the forest (*aruz*) and fields (*araeh*) which surround them. They divide the world around them into edible and inedible plants, and potential animals for hunting. For edible forest species, women in TD were observed being very selective on form, shape, and colour. This gives reason to deny the prejudiced argument that poor people will eat everything. However, with the emerging food crisis, the author predicts that the Katu behaviour is likely to change. Current changes in basic food selections are confined here to issues of food classification, and to the spiritual dimension, and also to the ideas of maximising opportunities and energy, to nutritional advantage, and to taste.

4.5.1.1 Classification of food

Besides rice, the Katu recognise the food groups of vegetables, fruits, and meats.

Vegetables (*lam dong*) are subdivided into four groups, a) *lam dong klir*, vegetables with a sticky consistency after cooking such as sweet potato and cassava leaves, ferns, and *phak pang*, b) *lam dong ajang*, bitter vegetables such as *phak kadau*, *phak kadon*, *phak ka dom* (liana), *phak bee kiat*, c) *lam dong jeuarr*, lianas such as *gnot tam nin, gnot way, phak silay,* and d) *lam dong xiang*, filling vegetables such as pumpkin leaves. There are three groups of fruit, a) *palaeh ajang* e.g. *mak keng*, b) *palaeh achuay* or *aju* e.g. pineapple or mango, c) *palaeh achek* such as *mak fak* or figs.

To the author's knowledge, there is no classification for meats (*zedth*). Accordingly, no word for animal exists, only for the various animal kingdoms (*katoch, japuh* or *sum*). The Katu language does also not reflect the transformation from animals into edible meat.

There is the kingdom of crawling animals (*sum tatull*) to which snakes, snails, rats, insects, worms, lizards, crocodiles, turtles, crabs, worms, eels, and centipedes belong. Then there is the kingdom of flying animals (*paped narr*) with the three subgroups of 1) birds (*sum achem*), 2) domestic chickens (*a-uy* or *a-droy*), and 3) ducks (*adah* or *adak*). The kingdom of animals with four legs (*sum ja jeuang*[76]) includes species such as wild boars, deer, muntjacs, elephants, bears, and the Asian Wild Dog, amongst others. In addition, there is the subkingdom of the animals living in the trees (*sum rautu*), including macaques (*adok*), langurs (*rapuak*), and gibbons *(achuadth*). Civet cats are excluded is this realm, because they do not feed

[76] *Literally, standing animals.*

exclusively on fruits. Big cats form the *sum ar ai*. The subkingdom *sum apui* comprises bears, mountain goats, and others. Fighting animals form a crossing group of *che ka wan* which include the big cats. Lizards are grouped under the kingdom of *sum akuy*. As such, no kingdom exists for aquatic animals, fish, and insects.

4.5.1.2 Spiritual dimension

The linkage of food with the cosmos becomes clear with the idea of food taboos (*adiang*). While the Katu's religious and social sanctions are fading, taboos still determine food selection, especially regarding meats. An overview is given in table 24. The constant need to appease the spirits has been extensively been described for various ethnic groups in SEA. For the ritual killing of the buffalo for example see Kirsch (1973). Also the Katu believe that food does not only feed humans and animals but also appease the spirits. During the Katu funeral procession, for instance, food is offered to the soul of the dead. By custom, the person's field basket is filled with sticky rice, together some meat, and with some favourite food, e.g. something sweet like banana or tobacco, and placed on the tomb.

Especially, the consumption of rice extends to ancestors and spirits. For the Katu, rice appears to have a soul like humans and other living beings. For this reason, cooked rice determines social units and kinships, so it is preferred that only close relatives share rice with each other.

The Katu do not attribute a soul to other plant groups. Animals thought to have a soul are the domestic animals - and some wild ones such as elephants, bears, tigers, Sambar Deer, muntjacs, serows, civets, and turtles. In this context domestic animals can be regarded more as assets and potential sources for ritual power rather than as food (see also chapter 4.4.1). Eating domestic meats is never simply an act of consumption, but also a means of attaining ritual benefit. For instance, at the *bua joll* festival in KDM, the author observed that after the ritual killing of the buffalo a tiny piece of the neck meat is offered to seven spirits. The spirits are the village spirits, the house spirit, the ancestors' spirits, the spirit of people who suffered from a violent death, the forest spirit, the *phee phob* spirit, and the spirit who provides the meat. Killing a buffalo (*tariah)* shows the highest ritual potency, followed by pigs (*a-euk*), goats, and chickens (*a-uy*). The Katu claim the spirits will not accept offerings of wild meats.

The identified Katu's social and religious food sanctions summarised in table 24 might not apply to other Katu subgroups. Nowadays however, these taboos are being violated more often, especially by the younger generation. In the footnote some further notes are given on the species considered inedible[77], but which as such are not taboo.

At the same time, there are behaviour taboos, which if violated are assumed to negatively affect food availability. A good example is the delivery of a baby in the house, which is believed to cause a lifelong rice shortage for the mother's family. Other aspects believed to be interrelated are delineated in the footnote[78].

---

[77] With species of the same family or order accepted as edible, the Katu consider the following species as inedible akut chakong (toad), the snakes kaxeng te uh, kaxeng cherrlung, kaxeng karbodth, kaxeng pelakh, kaxeng tcherrak, and kaxeng raroh, the rat abuat a-euk (Hylomys suillus), scorpions, klab aburr (termite), all spiders (adiang), Broad-Headed Bugs, butterflies, snakeflies, antlions, lacewings, mantispids, blisterbeetles, earwigs, stick insects, and pink warblers.

Not inedible, but not preferred is the meat of the Indochinese Ground Squirrel due to its smell and its diet of one specie of worm, which lives under the earth. Some species of mongoose (Herpestes spp.) are considered as dirty. Squirrel species such as Dremomys sp., also according to the legend, come from the worms.

[78] On the day of a birth, the villagers are not allowed to go into the field, the husband in particular for three successive days. In addition, smoking is taboo in the house of the newborn and hair should not be cut. If the fire pot falls down this is considered a bad omen. Pregnant women are not allowed to go into the rice storage houses.

Table 24: Katu social and religious food sanctions[i)]

[i)]Including hunting, since it will result in consumption

Food source	Sanction	Social group	Background
Totem animals, vegetables, fruits*	Consumption, fallen fruits	Male family kin	Consumption of family totem[79] will cause severe insanity
Gibbons, langurs, macaques, elephants, dogs, snakes, and albino buffalos	Consumption	Elderly	Consumption will cause joint and upper body pains
Gibbons, langurs	Hunting	Individual affair	Gibbons are humanlike creatures
Gibbons	Hunting	Individual affair	Warning songs in the forest for tigers or other big cats[80]
Silvered langurs	Hunting	Individual affair	Consumption will cause disease
Toads (*Bufo melanostictus*), jungle fowls, ducks, turtles, mice, mushrooms (*Termitomyces spp.*)	Provide to relatives	Family kin	Provision to relatives will cause family tension or even break-ups
Jungle fowls, toads (*Bufo melanostictus*), pangolins, turtles, gibbons, langurs, bats, muntjacs, civets (*Viverra zibetha*), Indochinese Waterdragons, bamboo rats, bees (karrot only), all animals which were killed by another animal or which were bleeding	Consumption	Couple in first year of marriage, nowadays only 3 months	n.d.
Snakes, langurs, gibbons, macaques	Consumption	Pregnant women	n.d.
All animals which were killed by another animal, where the body was cut up or blood was issuing	Consumption	At new village location, changed from formerly one year to three months (whole village)	n.d.
Toads (Bufo melanostictus)	Consumption	Planting unit first day of burning the field	The crab, which logically should be tabooed as well, can be eaten since it lives in the earth
Muntjacs	Hunting	Planting unit first day of sowing	Fear of shortage in rice seeds (e.g. 10kg for only 0.8ha instead of one ha)
Jungle fowls	Hunting	Planting unit first day of sowing	Fear of soil erosion and low harvest (associated to scratching talons of chicken)
Nightjars	Hunting	n.d.	Only formerly in KDM
Toads (Bufo melanostictus)	Hunting	Planting unit first day of sowing	Fear to work as slow as the toad moves
Snakes	Hunting	Planting unit first day of sowing	Fear that rice kernels will not be full and "slim like a snake"
Wild fruits	Climbing trees and picking fruits**	Planting unit at day of burning the farmland	Fear that the fire will spread beyond the marking
Muntjacs and snakes	Hunting	Planting unit at first day of harvest	Fear that the harvest will be lost
Dogs (domestic)	Consumption	Everyone	Taboo has faded, now dogs are eaten, in TD e.g. 4-5 dogs/year
Peanuts	Consumption	Young children	Consumption will inflate the stomach resulting in severe illness
Slow Loris	Consumption	Everyone	Suffering a very slow death
Doves, owls	Hunting		Intermediators between spirit and real world
Fantails (*Rhipidura spp.* only)	Spelling name	Women	Allegedly sexual related

*In TD for instance there are ten family totems: tiger, hog badger, dog, pangolin, cat, cobra, deer, jackal, and *mak roo* (n.d.), *palaeh krul* (*Nephelum hypoleucum*).

**At the same time, no gifts can be given to relatives and friends. One should wait until the fire is stopped.

Source: Own compilation

---

[79] *Peoples from many cultures believe they originate from certain sacred plants, as for instance the Maya from the maize (Rhoades and Nazarea 1999). They described that to native American groups the diversity of maize types and colours reflects relationships, ethnic origins, cardinal directions, and a reverence for diversity.*

[80] *In general, their song is appreciated in the morning. Hearing their songs at noon however is interpreted as a prediction of death.*

By the traditional Katu custom there was no eating taboo during pregnancy or after giving birth. Today, the Katu have increasingly adopted elements of the lowland belief system. Now, for example in NB-TM, directly after a birth, it is taboo to eat bananas, chicken, fish, galgant, and ginger. In addition, in the first 7-10 days after a birth, no fat should be eaten (e.g. pork), along with pepper and the vegetable *tarrkaen* (*Eryngium foetidum*). Women from TD and TK still claim that in their villages there are no eating taboos after a birth and also during lactation.

In general, the spiritual dimension of cuisine is vanishing, leaving the Katu vulnerable in negotiating their rapidly changing environment. In many cases, existing gaps in the fading belief system are not being filled with rational knowledge. Instead, obscure lowland beliefs are being incorporated. In terms of health this issue will be picked up again in chapter 4.6.

4.5.1.3 Maximizing opportunities

In Upper Kaleum, the very basics of annual food selection started with the location of villages and fields. For field selection, the Katu watched out for "*land with good soil, close hunting grounds, and certain favourite wild fruit trees*".

Until now, food acquisition has been largely opportunistic. In general, decision-making is based on one, to a maximum of three days planning, expressed in the common saying "*boh haa boh kin*", translated as "*if you do not set out to get food, there will be nothing to eat*". The biological life cycles of animals and plants do however fix an overall seasonal profile and determine agricultural and hunting activities (e.g. the seasons of bamboo shoot, frogs, or garden vegetables). The opportunistic character of Katu hunting has already been described in chapter 4.4.1.

4.5.1.4 Maximizing energy

From an external viewpoint, it is obvious that with their high physical expenditures the Katu wish to maximize their energy return rates. This might determine their preference of meat over vegetables. They especially appreciate meat rich in fat such as that of wild boars (*armoll*), of badgers (*aroll),* of toads (*akut trrluaz*), or also of fat rich insects (*ayum terr*, *ayum kein*, *prroh-ohm, atu*). This conforms to with the overall propensity for larger animals. This issue will later be discussed in chapter 4.5 in relation to the foraging theory introduced in chapter 2. There are many other examples in the field of production, processing, and preparation, which further substantiate the traditional idea of optimising energy supplies.

Nowadays, this trend has been reversed. Gradually, the Katu have not only had to adapt to climatic hazards, illness, and taboos, but also to land shortages, new production techniques, hunting bans, etc. Increased rice production means increased labour with fieldwork and rice pounding, with the amount of other chores staying the same. In TD for example, there is an old woman who, for this reason, often decides to eat cassava instead of rice. Rice pounding was mentioned as a major issue when women were asked to rank their problems. It also appears that setting traps and hunting requires by far less energy than raising livestock[81] and is also less risky. In addition, the spatial conflict of wet and dry rice production, as well as fishing, hunting and gathering edible forest products have thus far not been anticipated by those who have induced changes in the food chain. Increasingly, villagers have to walk much further to their fields and also undertake longer walks for hunting and gathering than in previous years - not taking into account the relatively new prospect of walking to distant markets. The current situation has moved in a direction, which now resembles the arduous years before the war. It should be clear that with excessive new work chores, nutritional requirements increase. It is also reasonable to

---

[81] *Including the acquisition of cassava and other livestock feed, transport to the village, and processing and cooking for which firewood has to be gathered.*

surmise that the Katu have lost their sovereignty on food selection, which used to safeguard maximal energy supply.

4.5.1.5 Nutritional knowledge

From a nutritional point of view, there are no Katu guidelines for food intake. The Katu's cognitive linkage of diet and health differs from the Western perspective. They do however follow some guidelines, which prevent them from eating excessive mounts of certain foods[82]. The Katu consider rice to be the most nutritive food. There is the general belief, that rice and maize together with meat make people strong, while roots and tubers do not. There is an indifferent attitude towards vegetables and fruits despite the knowledge that fruits are good for the body, which however might be adapted from outsiders. Up until now knowledge and consumption patterns have not yet been linked like they are in industrialised countries.

Traditionally, the Katu's nutritional knowledge derived mainly from the observation of animals. They state "*what animals consider edible cannot be poisonous; also animals are apt at selecting good foods*". A recent study has demonstrated that monkeys select young leaves rather than matures ones, since they are more digestible and have a higher/protein fibre ratio (see Chapman and Chapman 2002). Indeed, many foods rejected by animals are in fact poisonous. Nowadays, the Katu are striving to constantly expand their knowledge system. However, they are lacking access to means of proper education so as to blend traditional knowledge with lowland knowledge. This often results in a judicious mix, but afterwards, in many cases, traditional knowledge is simply discarded, especially that passed down by the older generation.

To give an example, the Katu have adopted the lowland concept of *bamlung* (vitamin). In addition, they have started to believe that morning glory (*phak bong)* is a vegetable rich in vitamins. This green vegetable, alien to the uplands, is not likely to be suitable for the Katu agricultural system, mainly because of the absence of wetland rice fields for it to grow in. Until now, the Katu have had no information that enables them to recognise that some of their traditional vegetables and fruits might also possess exceptional high nutritional values. Often they simply suppose that *bamlung* is unlikely to be found in their local edible forest plants. Concurrently, traditional nutritional knowledge is being rapidly lost.

At the same time there is a dangerous lack of information about market foods. Mothers of other ethnic groups with access to market food have already started to provide sweets, snacks, and soft drinks to their children for example. In Kaleum village (the district capital) dried instant noodles have already become a snack of preference. Lowland subjugation has contributed to a situation whereby the younger Katu have started to perceive customary practices, such as the eating of wild forest vegetables as inferior, not to mention the eating of RTs.

4.5.1.6 Taste

It is very difficult to say which features of food the Katu determine as tasty (*chiam*). Here, only some preliminary trends can be presented. Table 25 shows preferences within food groups which - the author contends - influence basic food selection. The table does not describe preferences for recipes and flavours, but is instead an attempt to sketch the social taste of the Katu - or what can be called the "Katu mouth" (see Falk 1994 in chapter 2).

In terms of staples, rice and maize rank the highest for taste and seem to be appreciated more than cassava or other RTs. It can be assumed that in the distant past, the taste profile was similar to those in TD, which still ranks the taste of maize as equal to that of rice.

---

[82] To prevent stomach ache e.g., they avoid excessive amounts of souring foods. They also believe diarrhoea as being to be caused by consumption of uncooked blood, fish excrement, snails, and axiu aplak, which they advise eating only in small amounts.

What is not shown in table 25 is that the taste of sweet potato (*pong dok*) and *Dioscorea sp.* (*pong takoy*) is appreciated more than that of cassava. RTs considered as not being tasty are *dong aloh* (*Dioscorea hispida*), together with unknown species of *p. kaliang* and *p. aching*. The taste of other RTs, both wild and cultivated, is fairly well accepted. In the past, RTs were mainly eaten fresh. Today, the villagers of NB-TM claim that roots and tubers are often used as dried flour, which diminishes the taste. The increased danger of wild boar eating RTs however means that the Katu have to harvest early. Only some of the big wild RTs can be left covered in the earth for up to two months and still be eaten fresh.

Table 25: Ranking score[i)] of food groups for taste[ii)]

[i)]Score: 1=Good, 2=bad
[ii)]Not considering preparation techniques

Food group	NB-TM	KDM	TK	TD	Total
	n=10	n=10	n=10	n=10	n=40
Staples					
Rice (glutinous and non-glutinous)	1.0	1.0	1.0	1.0	1.0
Maize	1.7	1.3	1.3	1.0	1.3
Cassava	2.0	1.5	1.4	2.0	1.7
Other roots, tubers*	2.0	1.8	1.9	2.0	1.9
Fruits					
Bananas	1.2	1.4	1.0	1.0	1.2
Garden fruits	1.4	1.2	1.2	1.1	1.2
Wild fruits	1.8	1.6	1.7	1.5	1.7
Vegetables					
Garden vegetables	1.2	1.3	1.1	1.1	1.2
Herbs	1.8	1.1	1.6	1.0	1.4
Mushrooms	1.8	1.1	2.0	1.8	1.7
Shoots	1.6	2.0	1.4	1.6	1.7
Forest vegetables	1.9	2.0	1.3	1.4	1.7
Meats					
Fish (wild)	1.0	1.0	1.0	1.0	1.0
Chicken	1.0	1.2	1.0	1.0	1.1
Buffalo meat, beef	1.4	1.3	1.2	1.0	1.2
Big mammals	1.5	1.3	1.2	1.0	1.3
Medium and small size mammals	1.9	1.6	1.2	1.0	1.4
Frogs, toads	1.8	1.6	1.3	1.3	1.5
Pork	1.8	1.9	1.3	1.0	1.5
Lizards	1.9	1.7	1.6	1.9	1.8
Insects	2.0	1.9	2.0	2.0	2.0
Crab, snail, shrimps	2.0	1.9	2.0	2.0	2.0

*Such as sweet potato, yam, potato but also including wild roots and tubers.

Source: Own compilation

Wild fruits together with wild vegetables, mushrooms, and shoots are not considered as tasty as domesticated species. Edible forest species are still more highly appreciated in TD and TK than in NB-TM and KDM, where the adopted elements of the lowlanders prevail. The question however is whether this development actually results from the taste itself. It can be argued that the Katu cuisine has not yet reached its full potential. Until now, many vegetables have been merely boiled in water with few other ingredients. It is likely that the trend of decreased taste appreciation could be arrested with different preparation techniques, as might have been the case in KDM, where previously unfavoured mushrooms already now show a taste score of 1.1.

Fish is ranked as the most favourite meat, with chicken and buffalo the next. The Katu suggest that fish can be eaten with pleasure every day, whereas other meats cannot. In TD and TK, wild mammal meats still rank very highly, whereas in NB-TM and KDM wild meat compares unfavourably with domestic meat. A complete taste ranking of all wild mammals can be seen in the Appendix 5.2. While in TD and TK pork and meat from frogs and toads still rank fairly highly, their rank in NB-TM and KDM is low. In all villages, the consumption of insects, crabs, snails, and shrimps is not relished. An outstandingly good taste was attributed to pheasants, jungle fowl, and pigeons. Many birds were ranked as medium tasty such as partridge, buttonquail, *nok kiang*, cuckoos, and nightjar, whereas some birds were not considered as tasty at all, e.g. babblers (too small) and hornbills (dark and hard meat). In general, larger birds compare favourably with smaller birds.

It should be kept in mind that the ranking might have been influenced by the consumption frequency. What distils from here is that the high wildlife consumption of the past was not a question of taste but of availability. The increased demand for wildlife is a phenomenon mainly originating in the lowlands; meanwhile the consumption of plant foods, as determined by taste, is decreasing, issues of acquisition, availability, and prestige are becoming more important.

4.5.2 Change in the manipulation techniques

This section explores how the Katu transform foods into meals. In general, there are dishes with many ingredients and dishes with fewer ingredients. The Katu further divide between meals with rice (*cha meu*), even when mixed with RTs, and meals without rice (*cha na*).

4.5.2.1 Food combinations

It appears that the Katu mind map their meals in the fields or in the forest. The decisions which dish to cook can be simplified into four steps: a) Information on the type and amount of meat obtained from traps, snares or fish dictate which condiments and vegetables have to be picked (e.g. not harvesting lemon grass for the preparation of bamboo soup). A big dish of filling vegetables such as pumpkin leaves would never go with a meat or fish dish, if plenty of meat or fish is available. An exception, however, is bamboo shoots with their distinct aroma, which are often mixed in soups. b) In the absence of meat, the Katu might try hunting for frogs or other aquatic animals (OAA). c) If this is unsuccessful, or if time is limited, vegetables are harvested. d) If no garden vegetables can be gathered, the Katu go for the wild ones. "*You can even eat the weeds (ateung) from the field*", they say. It would be wrong to suggest that wild forest vegetables are opportunistically gathered. Constant observation of the environment allows the Katu to follow the life cycles of plants and harvest at certain times. When planning a meal the Katu rely on their local ingredients, as opposed to other ethnic groups who rely on comestibles provided by the market networks.

As their hunting system is more elaborate than their agricultural production system, it is obvious that meat plays the crucial role in the traditional Katu cuisine. This becomes clear during the festivals, when assorted cuts of meat are served but no vegetable dishes. When receiving guests (*tamoy*) the Katu always feel obliged to serve meat. Sticky vegetables (*lam dong klir*) and the filling vegetables (*lam dong xiang)* appear to be more a substitute for meat rather than a major element of cuisine. Other vegetables are used more like condiments to intensify the taste of meat. These small leaf embellishments are neither served on a plate, nor cut (e.g. the 30cm long leaves of *phak falang)* nor are they otherwise prepared. Leaves from mangos, figs, *phak ka don (Careya sphaerica)*, *ala kawah*, *ala krrtoy* are also left attached to their branches and have to be picked off during the meal.

The author contends that the Katu feel a meal to be complete (*sombun*), if meat and rice are available and are prepared together with a nice sauce (*cheo*). In the absence of a classic culinary trilogy of meat, staple, and vegetable (as with the Germans), the Katu cuisine can be characterised more as having a dualistic character. It should be clear that this is a question of Katu culture rather than availability. With the lower availability of wild meats however, the Katu cuisine is on the edge of transforming its dual character into a rice humdrum.

4.5.2.2 The kitchen

Traditionally the kitchen was situated at the end of the longhouse where there were as many hearths as families, or respectively wives. Increasingly, as lowland architecture is promoted, the kitchen is being relocated into a separate house, linked by a bridge to the living house. Each family also has a simple kitchen in the fields, where some eat breakfast or dinner.

Indeed, the hearth unit (*tawaeh*), does not only provide cooking facilities, but also determines kinship and is the subject of many taboos, e.g. *adiang tirr arang*. In Upper Kaleum, people often slept around the hearth, cuddled together. Up until now, the Katu have used logs for cooking, over which a little tripod (*trrkoh*) is placed[83].

In Upper Kaleum, the traditional Katu cooking utensils include a wooden mortar (*sakebeua*) and pestle (*tual entraeh*), a cutting board, knifes, carved wooden spoons, small bowls (*pagnan*), big bowls (*kasam*), a pair of pliers (*tenkab*), a tripod (*trrkoh*), a grater, (*kuar pong dong*), baskets for rice winnowing (*apoh sohm peuy*), a kettle (*areah dae atoh*), and some calabashes (*palaeh aluy*) for storing water. Large cooking pots were made from clay and could be used for cooking for up to 30 people. Often leaves were rolled into a funnel and used as spoons. For cooking spoons, skewers, etc. pieces of bamboo were used. When preparing in the *tcheruak*[84], bamboo pieces about 7-9cm in diameter were cut; this technique was also used when cooking in the fields or in the forests.

Today, many of the traditional cooking utensils are still used. But nowadays the women possess and share various aluminium cooking pots (*ada(e)h, adiah*), one of which is topped with a basket (*prrhuat*) for steaming rice (*ada(e)h perhuat*), another one for cooking the pigs' food, another big one for making alcohol and another one for ordinary meal preparation. As in Sekong town and in other provinces of Laos, in KDM and NB-TM, supplies of large bamboo pieces are already running very low. Only families in TK and TD can still prepare food in the *tcheruak*. In TD however, some families have produced a replica out of bomb scrap. Also cooking pots, mortars, spoons and bowls are still self-made out of bomb scrap when not bought at the market. While in the houses, aluminium spoons are used, in the fields leaves often still serve as spoons.

Table 26 summarises some of the salient Katu cooking methods. The author has separated vegetarian and meat dishes. The methods of grilling vegetables such as mushrooms, *Luffa sp.* or stems (e.g. *tamay*, rattan) and putting vegetables directly into the embers are not included. Mostly, the amount of food available to hand influences what dish to cook. The Katu state "*if there are only a few fish, you make a sauce; if you have a lot you make a soup*". In addition, the available time plays an important role in deciding which dish to cook. "*To steam the vegetables in the rice-basket is very easy but it takes too long. To cook the vegetables in a pot is quick, therefore we prefer it*", the Katu reason.

---

83 Assuming the preparation of three meals, the author calculated that 10-15kg of firewood would be required daily for a four person household (five logs of about 2-3kg weight). Every family has its own firewood storage under the house (100-400kg). With the abandonment of shifting cultivation it is likely that a firewood crisis will emerge, as has already happened in other parts of Laos and other tropical countries.

84 The bamboo is cut just below the joint and then just below the next joint, providing a container which is sealed at one end and open at the other.

Table 26: Salient Katu cooking methods

Katu name	Lao name	English	Description
		Without meat	
kkloh (akloh), trrnap, kaloch	Cheo seu seu	Chilli sauce	Crushed chilli (dried or fresh) mixed with MSG and salt, herbs if desired
chaen, prrjam, prrap	Khaeng	Clear vegetable soup without any staples	Clear soup made with vegetables, salt, and chilli
arrong, trrong, tcherrok	no Lao name	Thick soup with vegetables and staples such as cassava, rice, maize, etc.	Soup with all sorts of vegetables, salt, and chilli together with mashed cassava or other tubers or rice
ab	Soup phak, ob phak	a) Vegetable salad or b) boiled vegetables	a) Boiled* or steamed vegetables**, topped with roasted rice, sesame seeds, pumpkin, cucumber seeds, or almonds, b) boiled vegetables (not salt added during cooking)
tcheruah, tcheruak, perruah	n.d.	Stew in bamboo container	Finely chopped vegetables are mashed in a bamboo tube together with meats or staples
n.d.	phak dip	Raw vegetables	1) *Curbitacea* sp., green beans, ferns, etc. as embellishments to various meals, 2) wild, astringent leaves as a side dish to meats, 3) wild leaves as ingredients in sauces (kkloh)
		With meat	
kkloh (akloh)	Cheo, pon	Chilli sauce with meat	As vegetarian chilli sauce, but a) with pieces of sliced meats, b) as a) but with added water
tadik	Laab, goy***	Minced meat (raw)	a) Chopped meats and b) minced meats mixed with finely chopped herbs such as galangal, kaffir lemon, ginger, mint, spring onion
tcheruah, tcheruak, perruah	n.d.	Stew in bamboo container	Meat is simmered in a bamboo container, condiments are added if desired, staples could also possibly be added
aem, perrzaeh	Khaeng	Soup with meat	Meats are boiled in soup, often together with bones, skin and giblets
boch	Peeng, chee	Grilled or roasted meats****	a) Meats are grilled on skewers or put on the grill (fresh or dried meats), b) meat is put in the embers
n.d.	Ob	Braised meat	Sliced meats are braised together with herbs, water is added
teum	Mok	Stew in banana leaf	Meats are wrapped in banana leaves or other leaves and steamed in the embers

*Until all water is evaporated.
**Such as leaves of cassava, sweet potato, pumpkin, wild figs or ferns.
***In the absence of meat, mushrooms can be used, e.g. *trrir chakalong* , *trrir tarlong* or the long fruit *palaeh apin (Oroxylum indicum)*.
****Such meats can later be added to soups.

Source: Own compilation

Contemporary cooking methods reveal some interesting notes of how the Katu culinary behaviour has changed over time. What becomes evident is that lowland cooking methods and dishes have been incorporated into the Katu cuisine. This trend can be seen in table 27 and 28. Often, if ingredients of the lowland dishes are lacking the Katu were able to modify the recipes. A good example is with papaya salad. Instead of a sauce made with fermented fish, salt, sugar, lemon, garlic, peanuts, and chilli, the Katu mix *baat* (*Eryngium foetidum*), kaffir lemon leaves (*ala poz podge*), spring onions, a sour fruit, and salt.

In Upper Kaleum, cooking and mashing vegetables in *tcheruak* together with thick soups made up 50% of the cooking methods. At present, as suitable large pieces of bamboo are short in supply, the average amount of stewing done in bamboo containers has dropped from 22% to 15%, and to 7% only in NB-TM. Preparation of thick soups declined from 29% to 20%. This can be mainly connected to the increased rice consumption, the lower usage of RTs (some of the wild RTs have already become extinct in NB-TM), and the vanishing usage of coarse grains. If RTs are eaten today, they are mainly grated and steamed with the rice.

In the past, plain chilli sauce was seldom eaten (3-7%) with the exception of TK. However, with the present reduced availability of meat, the Katu's low propensity for vegetables coupled with a newly-developed appreciation of spicy foods has meant that in almost every fourth meal, no other dish besides chilli sauce is enjoyed (the *cheo seu seu* phenomenon). In NB-TM, chilli sauce already makes up 23% of the dishes. Nowadays, more raw vegetables are being consumed (12%). This can be mainly attributed to the increased intake of raw herbs, green beans, eggplants, and other cultivated plants - meanwhile raw forest vegetables are being consumed less. The preparation of clear vegetable soups and boiled vegetables has remained fairly constant. In summary, the Katu's traditional vegetarian cooking methods have been best maintained in TD and TK.

Table 27: Share of contemporary and traditional cooking methods for non-meat foods (in %)

Cooking method	NB-TM	KDM	TK	TD	Total	TM	KDM	TKK	TP	Total
	n=10	n=10	n=10	n=10		n=10	n=10	n=10	n=10	
	Contemporary					Traditional				
Chilli sauce	22.8	23.3	16.3	11.7	**18.5**	3.8	6.2	13.3	3.3	**6.7**
Clear Vegetable	16.6	18.6	17.9	18.0	**17.8**	22.1	21.1	20.0	16.7	**20.0**
Thick Soup	23.1	25.2	12.5	18.7	**19.9**	30.3	35.9	16.7	33.3	**29.1**
a) Vegetable salad or b) boiled vegetables	21.1	16.3	14.6	16.7	**17.2**	18.7	13.9	10.0	13.3	**14.0**
Stew in bamboo container	6.5	3.3	26.3	23.9	**14.9**	18.4	17.7	25.6	26.7	**22.1**
Raw vegetables	9.9	13.3	12.6	11.0	**11.7**	6.6	5.3	14.4	6.7	**8.3**

Source: Own compilation

Traditionally, the Katu fermented vegetables, which could then be stored for up to one year. Until now sour vegetables (*ajiu*) have served as a kind of reserve food for the rainy season during which the supply of garden vegetables is low. The species used are a bitter type of mustard green[85] (*apih*), spring onion (*sakiau*), and bamboo (*abang*). For each type, women could prepare 10-20 bamboo containers, 1-6 times a year. More recently, the Katu have adapted to also ferment *phak kum* (*Creteva magma*).

Table 28: Share of contemporary and traditional cooking methods for meats i), ii) (in %)

i)Not including fish

ii)Only including those meats intended for direct consumption. Smoked or dried meat is not captured in this table

Cooking method	NB-TM	KDM	TK	TD	Total	TM	KD	TKK	TP	Total
	n=10	n=10	n=10	n=10		n=10	n=10	n=10	n=10	
	Contemporary					Traditional				
Chilli sauce with meat	19.5	17.1	12.5	9.7	**14.7**	5.2	14.2	7.8	3.3	**7.6**
Minced meat (mainly raw)	19.0	19.5	20.8	16.3	**18.9**	22.1	4.8	13.3	6.7	**11.7**
Stew in bamboo container	7.3	1.4	19.6	10.7	**9.8**	14.8	28.4	27.8	16.7	**21.9**
Soup with meat	17.9	21	15.4	24.7	**19.8**	19.2	18.6	16.7	36.7	**22.8**
Grilled or roasted meat	11.1	17.1	12.1	13	**13.3**	13.3	2.1	11.1	10	**9.1**
Braised meat	12.7	15.2	10	15.3	**13.3**	10.6	18.2	10	6.7	**11.4**
Stew in banana leaf	12.6	8.6	9.6	10.3	**10.3**	14.7	13.7	13.3	20	**15.4**

Source: Own compilation

The change in meat preparation (see table 28) resembles the trend described for vegetarian dishes in table 27. The traditional dishes, namely the stew in the *tcheruak* and the soup used

[85] In the case of mustard greens, the leaves are dried for three days before being placed in a bamboo container. No salt or other ingredients are added. After three nights, the leaves are dried again and can then be stored. This technique produces a food item rich in Vit B12 (see chapter 4.5.2).

to form on average 45%, though has now declined to about 30%. Traditionally, small animals, especially avian and aquatic species together with arboreal mammals and rats were frequently prepared in the *tcheruak*. After simmering, together with other ingredients, the meat and other edible body parts were squashed into a palatable mash containing tiny pieces of bones and cartilages. This preparation technique has also been described for the Indians in the Venezuelan Amazon (Holmes 1992). The analysis of two such stews with rat meat and with meat from the Sambar Deer showed an extraordinary calcium content, which will be further discussed in chapter 4.5. Stewing meats in banana leaves is highly appreciated, but the time-consuming preparation might have contributed to its decrease from 15% to 10%.

During the 1970s with the prevailing *pathet lao* forces, dishes like *ob, laab, goy, pon,* and *cheo* were introduced to the uplands in Kaleum. These lowland cooking methods have subsequently been incorporated into the Katu cuisine, especially braising and mincing raw meats. Simultaneous to the lower provision of wild meats, the consumption of domestic meats at festivals has gained significance. This is reflected in the more frequent preparation of festival dishes like *laab* and *goy*. In the past, during festivals mainly soups were eaten. Villagers reported that in Upper Kaleum, minced wild meats were more a dish of leftovers (*entor*). In addition, in Upper Kaleum grills were not available, so the meat was instead skewered on sticks and then stuck in the hearth. Chilli sauce with chopped meat is a typical dish, prepared the when a family's meat supply is short (less than 80-100g, e.g. 1-2 fish or frogs). Such dishes are prepared almost twice as often in NB-TM than in TD and four times more than in TM. The method of frying foods *(kawah)* was only recently introduced to the Katu, but only a few families have the means to purchase oil. On average, families buy less than 30ml per year.

In the past, soft bones from big mammals - e.g. bone parts from legs, neck, and chest - were fermented for about a month. Prior to this, bones and cartilage (*hang gnom*) were crushed and simmered in a bamboo container. Macaque bones were boiled for 3-4 hours; in the case of the Sambar Deer bones the process took days. In addition, skins were fermented for a couple of days to make them softer and tastier. Meat was also fermented, but for no longer than three days. This method was applied to meat which had already started to rot in traps and snares. Traditionally, the Katu did not ferment fish (*prrhoh*). Only recently have they adopted the fish fermentation methods of the lowlanders. First, the fish, preferably small species such as *axiu axob*, is dried, then it is put into a bamboo container together with chilli, salt and often *assur* (*Rhus sinensis*). It is ready to eat after 10 days, and keeps for 1-2 months. Up until now fermented fish has never been eaten raw as many lowland people do; instead it is either cooked or stewed in banana leaves (*teum)*.

In the past, excess meat, from hunting raids especially, was smoked or dried in the sun to serve in lean periods. Even today, dried frogs and fish serve as "fast food" if time and fresh meats are short. The dried meat has to be grilled or roasted again before being consumed, most favourably in soups.

4.5.3 Change in the flavoring principles

One of the most distinct factors in culinary behaviour is that the Katu flavouring principles have changed significantly over time. Formerly, the high variety of wild meats provided a wide range of tastes, which were completed with condiments such as herbs and wild vegetables, even though these were less important than the meat itself. The decline of meats and the contact with the lowland cuisine has accordingly triggered some alterations in the Katu's flavouring principles.

The traditional base of spring onion, lemongrass, chilli, *baat* (*Eryngium foetidum*), and *aloz* (*Ocimum camum*) was completed with *assur* together with wild leaves such as *ala krrong*, *ala tchirkatt*, *ala kaki*, *ala aluy*, *ala aluy reng*, *ala katiang*, *ala krroty*, *ala kawah*, *ala apiak*, etc. Forest leaves are still appreciated for their astringent taste. In the absence of lemons, other alternative souring ingredients included red ants, whip scorpions, and other insects containing formic acid. Wild fruits such as *palaeh agnoaz*, *mak kho*, *palaeh ihak*, *palaeh alari*, *palaeh sapeu*, *palaeh atong* were also added to soups, or grinded for the *cheo*, as still seen in TD and TK. In NB-TM and KDM many of these fruits cannot be found anymore. In lower Kaleum *mak kok* (*Spondias pinnata)* has also started to become available. The souring properties of tamarind for soups are highly appreciated, but gardening tamarind has so far proved unsuccessful. In KDM and NB-TM, the Katu have started to consume the sour Giant Water Bug (*Lethocerus indicus*), which villagers in TK and TD still consider inedible. The esteem held for sour foods is also expressed by the consumption of unripe fruits such as wild figs, mangos, and guava, which are dipped into a salty sauce. In the case of mangos, it appears that almost 50% of the harvest is consumed unripe.

Men especially appreciate the bitter taste (*ajang*). As well as wild vegetables, gall bladders also serve as bitter flavouring. Gall bladders are additionally considered to be stimulating and energising. Some of the traditionally relished wild leaves possess a highly pungent aroma. The flavouring method of topping steamed vegetables with roasted pumpkin seeds, cucumber seeds or roasted almonds has almost been abandoned completely, with the exception of roasting sesame seeds for the production of *malmel*.

Only after the war did the zest of wild ginger and galangal come into use for dishes such as *ob*, *laab*, and *goy*. This is also true of the leaves of various *Citrus* species such as *ala poz podge* (*Citrus hystrix*), and also mint. Since there is no Katu name for *phak kadon* (*Careya sphaerica)* it is reasonable to assume that this leaf was formerly not used. Up until today, only a few families plant garlic. The taste is considered highly acceptable, but villagers have no access to useable plant material.

The Katu cuisine does not include sugar, nor does it contain sweet dishes like in many other SEA cuisines. Until now, fruits and honey, together with extracted cane juice have satisfied the craving for sweet food. In addition, the Katu boil their tobacco in cane juice, or in absence of this, with peel from pineapple, banana, or from other fruits. For the children, the Katu steam sticky rice wrapped in the leaf of *ala poh* which resembles the lowland sweet *khao tom* - though *khao lam* is also produced by the Katu.

In Upper Kaleum, fermentation was not only used for preservation, but also to expand the taste profile. The aroma from fermentation was reported to resemble that of "salty food", for which a constant craving exists. Today, villagers claim that "*fermentation is not needed anymore, since MSG use also provides tasty food*".

The Katu distinguish between salty foods (*ajang puach* or *ajang boch*) and non-salty foods *(ajang teuch*). Suffering from severe salt shortages in Upper Kaleum, the Katu produced a kind of vegetable salt, for which they used the leaves of *lom pakay* (*Alocasia sp.)*, which could be harvested in the upland fields between January and August and which were first dried before being stored. Also the sliced leaves of *lom pakay* could be readily used as a salt substitute[86]. More often, however, sliced leaves were mixed in a bamboo container with some ash from the hearth and covered for a couple of days - on the second night a salty liquid develops. Its extraordinary nutritional value is discussed in chapter 4.5.2. Nowadays with the exception of TK, vegetable salt is not produced any more. It is reported to still be in use in TP and KD. Ethnic groups in Attapeu Province still produce vegetable salt from bamboo shoots (p.c. Ian Baird 2004). In the past, dried leaves were also a popular gift for relatives.

There are also some astringent leaves from tubers to which ash has to be added during preparation. Otherwise consumption "*causes a rough feeling in the throat* ". This applies to the *Colocasia* species *pong aro pong* and *pong aro adon*, as well as to *pong akok* (unidentified). For the latter it is advised to slice the leaves first, mix them with ash, and then ferment them in a

---

86 Each time they harvested about 300 leaves. About two medium sized leaves lasted for one day without having to use additional salt (assuming a today's family size of five people eating three meals a day).

bamboo tube for 3-4 days, before drying then in the sun for another two days. About 10 leaves would fill one bamboo container. Not so much as a salt substitute but as a condiment, *lom pakay* can readily be used.

The main impulse for altering flavours came with the introduction of MSG by the Vietnamese soldiers, which has since spread over the whole country. Today, MSG is the major flavouring ingredient which has lead to a decrease in the use of fresh condiments. This trend is further extended because MSG costs less to buy than salt. The Katu state that with MSG they are able to compensate for the lack of sophistication of their culinary practices. Yet, instead of increasing the diversity of aromas, the augmented usage of MSG has resulted in a monotony of flavours, aggravated by the declined availability of wildlife. At the same time, new combinations of comestibles and preparation techniques remain unexplored.

4.5.4 Change in the eating habits

4.5.4.1 Consumption units

In the past, with about 30 people living in one house, the first wife often cooked for everyone and portioned out the food. In the case of dishes like *trrong* each person received their share on a banana leaf. For meals with more than one dish, only the individual share of staples came on a banana leaf. Additional parts such as meat were shared within a bigger group of approximately 6-10 people. Portioned meals were stored for those who were absent but who would join in later.

The contemporary consumption unit[87] is the family (*chum)*, not the household anymore (with the exception of KDM), mainly as a result of declined polygamy and the ban on building longhouses. Women eat together with their children, and the husband joins them as he desires for both bed and food. After successful hunting consumption units sometimes separate with the choosing to relish the game together in the hunter's hut. This custom might be retained from the time when men relished fresh wildlife together in the communal house. With the consumption units the production units, in which the harvest of rice, wildlife, etc. is shared, have narrowed. Only in TK and TD can production units be found which extend beyond the households, often amongst brothers.

In Upper Kaleum the Katu mainly ate only two meals a day on days when villagers had breakfast in their fields and had dinner after returning home. Today most of the families eat three meals a day with meals in the morning between 06:00 and 07:00 a.m. and in the evening at, or after, sunset, besides lunch in the fields. Since the mid 1990s some families in NB-TM and KDM have only been able to afford to eat twice a day. This has mainly been the result of land shortage, labour shortages, illness, an old age, and concomitantly the lack of foods, especially of both rice and RTs.

Snacks are consumed throughout the day and are made up of whatever foods are available, especially by the children. Until the age of five or six, children do not partake in the regular eating times, but instead help themselves to rice six up to eight times a day. They also snack on bits of roasted meat, and raw insects such as termites, stag beetles (e.g. *ayum taling bahn*), and scarabs (e.g. *ayum tuk teuk*), fruits, lizards, RTs, grilled jackfruit seeds, etc. Often the older children gather wild bird nests, and their mothers prepare little omelettes steamed in a banana leaf or they make barbecues in the forest, grilling crabs, frogs, shrimps, and little fish. Children especially relish the crispy grilled claws of wildlife, which they suck on

---

[87] In this context, Rhoades and Nazarea (1999) have noted that in traditional agroecosystems, household production units are also direct consumption units. These units show a vested interest in linking production and consumption in a way not found in commercial systems, where different activities are typically carried out by separate groups.

like gummy bears. As such, there are no special foods for children, yet young children often receive the best parts of the meat or the fish.

4.5.4.2 Festivals and sacrifices

In the past, festivals were a crucial part of the agricultural cycle, providing the opportunity for celebration and play and as such are missed by the elderly of today. Besides appeasing the spirits, the various festivals provided the opportunity for the communal eating of meats. There is a saying in Sekong "*bun lao theung eem thong, bun lao lum eem taa"*. This quotation expresses the notion that the festivals of the ethnic minorities living in the mid- or uplands aim to fill the bellies, whereas the lowland festivals are more a visual treat like the elaborative floral accessories of Buddhist style celebrations. Today as in the past the presence of guests may cause the women of the house to forfeit their own food. Eating with guests is a male prerogative.

After the sacrifice, the animals are dressed and usable meats and edible parts are distributed to each family. Even small organs are shared with some portions of offal weighing no more than 10g. Often, at ceremonies such as marriages, funerals, or births the whole community provides food, each to the best of their ability.

As mentioned before, for the Katu the killing of buffalos (*bua joll)* is of high importance. While in the past a total of 7-10, or even 15 buffalos were sacrificed every year on various steps in the agricultural cycle, nowadays, villagers cannot afford to kill more than one every couple of years after the rice sowing[88]. Villages are also forced to invite four or three times less guests, since they cannot provide the appropriate amount of meat, alcohol, tobacco, etc. besides the buffalo which has to be bought – it may not be one of the village's own livestock. To give an example, in the case of TD's *bua joll* in 2003, each family had to spend 70,000Kip equal to about 25% of the mean annual per capita income of the target families. Concurrently, the GOL does not support such festivals believing e.g. after the harvest only small livestock should be slaughtered. For many villages in Thateng it is reported that each family now celebrates individually with a small sacrifice like that of a chicken or a small pig.

In the past, there was also more communal feasting on wild meat. Successful hunting often provided enough meat to be able to invite 3-4 villages, who would eat for about a few days, still leaving some meat left which could be dried and stored. In the past, a single bear e.g. provided meat for approximately 150 people to feast on for 2.5 days.

4.5.4.3 Kinship solidarity

Traditionally, surplus foods and cooked wild meat in particular were shared with relatives, friends, and in many cases with the whole village. In TD, the village where this tradition has been most uphold, sharing involves up to 8-15 people (5-10% of villagers). This tradition is already fading in the other villages and as a consequence people are starting to recognise diminishing solidarity. Especially in terms of rice, NB-TM villagers perceive an increasing polarisation between those who are rice sufficient and those who are not.

Wildlife is shared according to the size of the catch. Large animals such as wild boar (75-200kg), muntjac (40-50kg), or deer (185-260kg) provide enough meat for every family in the village. Juvenile and small mammals are only shared with core family members, friends, and neighbours. To give an example: a bamboo rat supplies meat for four families, a civet cat (*tchekoll*) for ten families and a macaque for 5-6 families. Fish and frogs are only ever shared with close kin. If there is a catch of ten frogs or fish then at least three would be given away. A large monitor lizard provides meat for ten families as does a snake, e.g. a

[88] *Changes in current livestock populations have also lead to the situation whereby villagers have not build communal houses, which require annual sacrifices. For this reason, there is no communal house in TD and TK. Construction in KDM was supported by the GOL in the vein of cultural heritage promotion. Troubled NB-TM felt the need to appease the spirits and finally in spring 2003 they constructed a communal house, almost thirty years after migration.*

python or a King Cobra. In TD, if a family harvests more than one animal in one day, the extra animals are given away instead of the meat being preserved. In the other three villages this practice is nowadays unknown – presumably as a result of the reduction in wildlife availability.

Undeniably, because of the emerging wildlife trade in the Sekong Province it can be assumed that meat, which today is provided to relatives, in the future might well be saved for opportunistic wildlife trading (see also chapter 4.4.2). In TD, the author was told that "*the Katu culture is very different from that of the non-Katuic people. They keep little for themselves and their relatives, and instead try to sell the surplus*". Before the war wildlife trade was a very rare phenomenon in Kaleum.

Sharing food increases the diversity in the diet, expands the food base and brings variety into the cooking methods. Additionally, it provides the opportunity for the most vulnerable families to receive some extra food, even if they cannot share their own food base. Those families ranking higher in the village hierarchy give and receive more frequently, such as the village head.

4.5.5 Conclusion

Despite being widely unrecognised, the author observed that in all villages, problems at the food chain level are interrelated with disrupted culinary principles. The originally broad food base (see inventory of about 700 entries), which consisted of a tremendous variety of plant and animal taxa has been tremendously reduced in recent times but cannot be compensated by market foods. While rice deficiency is an old phenomenon (and was at least in the past tackled with various food based coping mechanisms), the diminishing availability of wild meat currently constitutes a major problem.

Over the years the level of Katu gastronomy was found to have remained low. Complex principles of food selection were however identified. While it was observed that fermentation and preserving techniques are fading rapidly, manipulation and cooking techniques were identified to have been largely retained. Taken together, the Katu's culinary principles were found to have shifted towards culinary monotony. It appears that there is an ever-increasing risk of a rice humdrum. The increasing use of MSG is suppressing traditional Katu flavouring principles.

It has been argued that through creation of smaller consumption units (mainly as a result of suppressing polygamy) kinship solidarity is decreasing, something which affects the poorer strata of the Katu society in particular. This decrease was found also to be a result of the reduced number of festivals, involving the ritual slaughter of livestock, and of the lower wildlife harvest to share with close kin, which undermine the potential for nutritional benefits through effective local food sharing mechanisms. Further acculturation is found to be disruptive as in the more "modern villages" some families are able to sell their excess rice; some are only able to eat twice a day.

4.6 CHANGE IN THE DIET

4.6.1 Change in the food groups

4.6.1.1 Change in ratios

The results from the estimated and weighed food recalls showing the amount of food consumed in each village are summarised in table 29. In all villages rice makes up the greatest share of food consumed, ranging between 64% and 73%. Vegetables, including mushrooms and herbs, together with shoots and fruits form the next largest share, ranging between 18% and 25%. Contrary to the past, meat including wildlife, domestic meat, fish, and OAA contributes only 7-9%. The data of KDM, despite not being presented here, in general support the overall trend.

Table 29: Consumption per food group per capita and per day[i)]

[i)]Summary of weighed and estimated food recalls (prepared food, not raw)

Food group	NB-TM		TK		TD	
	g	%	g	%	g	%
Rice	766.2	72.6	829.8	63.6	867	70.7
Roots, tubers	5	0.5	56.2	4.3	8.4	0.7
Wildlife	0	0.0	10.8	0.8	62.6	5.1
Domestic meat	56.3*	5.3*	0	0.0	0	0.0
Fish	27.8	2.6	62.7	4.8	34.8	2.8
Snails, crabs, frogs (OAA)	10	0.9	18.1	1.4	9.3	0.8
Vegetables, mushrooms, herbs	61.6	5.8	198.3	15.2	130.4	10.6
Chilli	2.5	0.2	6.1	0.5	5.8	0.5
Shoots	25.7	2.4	23.3	1.8	8.6	0.7
Fruits, flowers	100	9.5	100	7.7	100	8.1
Total	**1055.1**	**100.0**	**1305.3**	**100.0**	**1226.9**	**100.0**

*High consumption due to livestock epidemics (see also chapter 4.4.1).

Source: Own compilation

The villager's own estimations with the "food wheel" as presented in table 30 (see description in chapter 1.3.3.2) are consistent with the trends identified in table 29. There is reason to surmise that the food wheel highlights those elements in the diet, which are underestimated in the food recalls. What is seen in table 30 in particular is that the former and the contemporary Katu diet is fundamentally different in food group ratios.

In the following section each food group is discussed individually. In Appendix 1.3 the full seasonality profile of the traditional Katu diet is presented, which is not discussed in the context here.

Staples

Formerly in Upper Kaleum, the rice for daily consumption was usually finished by January (see also table 14). The rest of the harvested rice was mainly saved for guests, especially for the frequent festivals. Table 12 revealed that in the past rice made up between 38-50% of staple production. Table 30 shows that in the past rice on average was estimated to be less than one third of the staple supply.

Table 30: Villagers' estimate of consumption per food groups (in %)

	NB-TM	KDM	TK	TD	Total	NB-TM	KDM	TK	TP	Total
	n=7	n=10	n=10	n=8	n=35	n=7	n=10	n=10	n=8	n=35
	Present					Past				
					Staples*					
Rice	51.9	53.2	46.3	43.3	48.7	29.1	25.9	23.3	25.9	26.1
Cassava	17.1	20.5	23.7	15.1	19.1	43.3	41.5	53.4	41.0	44.8
Maize	22.4	17.1	17.3	27.3	21.0	12.4	20.9	13.3	21.8	17.1
Other roots, tubers	8.6	9.2	12.7	14.3	11.2	15.2	11.7	10.0	11.3	12.1
					Fruits					
Banana	53.3	45.0	38.3	42.5	44.8	33.4	25.7	40.0	38.9	34.5
Wild fruits	16.7	29.8	29.3	23.8	24.9	39.5	44.8	43.3	26.7	38.6
Garden fruits	30.0	25.2	32.4	33.7	30.3	27.1	29.5	16.7	34.4	26.9
					Vegetables					
Mushrooms	11.8	14.3	11.7	16.1	13.5	14.8	24.1	23.4	15.8	19.5
Shoots	31.0	25.7	25.3	20.2	25.6	25.2	20.1	30	13.7	22.3
Herbs	12.9	19.9	15	16.8	16.2	10.5	15.3	3.3	20.2	12.3
Garden vegetables	33.8	24.4	25.3	27.1	27.7	33.3	23.5	10.0	21.9	22.2
Forest vegetables	10.5	15.7	22.7	19.8	17.2	16.2	17.0	33.3	28.4	23.7
					Meats					
Fish	28.0	16.8	22.7	20.0	21.9	22.7	16.8	9.4	16.7	16.4
Frogs, toads	11.6	11.8	11	7.5	10.5	6.6	5.6	6.3	8.3	6.7
Insects	3.9	5.3	4.3	3.8	4.3	6.2	7.3	12.5	5	7.8
Chicken	13.1	11.4	13.3	10.0	12.0	11.8	11.2	12.5	11.7	11.8
Pig	11.2	13	9.7	9.2	10.8	10.4	11.6	6.3	6.7	8.8
Buffalo, cow	5.4	12.2	7.7	9.6	8.7	3.8	11.2	3.1	10.0	7.0
Lizards	7.2	2.3	5.6	6.2	5.3	4.3	2.1	3.1	8.3	4.5
Squirrels, rats	6.2	13.1	6.7	8.3	8.6	16.6	16.6	6.3	6.7	11.6
Large mammals	6.2	3.3	7.3	17.9	8.7	10.0	11.7	6.3	20.0	12.0
Crabs, snails, shrimps	7.2	10.8	11.7	7.5	9.3	7.1	6.0	34.4	6.7	13.6

*Excluding minor cereals such as millet, sorghum, job's tear, etc.

Source: own compilation

In the past, in order to make rice reserves last longer, the Katu often consumed rice mixed with grated cassava (*pong dong*), taro (*pong aroh*), wild RTs, and maize (*a-ohm*), etc. Rice was also mixed with soybeans, or substituted by millet, sorghum, and job's tear (*a-ohm prrjaeh, trrang*) which were ripe in July before the rice harvest in November. As a result, thick staple soups (*trrong)* were the preferred dish to cook (compare also table 27).

Cassava together with other RTs contributed more than 50% of the staple supply (see estimation table 30). This is recalled by the elderly as a distinct marker for Katu cuisine and distinguished it from the typical lowland cuisine. Cassava could be harvested all year round from the old fields or from new fields after October. During this time, *Dioscoracea spp.* could also be harvested like *pong ajorr*, *p .adong*, *p. alak*, *p. apodth*, *p. apuak*, *p. atao, p. peu ang*, *p. takoy*, and *p. zazill* as well as *p. azoch*. The wild *Dioscoraceae* species *p. kleuz* and *p. atus*, were best harvested between April and May[89]. Also during this time the Katu could search for the wild tubers of *p. duell* and *p. kaliang*. Wild *p. angeul* and *p. aloh* were available later, starting in August. *Colocasia spp.* such as taro (*p. aroh* and *p. aroy*) were harvested after September. *Fabaceae spp.* such as yam bean (*p. away*) and *Cucurbitaceae spp.* such as sweet potato *(p. dok)* were ready for harvesting after October as were species of *Marantaceae* like

[89] *These tubers sometimes are as long as 1-2m.*

arrow root (*p. aham*). Many of the RTs are still taxonomically unidentified at species level, not to mention the array of varieties.

Table 31: Traditional rice substitutes and plant emergency foods[i)]

[i)]The consumption of dried wild meats is excluded here.

Name	Type	Description and preparation	Harvest time
hmat	Cereal	Boiled, also for alcohol production	Oct-Nov
Maize	Cereal	Steamed, grilled	Jul-Aug
Various coarse grains	Cereal	Steamed, soup	Oct-Nov
Soybean	Lentil	Mixed with rice and steamed	Nov-Jan
pirr tcherau, pirr katio, pirr pe, pirr ayul	Flower	Mashed in cheo, or steamed in *tcheruak*	Apr-May
Banana species	Flower, fruit	Wild and cultivated (boiled)	Jan-Dec
palaeh akual	Fruit	Wild, little fruit, boiled with rice	Nov
palaeh arid	Fruit	Cultivated little fruit (formed like a star), mixed with the rice and boiled, also used for alcohol production	Nov-Dec
palaeh tabut	Fruit	n.d.	Aug
palaeh kadun	Fruit	Liana fruit	Nov
palaeh taneng	Fruit	Wild liana fruit, sweet	n.d.
palaeh kayay	Flower	Wild liana fruit	July-Sep
palaeh ating, p. kalong ating	Fruit	Very fatty, wild. First grilled, then peeled and cut into pieces, after that it is boiled 4-5 times (changing the water each time)	June-Jul
pong cherring, p.takoy, p.acheum, p.kleuy, p.apodth, p.kleuz, p.atus, p.angeul, p.aloh, p.aliang, p.chilai, p.anong, p.tateuk	Root and tuber	Wild, some need frequent washing	Mainly April-May
akong, chakoy	Stem	Bark removed, then stem is mashed and dried	All year
Wild palm hearts	Stem	Grilled, tcheruak, soup	All year
Rattan, bamboo	Stem	Tender parts boiled as soup	All year
aleng , khut kho	Fern	Steamed, vegetable salad or as soup	May-Oct
agnoy, leaves of sweet potato and cassava	Leafy vegetable	Steamed	Jan-Dec

Source: Own compilation

During April and May, when rice was already scarce, flowers such as *pirr tcherau* and *pirr katio* were used as filling foods. Various ferns, e.g. *aleng*, *katogn*, “weeds” such as *agnoy*, and also the leaves from cassava, and sweet potato served as bulky foods. Fruits such as *palaeh ating*, *p. arid*, *p. tabut*, *p. kadun*, *p. taneng*, and *p. akual*, etc. and also banana were mixed with rice and steamed. Also various stems from wild plants, together with the hearts from wild palm trees and rattan served as filling foods. Many of the emergency foods however share the common feature that their processing is time consuming and tedious. E.g. *Dioscorea hispida* (*pong aloh*) needs to be washed well in order to remove toxic cyanides.

As mentioned before the fermentation of vegetables and the production of dried meats also constituted a means to cope with rice shortages.

Today, as was seen in table 14 in all four villages, there are some families who claim to have sufficient rice for 12 months. For most families however the rice supply usually only lasts until the next rainy season and in cases of production failure or natural disasters, the rice may last only for 2-3 months.

Currently, there is a trend that RTs (with the exception of cassava) are demoted to snack foods. Increasingly, eating roots and tubers is perceived as inferior, not only by the lowlanders, but also by the Katu themselves, especially the younger generation. The consumption of selected flowers and fruits, together with filling leafy vegetables and stems has also reduced significantly. Eating vegetables is however more popular than eating wild

RTs. Only in TD, however, do cassava leaves and buds serve as a convenient filling food, since only there have the villagers sustained the practice of grand cassava fields. Today, bananas, bamboo shoots, and maize usually serve as modern substitutes for rice. In NB-TM and KDM, wild filling foods are becoming progressively more difficult to find. Only in TD and TK various wild plants are still available. Coarse grains such as millet, job's tear, etc. have almost been abandoned in the Katu cuisine.

Table 32: Ranking of applied coping mechanisms in case of rice shortage of target families

Ranking	NB-TM	KDM	TK*	TD
First applied	More vegetables	More cassava	Rice purchase	More cassava
…	Exchange	More vegetables	Exchange	Relatives
…	Relatives	Relatives	Relatives	Exchange
…	More cassava*	Exchange	More cassava**	More vegetables
…	Rice purchase	Rice purchase	More vegetables	Rice purchase
Last applied	More roots and tubers	More roots and tubers	More roots and tubers	More roots and tubers

*The severity of the rice shortage may determine the coping mechanism. E.g. in TK rice shortages are often so severe, that rice purchase was often first applied, even when those families were short of money.

**NB-TM and TK are short on cassava due to wild pigs and porcupines.

Source: own compilation

The ranking of applied coping mechanisms shows that variations in the cuisine are steadily losing importance (see table 32). On the other hand, the acquisition of rice by means of exchange, or purchase, is becoming more important.

Currently the daily per capita consumption of rice (both glutinous and non-glutinous) averages about 800g (see table 29). In KDM however, where some of the target families only eat twice a day, consumption does not even reach 500g. Root consumption ranges between only 5g to 56g per capita/day, but the full extent may be underestimated in the food recalls. A focus group of elderly people in TK reported that in the distant past (before 1975) about 6 *kapa* of roots and tubers were eaten per capita per year (with bark), which would be equal to about 120kg (unpeeled). Given a loss of almost 20% after peeling, then roughly about 100kg would have provided for 270g RTs per day (not including cooking loss). In all villages the elderly reported an approximate annual rice harvest of 10-15 kasop, which is equal to about 300-450kg of unhusked rice - or a bit more than 1kg for a whole family per day.

Conclusion: Rice production should not necessarily be equated with food insecurity. Neither in the past, nor the present, does rice insecurity constitutes food insecurity.

Vegetables

GARDEN VEGETABLES

Garden vegetables were consumed less in the past than they are today, but gained considerable momentum in the mid 1990s. While in TD and KDM, villagers remembered always having moderate consumption levels of garden vegetables before their resettlement, in NB-TM they had very low consumption levels even before the war. TK recalled very low consumption levels until the mid 1990s. Changing vegetable consumption patterns are provided in table 33.

Table 33: Change in usage of vegetable groups[i)]

[i)]1=High, 2=medium, 3=low

	1960s	After 1975	1980s	Early 1990s	1996	1998	1999	2000	2001	2002
Leafy forest vegetables										
NB-TM	1	1	1	2	2	3	3	3	3	3
KDM	1	1	1	1	1	3	3	3	3	3
TK	1	1	1	1	1	1	1	1	2	3
TD	2	2	2	2	2	2	2	2	2	2
Bamboo shoots										
NB-TM	3	3	2	1	1	1	1	1	1	2
KDM	3	3	3	3	3	2	2	2	2	2
TK	2	1	1	2	2	2	2	2	2	2
TD	3	3	3	3	3	3	2	2	2	2
Mushrooms										
NB-TM	1	1	2	3	3	3	3	3	3	3
KDM	1	1	1	1	1	2	3	3	3	3
TK	1	1	2	3	3	3	3	3	3	3
TD	1	1	1	1	1	3	3	3	3	3
Garden vegetables										
NB-TM	3	3	2	2	2	1	1	1	1	1
KDM	2	2	2	2	2	1	1	1	1	1
TK	2	3	3	3	2	2	1	1	3	1
TD	2	2	2	2	1	1	1	1	1	1

Source: Own compilation

The garden vegetable season peaks in November and December and lasts until April. Predominant species are pumpkin leaves (*ala palaeh adeuk*), cassava leaves (*ala pong dong*), sweet potato leaves (*ala pong dok*), *palaeh krrhoh* (*Luffa cylindrical),* bitter mustard greens (*apih*), cucumber (*palaeh akiel*), green beans (*palaeh atong*), *palaeh krrpay,* and eggplant (*palaeh akeung*). In the past, vegetable consumption showed a greater variety. Today pumpkin leaves constitute the greatest share. In Upper Kaleum *mak seuweu* was frequently eaten, but today the seeds have been lost. Principal herbs were lemon grass (*awial*), a type of basil (*aloz*), spring onion (*ideu*), and mint (*tarrkaen*).

Increasingly, alien species are being adapted from the Vietnamese, or being promoted by the GOL agricultural extension programs. These are mainly non-bitter mustard greens, salad, and morning glory.

FOREST VEGETABLES

The author started from the premise that the Katu would have great knowledge and appreciation for wild forest vegetables as had been reported for various other ethnic groups in Laos and Southeast Asia. However, following the duration of her work the author now ventures the opinion that forest vegetables are not appreciated in the same way as cultivated vegetables, even though most of the green leafy vegetables species which the Katu know and use are wild species.

The consumption of forest vegetables is highly seasonal and highly dependent on the effort which a family puts into collecting and gathering. Many of the identified forest vegetables are however reported to be available all year round. These are *agnoy*, *aneng*, *saluat*, *aworr*, *ariad*, *karaeh*, *arob*, *arok,* *tamay* and *tua kawah*, *t.krrtoy*, *t.alari*, *t.katiang*, *t.apae*, *t.krrpuh*, *t.kilek*, *t.aruy*, *t.kaki*, *t.chirrkat*, *t.krrong,* *t.adah* amongst others. Appendix 1.1 provides a full overview of the recorded species. It is difficult to understand why there is not a higher consumption of forest vegetables in order to embellish the diet. Forest vegetable consumption is in steady decline and has reached its lowest ever level in NB-TM (see table 30). In the author's eyes however, declining availability is not the only reason for this trend. Accordingly, further investigation into the concept of "basic food selection" is required.

Bamboo shoots are fairly well established in the cuisine, but in KDM and NB-TM their populations are severely degraded. Accordingly, villagers from both KDM and NB-TM have taken the effort to plant bamboo in their own gardens. This allows for twofold harvesting (firstly from May to August, secondly from November to December). It should also be kept in mind that bamboo shoot consumption is a trend on the increase. The consumption was very low in Upper Kaleum. This is partly mirrored in the results from the food wheel (see table 30), but the classification of shoots presented there also contains rattan and other shoots. We can assume that within the group entitled shoots, bamboo shoot consumption has increased significantly whie consumption within the vegetable group have changed only moderately.

Mushrooms

In Upper Kaleum, more mushrooms were eaten in the past than nowadays. TD villagers report of palm-sized mushrooms in TP, which could be easily harvested and grilled. Over time, mushroom consumption has considerably decreased. Today, mainly smaller mushrooms are consumed such as *Schizophyllum* and *Lentinus spp.* (e.g. *trirr katiak*, *t. kiton*, *t. ploh*, *t. set*, *t. peuz*, *t. tozed*, *t. tuk*) and will often serve as a meal without the need for any extras besides rice. Harvesting mushrooms is tedious, and mainly starts at the beginning of the rainy season in May, and lasts until August. In the *hai* fields mushrooms often sprout on the burnt logs, mainly *Auricularia polytricha* (*trirr torr*). Some villagers also reported that they are afraid of picking mushrooms. To test if mushrooms are poisonous, they are steamed together with rice. If the rice turns purple, the mushroom is inedible. In the case of food poisoning, the Katu drink a boiled infusion of dried powdered meat from a turtle's head or chest.

Flowers

In the past, flowers were sucked like sweets. Tobacco flowers especially, but also many wild flowers were also appreciated for their aroma. Some were also used as "vegetables", but today few villagers pick flowers in order to be able to harvest the fruits. Mainly consumed are the flowers of the pumpkin (*pirr adeuk*), cucumber (*pirr akiel*), and cassava (*pirr pong dong*) together with flowers from fruit trees such as *pirr apugn* and *pirr atong*[90]) and from many lianas. Flowers can be eaten raw or steamed and are sometimes used to embellish the typical *cheo*. The wild *pirr atong*, *p. chapua*, *p. pelarr* are especially appreciated for their flavouring qualities.

For their "filling" properties the flowers of the wild banana (*pirr ayul* or *p. ariad*) or of many other cultivated species (*pirr pe akrol, p.p. angoy, p.p. ariel, p.p. lun*) are of special importance. They can be eaten raw or prepared in the *tcheruak*. Banana flowers can easily be stored and prepared and are highly preferred.

From the weighed and estimated food recalls, the author summarised a total consumption of garden and forest vegetables, together with mushrooms and herbs as follows: 198g for TK, 130g for TD, and 62g for NB-TM per capita per day.

Fruits

GARDEN FRUITS

As can be seen in table 34 the consumption of garden fruits is now becoming more popular with the exception of TD which claims that garden fruit consumption has always been high. In NB-TM and TK consumption has been increasing since the mid 1990s. In general, it appears that a reduction in forest fruit consumption is being compensated for by

90 *Parkia Speciosa (pirr atong) is known not to be eaten by the lowlanders as with many other flowers.*

increased banana consumption. Consequently, we can infer that fruit consumption levels have probably stayed the same over time; the ratio of forest to garden fruits however has changed.

Out of all the garden fruits, bananas are the most important. Besides bananas; pineapples, sugarcane, *Citrus spp.* such as *apoz podth*, *apoz kong*, *apoz poet*, *apoz lung*, *apoz leng*, jackfruit (*palaeh panaz*), mangos (*palaeh kill* and *p. kasian*), and *Cucurbitaceae spp.* such as *p .akial neull* and *p. adeuk peleung* are the next most important. Villagers have also been involved in planting new fruit species such as guava (*p. srriang*), tamarind, etc. As these trees mature over the next few years, more garden fruits will become available, especially in TD.

Table 34: Change in fruit consumption[i)]

[i)]1=High, 2=medium, 3=low

	1960s	Post 1975	1980s	Early 1990s	1996	1998	1999	2000	2001	2002
					Forest fruits					
NB-TM	1	1	2	2	2	3	3	3	3	3
KDM	1	1	1	1	1	2	2	3	3	3
TK	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1	1	2	2
TD	1	1	2	2	2	2	2	3	3	3
					Garden fruits					
NB-TM	3	3	2	2	2	2	1	1	1	1
KDM	n.d.	n.d.	n.d.	n.d.	n.d.	2	2	2	2	2
TK	1	3	2	2	1	1	1	1	1	1
TD	2	2	2	2	2	2	2	2	2	2
					Bananas					
NB-TM	2	2	1	1	1	1	1	1	1	1
KDM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
TK	2	3	2	1	1	1	1	1	1	1
TD	1	1	1	1	1	3	3	2	2	2

Source: Own compilation

FOREST FRUITS

As stated above, more forest fruits were consumed in the past than are nowadays. As table 34 reveals, forest food consumption in NB-TM consumption began to decline at the beginning of the 1980s and in KDM in the mid 1990s mainly as a result of forest degradation. TK shows a high consumption level until the early 2000s. TD villagers had already reduced their forest fruit intake by the 1980s, and then again following resettlement due to the trend of consuming more garden fruits.

Forest fruit consumption levels are related to the location of the fields. If the area around the fields is still rich in forest fruit trees, the family has the possibility to fill their baskets with fruit on their way home. While some fruits like *palaeh krul*, *p. agnoaz*, *p. krrpuh* are suitable for storage, fruits like *palaeh kariang*, *p. arung* with soft flesh are best consumed immediately after they are harvested. Some fruits such as *palaeh agnoaz*, *p. alok* contain important souring flavourings and can, as mentioned before, be used as substitutes for lemon in soups, *cheo*, etc. In all villages, the consumption of wild mangos still outnumbers that of cultivated ones.

Table 35 aims to sketch the differing numbers of wild fruit trees in order to confirm the trend towards lower consumption. What becomes obvious is that TD and TK have many more wild fruit trees than NB-TM and KDM. Many of the fruit trees which can be still found in TD and TK are already extinct in KDM and in NB-TM, so that the actual intake of forest fruits is highest in TD. Therefore although reliable data on all four villages is unavailable, it is safe to surmise that villagers in TD and TK consume more wild forest fruits than the villagers in NB-TM and KDM. For TD and TK a total daily per capita consumption of approximately 100g was calculated from the dataset.

Table 35: Villagers' estimated numbers of selected wild fruit trees[i)]

[i)]The dataset is limited to the knowledge of the interviewees in their production area. Overestimations were modified with the help of the village head. The figures should be read as approximations only.

Katu name*	NB-TM	KDM	TK	TD
palaeh agnoaz	0	0	0	50
palaeh alari	n.d.	100	30	300
palaeh alok	40	n.d.**	5	10
palaeh apae	5	30	3	300
palaeh arung	5	2	5	300
palaeh cherraeng	0	unknown	500	500
palaeh empaeh	0	0	10	100
palaeh emploh	0	n.d.**	100	200-300
palaeh kalang	0	0	15	500
palaeh kariang	100	100	100	100
palaeh kawah	0	n.d.**	10	300
palaeh krrpok	0	10	30	100
palaeh krrpuh	100	n.d.*	20	30-50
palaeh krrtoy	n.d.**	10	100-200	1000
palaeh krul	100	10	500	500
palaeh plein kai	300	100	500	1000
palaeh prrdung	0	0	5	1000
palaeh prrlong	10	10	20	200
palaeh prrsuh	n.d.**	0	1000	300
palaeh pruall	0	0	0	100
palaeh sadth	20	n.d.**	50	1000
palaeh siel ploh	0	0	0	50-60
palaeh tabam	4	unknown	0	100
palaeh tchernia	0	0	3	200
palaeh xee	50	20-30	100	500

*For the Latin names, please see Katu food list (Appendix 1.1).

**N.d. indicates in this table unrealistic data.

Source: Own compilation

DOMESTIC MEAT

The author suggests that with higher livestock populations and higher frequencies of festivals (see chapter 4.4.1 and 4.5.4) domestic meat consumption was higher in the past than it is today. In table 16 the author revealed that especially in KDM and TD the contemporary number of buffalo heads per capita has decreased below the national average. On average annually between 0.3-1.5 chickens, 0.01-0.05 buffalos, 0.01-0.04 cows, 0.16-.041 pigs, and 0.01-0.07 goats are consumed per capita (see table 36).

This translates into a domestic daily meat intake (raw meat, wet weight) of 98g UMEP in NB-TM, 66g in KDM, 50g in TK and 25g in TD. It should be noted that the high kill rates in NB-TM were mainly due to livestock epidemics (compare also table 29, but which however does not include festival meat consumption).

Despite these low consumption figures, it appears that consumption cannot be increased by much, since kill rates, in NB-TM and KDM in particular, are already high in terms of their share of the total animal population (see column % of average livestock population). This correlates with the finding that villagers in NB-TM and KDM have started to purchase domestic meat (see table 22). As shown in table 36 if domestic animal meat is served, then less during unique occasions such as births, marriages, deaths, or daily life (see column ordinary consumption), but for the ritual slaughter of animals (see column sacrifice).

Table 36: Number of domestic animals killed for sacrifice and ordinary consumption of target families (n=10)

	Ordinary (in %)			Sacrifice (in %)			Total No. of animals			Mean of animals/cap	% of average population
	2002	2001	2000	2002	2001	2000	2002	2001	2000		
Chicken											
NB-TM*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	44	36	37	0.72	47
KDM	85	80	84	15	20	16	188	134	201	1.32	49
TK	24	8	33	76	92	67	17	13	24	0.30	19
TD	77	63	65	23	37	35	96	73	71	1.51	28
Buffalo											
NB-TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	2	5	1	0.05	22
KDM	60	0	67	40	0	33	5	0	6	0.03	27
TK	0	0	33	100	100	67	1	1	3	0.03	14
TD	0	0	0	0	100	0	0	1	0	0.01	5
Cow											
NB-TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0	0	0	0	no cows
KDM	100	0	92	0	0	8	1	0	13	0.04	27
TK	50	0	0	50	0	0	2	0	0	0.01	8
TD	0	0	0	0	0	0	0	0	0	0.00	no cows
Pig											
NB-TM*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	13	9	14	0.22	67
KDM	74	74	65	26	26	35	53	62	46	0.41	63
TK	0	0	29	100	100	71	6	9	14	0.16	20
TD	11	29	33	89	71	67	9	17	18	0.28	57
Goat											
NB-TM	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0	0	1	0.01	17
KDM	38	33	0	63	67	100	8	3	1	0.03	49
TK	0	100	0	100	0	0	1	2	0	0.02	8
TD	0	20	0	100	80	100	4	5	2	0.07	23

*Biased on high kill rates due to livestock epidemics.

Source: Own compilation

Meat

WILDLIFE

Quantification of annual wildlife consumption was assessed in two ways. Firstly, hunting lists with annual kill rates were quantified into fractions of usable meats (UM) and fractions of usable meats and edible parts (UMEP) as explained in chapter 1.3.3.2. The main findings are summarised in tables 37 and 38. Secondly, wildlife consumption was calculated from the weighed and estimated food recalls. This data is not detailed for species and will be discussed in chapter 4.6.3 (see also table 29). Changing kill rates are summarised in the next section called "kill rates".

In summary, wildlife in all villages was abundant until the beginning of the war. Whereas small mammals were more common than large mammals in TP this changed after moving to TD. There, larger wildlife appears to be abundant even nowadays. Large mammals are therefore consumed more often than small sized mammals (see table 37). This finding matches the optimal foraging theory introduced in chapter 2. The situation of TK is similar. However, in the early 1980s, wildlife resources started to dwindle, which has continued up until today. The decrease in small animals however did not start until the 2000s. Overall reduction of bigger animals is not as evident in NB-TM and KDM. In NB-TM, the reduction in wildlife availability started at the beginning of the 1980s, during the period of governance modification and reconstruction after the war. Wildlife resources were already depleted when villagers arrival in KDM in 1996 (resettlement from Upper Kaleum to Thateng) which was further aggravated in the later 1990s.

Fish availability shows a different trend. TM appears to have been located near good water bodies. Also in NB-TM villagers found abundant fish resources at their arrival during the 1970s. Yet, in the 1980s fish populations started to decrease significantly, reaching a very low level in the mid 1990s. KD was far away from water sources and showed a low potential for fishing. After resettlement access to water bodies increased, but due to environmental policies usage was and is still limited. Potential however appears to be higher than that in NB-TM. TK's settlement in the 1970s, close to the stream *huay ai,* provides access to rich fish populations, which has been sustained until today. However, since the late 1990s villagers have started to perceive a declining trend in fish populations, especially *pa soy* and *pa khang*. In TD, the provision of fish increased after the move down from TP into TD's vast habitat which is dissected by various streams. Villagers there, however, have also started to observe dwindling fish resources. As a result, consumption of frogs increased. In the past, their consumption was low as "*there was plenty of other meats to eat*". The same is true for crabs, snails, and shrimps, which were considered more as food for children the past.

Translating the kill rates into consumption amounts, in the contemporary diet of all four villages boar meat forms the major share of wild meat, with 34% in NB-TM, 26% in TD, 24% in TK, and 22% in KDM. As described in chapter 1, the multiplication of fractions of UMEP per species kill rate indicates the meat availability per carcass.

Table 37: Estimated available annual mammal UMEP per capita per day as a mean of the years 2000-2002 (in %)

	TD	TK	KDM	NB-TM
	%	%	%	%
Wild boar	26.0	23.7	22.0	33.7
Deer, muntjac	24.1	21.2	1.2	1.7
Civet, bintorung, linsang	19.5	2.0	1.0	4.1
Rat, bamboo rat, treeshrew	9.6	3.6	9.2	25.4
Mongoose, otter, ferret badger	6.8	15.2	31.8	3.4
Squirrel, Giant Black Squirrel, pygmy loris, weasel	6.6	4.9	34.3	25.6
Porcupine, pangolin	2.1	14.0	0.3	3.8
Primate	1.8	2.5	0.1	2.4
Bear	1.6	13.0	0.0	0.0
Serow	1.6	0.0	0.0	0.0
Jackal and Asiatic Wild Dog	0.2	0.0	0.0	0.0
Total per year	100.0	100.0	100.0	100.0

Source: Own compilation

While in NB-TM the rat, bamboo rat, and treeshrew group together with the group of squirrel, loris and weasel form 51% of wildlife consumption, most of the other groups are of little importance. Meat from bears, serows, jackals, and wild dogs is for example totally absent in the diet. KDM shows a similar profile, albeit with the group of mongoose, otter, and ferret badger stemming more than 30% and the rat group only 9%. In both villages, muntjac and deer meat contribute less than 2%. This contrasts to TD where these meats made for 24% and to TK, where they stem 21%. The civet group still made up 20% in TD, although this has been reduced to 2% in TK. Rat provides only about 10% in TD and only 4% in TK.

In absolute figures, TD stands out with the highest annual per capita availability of mammal UMEP which is a total of 53.2kg (42.8kg UM). In TK it is only 14.7kg (12.2kg UM), in KDM only 7.6kg (6.2kg UM), and in NB-TM only 1.3kg (1.1kg UM).

In total, the author calculated from the estimated kill rates a mammal off take of 53,327kg in TD, 14,695kg in TK, 7,593kg in KDM, and 1,379kg in NB-TM (all UMEP). The contribution of each taxa to the total meat amount is detailed in table 38. Appendix 5.4 also provides available UMEP for various bird species. Ranging between 400-1400g hornbill, jungle fowl, whimbrel, darter, pheasant, and heron being the most important birds. Small songbirds often provide less than 10g per annum.

Table 38: Estimated available wildlife[i)] UMEP per capita per day as a mean of the 2000-2002 kill rates (in g)

[i)]Excluding fish

	NB-TM	KDM	TK	TD
Mammals	4	21	40	146
Birds	<1	<1	2.14	15.6
Frogs	n.d.	n.d.	1.6	5.2
Reptiles	1.2	<1	<1	2.9
Serpents	<1	4.3	2.0	6.9
Total	6	26	46	176.6

*UM for mammals is as follows: NB-TM 3g, KDM 17g, TK 33g, TD 117g.

Source: Own compilation

What becomes obvious is that with an average of 6g/cap/d in NB-TM wildlife is almost absent in the diet, which is mainly due to the location and the degradation of the forest. KDM shows a slightly higher availability of 26g/cap/d. Availability rates are even higher in TK with 46g/cap/d, with the highest level of 177g/cap/d in TD.

Table 39: Hunting seasons of selected wildlife

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Rat								▲	▲	▲	▲	
Squirrel			▲	▲	▲					▲	▲	
Loris	▲	▲										
Macaque	▲	▲					▲	▲			▲	▲
Wild boar		▲	▲				▲	▲			▲	▲
Sambar Deer									▲	▲		
Snake			▲	▲	▲							
Monitor lizard			▲	▲	▲	▲						
Tadpole	▲	▲	▲								▲	▲
Softshell turtle	▲	▲	▲	▲	▲					▲	▲	▲
Fish*	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲

*However, most in 4,5 10,11 and 12; less in 1-3 and 6-9.

Source: Own compilation

Table 39 shows the hunting seasons of selected wildlife species. It is a compilation of information provided by various villages. Taken together, high seasonal variety provides wild meat all year round. To give an example: there are three seasons, the first in February/March (cassava), the second in July/August (maize), and the third in November/December, when the wild boar pillage the village rice crop. According to the villagers crop destruction 'justified' hunting in the past[91]. The flexible availability of wildlife further contrasts with the provision of domestic meats.

---

[91] *This is why macaques were always hunted, and gibbons and langurs to a lesser extent.*

Kill rates

The main conclusions from kill rate calculations have been summarised previously. The change in annual kill rates is described, either at village (v) or at family level (f). As such, a clear trend towards decreased wildlife consumption can be delineated.

Comparing TP in the 1990s with TD in the 2000s, rat consumption has declined from 100-200/f down to 100/f. Contemporary kill rates (maximum) for various rat species are detailed in Appendix 5.3. Also in TD, today only about 3 pygmy loris (per f) can be caught, instead of about 10/f in the past. Kill rates have also dropped for hog badgers (*aroll*) down to 5-6/f (37%) and for ferret badgers to 2/f (20%). The kill rates of the V*iverridae* spp. of *atok taek* and *atok tarun* have also both dropped to 80% and 67% respectively of their former numbers i.e. only about 1-2/v each. The consumption of *Felidae* spp. is now almost nil, while in the past a total of about 10 animals per year used to be caught such as tigers (*ra-ay koch*), leopards (*waz*), clouded leopards (*ra-ay ahem*), marbled cats (*tcherr*), leopard cats (*ameo kruang*), and jungle cats (*kala chedang*). While in the past about 4-5 bears were killed per year in TP, now only about two Sun Bears are killed (*ikau redth*) and one Asiatic Black Bear (*ikau ao*) in TD. In TP, the whole village used to be able to trap about 50-60 Brush-tailed Porcupines (*acheng*) and about 20-30 Malaysian Porcupines (*achong*), which numbers have reduced to 20-30 and 10-20 respectively in TD. The trapping of pangolins (*prrxiel*) has been reduced by two thirds down from 10-20 in TP to 2-5 in TD. The hunting of macaques has been reduced to a meagre 5%. In TP, each family was able to kill about 10-15 animals, while in the whole village of TD only about 10-20 animals are caught. The kill rate for bamboo rats (*ameu*) (10-15/f) and mongoose (*ka-och*) (3/f) has remained unchanged. Constant also is the harvest of flying squirrels. It is possible to harvest about 1-2/f of the *cheliang* specie and 10-20/v of the *trrjon* species per year. Other squirrel species such as *abez* and *semock* allow for 10-20/f, whereas *enuadth* allows for 5-10/f. At village level, hunting still brings in about 7-8 weasels (*prrsiang*), 4-5 otters (*pahi*), 2-3 wild dogs (*chakong*), and about 10-30 wild boars (*armoll*). The hunting of fruit bats and cave bats has also remained constant with 1-10/f. The kill rates for the Large Indian Civet have slightly increased (*a-king*) with 5-8/v as have been the kill rates for the binturong (*tiju*) with about 10-20/v. New species in the TD habitat are the Lesser Mouse Deer (*chakoy*) and the Sambar Deer (*perrnoch*) from which about 10-20/v are killed each. Various gibbon (*ayuadth*) species have also only just started to be hunted – bringing about 5/v. It can be assumed that in the past not as many langurs were shot as today. Today up to nine animals are killed, including up to five of the very rare Douc Langur (*pirr bok*). This species is almost extinct in neighbouring GMS countries. Villagers can still catch about 1-3/v serows (*kaeh*), down from about 10/v in TP. Due to the different habitat, the kill rates for treeshrews (*chaluy*), black giant squirrel (*xanok*), another squirrel species (*deuap*), and the civet species of *karoch* and *tchekoll* have increased considerably.

From the mid 1990s until now, kill rates in TK have already substantially declined. Present kill rates for squirrels have been reduced to 18-50%, e.g. *sorr* (5/v), *deuap* (2/v), *abez* (2-5/f). Villagers claim that species such as *trrjon*, *cheliang*, *enuadth* are impossible to hunt. Treeshrews (*chaluy*) which could not be hunted in the past are also still very difficult to hunt (maximum of 1/f). Also weasels, otters, and mongooses are still impossible to catch. Today families are able to obtain a maximum of two pygmy loris. Since the mid 1990s, hunting of bamboo rats has dropped by 50% to about 5/v from 10/v in the late 1970s. While in the mid 1990s kill rates for rats amounted to about 10-20/f, a drop from about 50/f in the mid 1970s, today 20-30/f are again being trapped. Taking hog and ferret badgers together, in the 1970s it was only possible to hunt about 2 badgers per village per year. Since the mid 1990s, each family has however been able to hunt about two badgers, although this figure is now dropping. In TK, villagers indicate that it is taboo to hunt some of the V*iverridae* spp. For the other species such as *atok*, *tchekoll*, and the bintorung, they are able to hunt between one and three animals at best, which is not many more than in the past. While there is no quantified data on the meagre present-day hunting of *Felidae* spp., kill rates in the past were considerably higher. Other species which have not been seen for a long time[92] are serow, some langurs, and the Asiatic Wild Dog. Hunting of gibbons is almost nil, with a maximum of one animal per village per year. Yet, other rare species are still being hunted such as the Sun Bear and the Asiatic Black Bear (each 1-2 v), which used to be only possible once every 10 years in Upper Kaleum. The Douc Langur is also still hunted in TK, with about 1-2 animals caught per year, reduced from about three in the 1990s. The hunting of macaques reduced from five animals to 2-4 animals per annum. The kill rates of the Lesser Mouse Deer also dropped from five to three animals per annum in the 1990s. Hunting of muntjac is down to about two animals per annum now - from about three in the 1990s – which is, however, still higher than the past figures in Upper Kaleum, where one animal at most was caught per annum. Wild boar hunting has dropped by one quarter to maximum of about five animals per annum. The kill rates for the Malaysian Porcupine (1-2/f), the deer specie *perrnoch* (1-2v), and cave and fruit bats (each 10/v) remain unchanged. Pangolins were not deliberately hunted in the past, but TK villagers are able now to trap about three animals per annum.

In KDM, the hunting of wildlife has been considerably reduced as a result of the degradation of forests in the mountainous areas. Today about 70 rats are trapped per family per annum, reduced from a figure of more than 100 in the 1980s. Recently however, the whole village has only been able to trap between one and two bamboo rats per annum; the harvest of flying squirrel (*cheliang*) with 2-3/v since the mid 1990s remains unchanged. These animals used to be more difficult to catch in the past; only about one animal every two to three years. Taking the squirrel species of *deuap*, *sompor*, *sorr* together, the present kill rate of 5/f is down from 10/f in the 1980s and 1990s. The same figures can be applied to the species of *abez* and *semock* (5/f). The present kill rate of pygmy loris has dropped slightly to 2-3/v from 3-4/v in the 1980s, as has that of the mongoose - from 5/f to 3/f. Kill rates for weasel with 1-3/f, for otter with 1-2/f, and for the pangolin with 2-3/v remain unchanged. The kill rates of hog badgers have declined greatly from about 15-20/v in the 1980s and 1990s to a maximum of one animal per year at present. Due to the different classification of civets in KDM, only a total figure for all species was recorded. In the 1980s, in KD the whole village harvested about 100 civets, which has declined to 2-4 animals per annum today. The bintorung is extinct in KDM, but was also rare in KD (1/v). In addition *Felidae* spp. have vanished from the KDM mountains. The elderly recalled that in KD they trapped a tiger every seven years, and in the last 50 years about 6 leopards, 7 clouded leopards, 2 marbled cats, and 4 leopard cats. In KD until the 1990s, they harvested annually per village about 1-2 Asian Wild Dogs, 2-3 Asiatic Black Bears, many deer (exact figure lost), 4-6 Sun Bears, 3-4 serows, 40-50 gibbons, 2-3 langurs and per family 1-6 Douc Langurs, 1-2 Brushed-tailed Porcupines, and 40-60 cave bats: animals which are now however all extinct in KDM. During the same period, kill rates for the Malaysian Porcupines dropped from 3/f to 1-2/v, that for macaques from 3-5/v to 1/v, that for muntjacs to 2-3/v, and that for wild boars from more than 100/v to 10-20/v, that for fruit bats from 30-40/f to 10/f. In KDM, the Lesser Mouse Deer (1-10/v) is new on the food list.

In NB-TM, most of the wildlife is believed to be extinct. While today families might be able to harvest about 5-50 rats per annum, large families are reported to have harvested more than 500 rats per annum in the past. Bamboo rat kill rates have dropped from 10-20/f in the 1980s to 1-2/v today. Flying squirrel (*cheliang*) rates declined from 10/v in the 1980s to 5/v in the 1990s, and only one in the 2000s. Taken together, the kill rates for the squirrel species of *deuap*, *sorr*, and *somporr* have dropped by 50% from 40/v in the 1980s to 20/v today. Species of *abez* and *semock* have also dropped from 10/f to 5/f. The kill rate for the species *enuadth* is down from 100/v to 1-10/v. The Giant Black Squirrel had reduced to 1/v in the 1980s, and is now extinct. In the past, about 5/v per annum were

[92] *Villagers are not using the term "extinct". They describe the absence of species as either "not seen" or "no habitat".*

harvested. Today a maximum of one pygmy loris per annum is caught, compared with 5/v in the 1980s, or even 7/v in the 1990s. The weasel harvest has declined from 1-2/f in the 1980s to 1-2/v in the 1990s and 2000s. The mongoose appears to be almost extinct now, after a drop from 10/v in the 1980s to only 2/v in the 1990s. Only about two otters can be harvested now, compared with 10/v per annum in the 1980s. Badgers were already extinct in the 2000s, although 10/v per annum were harvested in the 1980s. In the 1980s, each family was able to trap about 10 civets, which has now dropped to 2/v per annum. The bintorung seems to be almost extinct now, although 5/v per annum could still be harvested in the 1990s, down from 20/v in the 1980s. Pursuit of the *Felidea spp.* is nil, with the exception of a single jungle cat in 2001. Before the onset of the war, about 4 big cats were harvested in TM every year. In addition, the village harvested approximately 7 Asiatic Wild Dogs, 20 Sun Bears, 30 Asiatic Black Bears, 80 porcupines, 10 pangolins, 5 langurs, 10 Douc Langurs, 50 muntjacs, 100 deer, and 20-25 serows, animals which are all extinct now. The exception are porcupines and pangolins for which exists a reduced harvest rate (each 1-2/v). In addition the hunting of about 150 macaques has declined to about 1-2/v today. The kill rate for wild boars has dropped from 100/v to 2-3/v today. Fruit and cave bat consumption has reduced from 100/f to a meagre 1-2/v. In the 1980s about 30 Lesser Mouse Deer were killed annually. This rose to about 50 in the 1990s but has meantime dropped to about 5/v.

Liquids

Traditionally, besides drinking water, the Katu make tea with leaves (e.g. *ala chae*) or various barks from the *Ficus* species giving it a fresh aromatic taste. Today, only in TD and in Upper Kaleum is this tradition - although it is becoming less common – still continued in the other villages.

On special occasions, such as during festivals or when entertaining guests alcoholic beverages are offered. While *lao lao*[93] is predominant today, in the past mainly *lao hai* [94](*bua taem*) and also *lao kok*[95] were produced. While *lao lao* made out of rice is preferred[96], cassava[97] can also be used for alcohol production, especially in case of rice shortages. From job's tear and maize only *lao hai* can be made. While in the past ferment (*katong*) was produced from some leaves, it is now exclusively bought from the market. The tradition of making palm wine is also dying out. The Katu distinguish between the four palm trees, namely *tawako* (in Lao *kok tan*), *karrdin, tajuang,* and *talohr* (in Lao these are all called *kok tao*). Palm trees can be tapped up to 20 times per year, each time yielding about one litre of liquid. In NB-TM and KDM these palm species are extinct. In TD some trees remain within the village boundary, albeit a long walk away. In Upper Kaleum another kind of liquor is produced by adding bananas into the *lao lao*, resulting in a brew with a taste similar to rum. Recipes however are vanishing, and are already unknown to the younger generation. From the *kok tao* tree, sugarcane and banana, non-alcoholic beverages (e.g. *terrnoh*) are made. In order to do this, their sweet juices are boiled together with the bark of *alok kriaz* which has an aroma similar to cinnamon.

On long walks into the forest the villagers often cut some lianas, e.g. *antonng atual* or *antonng kiloy* to quench their thirst (*tha roidth*). Each person can cut up to 30 lianas a year, of the above species only. Water is never boiled, in the fields or the forests. On the way to the

---

93 *Hard liquor.*

94 *"Mild" liquor (equates with wine): Fermentation for about three months (can start to be drunk after three weeks), 10 kg husked rice in one jar, rice must be steamed beforehand, closed with plastic or leaf (in the past with mud).*

95 *Fermented palm saps (equates with beer).*

96 *Because drinking alcohol made from rice causes the mildest form of headache.*

97 *About 15kg of cassava together with 1.5 bags of ferment are boiled for two hours and then left for 15 days. Before bottling it must be boiled again. 15kg cassava (half of a medium basket) is enough to produce three bottles of lao lao (each 300ml).*

fields bamboo containers (*enkoh*) are filled with water and then left in storage, but never for longer than one day. Some people also take boiled water to the fields (e.g. if sick or pregnant). However, the practice of drinking unboiled water is the most common practice, and has been sustained even after health education campaigns.

4.6.2 Nutritional value of Katu foods

4.6.2.1 Staples

For the Katu, as in most Southeast Asian diets, rice is the principal source of energy, protein, Fe, Ca, vit B_1, vit B_2, and niacin – this is mainly because of the high amount consumed. Such high reliance is not necessarily perilous, but potentially it is.

A comparison of the major Katu staple groups shows that rice (including glutinous and non-glutinous varieties), provide the highest amount of energy (see table 40). Roots and tubers provide only half the energy content of rice, and filling foods provide even less. The Katu themselves suggest that "*non-rice foods do not fill us up*". While for non-glutinous rice the amount of amylopectin is almost 100%, glutinous rice consists of only 80% and has 20% amylose which has a bulky consistency (Watabe 1968). Also, in terms of protein, rice shows a better profile than roots, but is equal to the mean of Katu minor cereals such as millet. Yet, with a range of 2.6-3.7mg protein wild Katu roots (*pong atus, p. kleuz*) and domesticated ones *pong azoch* show exceptionally high protein values, especially when compared to cassava (0.4mg), see Appendices 2 and 3.

Table 40: Proximate nutritional values of Katu staples (per 100g)

Food	Gross energy	Crude protein	Crude fat	CHO	Vit B_1	Vit B_2	Ca	Fe	Zn
	kcal	g	g	g	mg	mg	mg	mg	mg
Roots and tubers (12 sp.*)	89.58	1.58	0.24	20.51	0.049	0.013	21.71	0.71	0.41
Rice (1 sp.*)	187.5	3.4	0.3	42.2	0.035**	0.010**	3.5**	0.12**	0.8
Other cereals (4 sp.*)	128.77	3.45	0.92	26.63	0.096	0.039	42.80	1.68	0.76
"Filling foods" (8 sp*.)	79.40	2.72	0.38	16.34	0.07	0.14	22.14	0.58	0.57
Soybean (dried)	176.25	14.25	6.96	14.13	0.40	0.14	142.92	3.71	1.21

*Data per species is provided in Appendix 3.

**Mainly as a result of preparation loss. Brown, home pounded rice is not necessarily low in nutrients.

Source: Own compilation

Fats in rice are linoleic, oleic, and palmitic acids (FAO/IRRI 1993). The amount of rice consumed however can be assumed to be too low to provide a substantial amount of PUFAs. In comparison to RTs and rice, coarse grains have on average a threefold higher fat content and with 1.7mg, a more than tenfold higher Fe content. Millet alone contains 2.4mg Fe. As for vit B_1 and vit B_2, rice compares unfavourably to the other staple groups. The Katu filling foods show the highest value for vit B_2, and also have the highest value in β-Carotene. The β-Carotene levels in rice are nil, but can reach up to 10,000μg in the filling foods (INMU 2002), such as various species of ferns or wild leaves (see Appendix 2). Filling foods also contain up to five times more Fe than rice; up to six times more Fe than roots and tubers, and up to ten times more Fe than minor cereals. Compared to all other staple groups, rice shows a very low Ca content (3-4mg). The wild Katu roots and tubers such as *p. kleuz* (18mg), *p. atuz* (15mg), and *pong azoch* (35mg) show a much better profile, and all compare favourably to cassava. Millet however with 142mg has the highest value, and taro also shows moderate amounts (48mg). If rice is mixed with sesame[98] (*malmel*) as happens during Katu festivals, the Ca content of this rice dish increases to 66mg. In comparison to roots and tubers, rice contains twice as much Zn, with the exception of wild arrowroot, which shows slighter higher amounts. The Zn content of wild Katu roots and tubers is slightly higher than cultivated species. Rice has a fair amount of Se, averaging

---

[98] *Malmel is a kind of "rice cake". Sesame is pounded into fine powder and then mixed with steamed glutinous rice, which is then pounded again in the big rice-pounder into a dough-like consistency. It can be stored and kept fresh for about 3-4 days. Before eating, it is then often grilled over the fire, developing a bread-like crumb. 1kg of steamed rice is mixed with about 50 g of sesame.*

6.7µg. In comparison, values for cassava, yam, and taro do not even reach 1µg. Even after cooking, roots and tubers still possess some vit C. Also their leaves, such as those from cassava, retain 197mg after cooking. The vit C content of steamed rice is virtually to nil.

During lean periods in the past, rice was often mixed with soybean. Soybean is known for its high quality protein and it contains fair amounts of Ca and Fe. Considering the moderate nutrition value of the Katu rice together with the general low lysine content in rice (FAO/IRRI 1993)[99], a judicious mix with other staples can be assumed to be most beneficial. Tubers e.g. are high in lysine, but deficient in sulphur amino acids such as cysteine and methionine (FAO/IRRI 1993). Whole grain-maize also has a lysine-rich protein, comparable to that of wheat (FAO/IRRI 1993). Amino acid scores showed tuber proteins to be superior to cereal proteins. This however does not take into account digestibility, which is better with rice due to its low fibre and tannin content (FAO/IRRI 1993).

Environmental factors such as soil type, but also harvesting (growth duration, photoperiod, degree of ripening, dormancy) together with threshing, drying, storage, milling and cooking are known to affect the nutrient composition of rice (FAO/IRRI 1993). In all four villages, most families still pound their rice mechanically, either by hand or with foot driven rice-mills.

The low proximate values of Katu rice need some further explanation. Usually, brown rice is highly nutritive. For the Katu rice, nutrient loss for fat, protein, vit B_1, vit B_2, niacin and tocopherol and various minerals, as reported for abrasive and friction milling (FAO/IRRI 1993) can be ignored[100]. The author however relates the low content of Fe, Ca, and B-vitamins to the practice of soaking overnight. Fe, Ca, and B-vitamins are highly water soluble substances and it is likely that a fair amount dissolves into the water overnight. By custom the Katu discard the water either in the pig's food trough, or cook it up as animal feed. Sometimes it is also used as a hair conditioner. Nutrient loss in rice through washing is reported to range between 1-21% for vit B_1, 2-8% for vit B_2, 1-10% for Fe, and 4-5% for Ca (FAO/IRRI 1993). It would therefore be wrong to infer that the Katu rice varieties have low nutritional values. There is however evidence that the low nutrient content of rice is a result of unfavourable preparation techniques.

4.6.2.2 Vegetables

Vegetables do not contribute much to the caloric intake, but they provide a substantial amount of vitamins and minerals. As with various other ethnic groups, Katu wild vegetable intake compares favourably to the nutritional value of cultivated plants (see table 41). Because of the low amounts consumed, condiments with a high nutrient content are here not used for direct comparison. Often only some leaves or tender tips are picked. Firstly, despite not being an important protein provider, the Katu forest vegetables show on average higher protein levels (3.36g) than their cultivated garden equivalents (2.14g). Good examples are *ala krrong* (9.5g), *ala tchirkatt* (6.8g), and *ala kaki* (3.4g). In domestic terms, bitter gourd leaves show the highest values with 5.8g. The importance of leafy protein has been discussed by various authors, referring to exceptional levels of 10% leaf protein. It can be assumed that there are other leafy vegetables which may show such outstanding levels of protein, but for which no analysis has been conducted. As a meat substitute, mushrooms contain high levels of protein. In an analysis of the nutritional values of 30 edible mushrooms from Upper Shaba, Zaire, the mean protein content was found to be 22.7g dry weight (FAO 1989a). The available data base here however is very incomplete.

---

[99] *With increased milling, lysine levels are further reduced (FAO/IRRI 1993).*

[100] *Rice-mills in both NB-TM and KDM are broken and during the stay of the author were not repaired. SEP DEV is considering providing a rice mill to the women in TD, since women complain that energy expenditure through rice milling is one of the most pressing problems.*

Table 41: Proximate nutritional values of Katu vegetables (per 100g)

Food	Gross energy	Crude protein	Crude fat	CHO	β-Car	Vit B_1	Vit B_2	Vit C	Ca	Fe	Zn
	kcal	g	g	g	μg	mg	mg	mg	mg	mg	mg
Garden vegetables (15 sp.)*	37.38	2.14	0.31	6.76	947	0.09	0.09	45	66	1.43	0.52
Condiments (9 sp.)	51.76	1.79	0.61	10.1	1,382	0.21	0.13	29.00	92.43	1.88	1.39
Flowers (3 sp.)	52	2.4	0.7	10.2	70	0.08	0.37	165	78	1.9	1.3
Forest mushrooms (4 sp.)	337.67	18.10	1.10	63.6	n.d.	0.35	1.78	34	96	10.37	3.00
Forest vegetables (25 sp.)**	55.93	3.36	0.51	9.8	1,236.5	0.17	0.23	22	79	2.68	0.70

*Cassava leaves are listed as "filling foods"

**Exclusively leafy vegetables.

Source: Own compilation

Selected Katu forest vegetables contain more β-Carotene than domestic species. Important wild key species are *ala krrong, a.tchirkatt, a.pelang, a.entarr*, *phak peo, phak ileut*. Domesticated ones are basil, pumpkin leaves, and bitter gourd leaves. Mustard greens also can contain considerable amounts of β-Carotene. Resorption, however, is dependant on the availability of fat. Moreover, β-Carotene is not the only vitamin A active substance. There are also α-Carotene, β-Cryptoxanthin, Lycopene, Lutein, and Zeaxanthan, which however have a much lower potential to transform into vit A. It should be noted that β-Carotene is extremely vulnerable to light, oxidation, etc. Therefore improper storage and cooking might result in immediate nutrient loss. Despite the laboratory results, it might be safe to conclude that chilli is one of the key species providing β-Carotene. The INMU database shows very high levels for papaya leaves. Hypothetically, the botanically similar *tchertokk* might yield comparable β-Carotene levels.

The content of B-vitamins, both for B_1 and B_2 is more than twice as high in the wild Katu species than in the cultivated species. Condiments show the highest level in vit B_1 (0.21mg) compared to typical vit B_1 rich food. Still, the Katu garden vegetables show significantly higher levels of B-vitamins than the Katu rice (soaked and steamed). The received wisdom is that vegetables do not contain Vit E. However, since mustard and pumpkin greens, as well as *krrtoy*, have been proven to contain 1μg, therefore it would be sensible to investigate this matter further.

Soured mustard leaves show a fairly high level of vit B_{12} with 10.5μg produced through fermentation, but they are only eaten in small amounts. Similar values can therefore be assumed for the fermentation of bamboo, spring onion, cassava leaves, and other leaves. Flowers are sometimes a useful source of vit C. A mean of 16 Australian wild flowers were found to contain 19mg (SD ± 29mg) (Brand-Miller and Holt 1998). In our calculations the mean of the three species reached 165mg, mainly due to the high content in Cassia flowers (441mg). Katu garden vegetables contain higher amounts of vit C after cooking than the wild ones. Vit C content of fermented vegetables can be assumed to be retained due to the high content of lactic acid (Belitz and Grosch 1992:718). Mustard greens have a high vit C content (as high as 118mg after cooking), which it is reasonable to assume is retained through the fermentation process. Bitter gourd leaves and their fruits are also good sources of vit C with more than 100mg. Mustard greens, spring onions, pumpkin flowers, and basil show the highest levels of folate.

The consumption of vegetables contributes significantly to mineral intake. All of the vegetable subgroups show significant Ca levels, ranging between 66-96 mg. Outstanding key species, however are *ala atiang* (253mg), *ala kawah* and *aneng* (both 121mg), Pennywort (146mg), *phak ileut* (275mg), *phak falang* (112mg) and *phak iku* (179mg). Bitter gourd leaves also show high amounts. Good wild sources of Fe are *ala pelang* (7.2mg), hog plum leaves (9.9mg), *phak peo* (5.6mg), and *phak ileut* (4.4mg). Preferred cultivated key species are *phak falang* (3.8mg), pumpkin leaves (3.5mg), bitter gourd leaves (3.0mg), basil (5.15mg), and mustard leaves (4.3mg). Many other species show Fe values lower than 1mg meaning that with 2.68mg on average, wild species compare favourably with the 1.43 mg found in cultivated ones. The same trend can be outlined for Zn, averaging 0.52mg for cultivated species and 0.70mg for wild ones. The highest Zn levels were found in *aneng*, *ala tchirkatt*, *atogn,* and *ala katiang*. Analysis of *ala aruy* showed exceptionally high values of Mg (915mg). The literature reveals an exceptionally high level of Potassium for wild and domesticated bamboo shoots, which is more than double the amount found in most of the other species. Despite low fat content, some vegetable species show acceptable levels of Se such as pumpkin leaves (0.9µg), mustard greens (0.6µg), garlic (14.2µg), and also *phak iku* (0.8µg). For the Se content no data on forest species is available.

The traditional home-made salt (see chapter 4.5.3.) showed extraordinarily values of Ca (5,542mg), Fe (163mg), Zn (22mg), Cu (1.77 mg), Mg (1,044mg) and of K (3,599mg).

4.6.2.3 Fruits and oilseeds

Like vegetables, fruits are not an important source of macronutrients, but they do contribute significantly to the Katu mineral and vitamin intake. To begin with, it is safe to surmise that the Katu forest fruits are far richer in Zn, vit B_1 and vit B_2 than the cultivated species are, but not in β-Carotene (see table 42). There is no great difference between vit C, Ca, and Fe.

The vit C content of the Katu fruits is on average not much higher than in vegetables (compare 27mg in forest fruits and 22mg in cultivated fruits). Vit C is a very sensitive substance which is easily destroyed through heat, oxygen, etc. (Belitz and Grosch 1992). That could explain average levels in analysed *palaeh koh* (41mg) mainly as a result of transport loss. The Katu chilli also showed only 4mg of vit C. There is not much more data on Katu fruits since many fruit samples had to be discarded in the laboratory (*palaeh kariang, p. agnoaz*, etc.).

The hogplum is a vitamin dense fruit. It contains high values of vit C (70mg), Fe (1.2mg), Zn (3.4mg), and vit B_2 (0.02mg). Analysis of *mak khay* showed an exceptionally high amount of niacin; more than five times the calculated average for the Katu fruits. Figs contain a high amount of vit B_2 (0.92mg) and are mainly being consumed unripe. Star fruit and lychee also provide a fairly high amount of vit B_2.

Table 42: Proximate nutritional values of Katu fruits (per 100g)

Food	Gross energy	Crude protein	Crude fat	CHO	β-Car	Vit B_1	Vit B_2	Vit C	Ca	Fe	Zn
	kcal	g	g	g	µg	mg	mg	mg	mg	mg	mg
Forest fr. (10 sp.)	60.63	0.86	0.15	13.95	34.56	0.13	0.17	27.00	24.38	0.59	0.54
Garden fr. (6 sp.)*	63.50	0.72	0.23	14.97	675.30	0.06	0.09	21.50	16.58	0.70	0.16
Oilseeds (6 sp.)	515	23	42	18	17	1	0	3	221	8	6

*Banana is listed as a filling food and excluded here.

Source: Own compilation

Good sources of vit B_1 are *mak khay* (1.0mg) and *palaeh kariang* (0.76mg), which is more than 30 times the amount found in rice. Mango (897µg), papaya, melon, and jackfruit are good sources of β-Carotene; much better than the wild fruits, with the exception of *mak khay* (85µg). Despite a relatively low fat content *mak khay* is a good source for vit E (4mg), as all other fruits show levels less than 1mg. An exception is the mean of four species of Thai mangos, which is 1.1mg. With their high unsaturated fat content, oilseeds such as almonds (18mg), pumpkin seeds (43mg), jackfruit (24mg), and various *Curbiticae* spp. (average 16mg) are a rich source of vit E. Like sesame seeds (0.8mg), *mak khay* (0.5mg) is also a good source of vit B_6. Out of all the seeds, sesame and pumpkin seeds together with fresh melon show the highest levels of folate. Almonds and sesame are rich in Se.

Fruits also contain a broad spectrum of phenolic substances, flavonoids, tannins, and other phytochemcial substances. Without detailing these components here, it is safe to summarise that besides vitamins and minerals, fruits contain many health benefiting substances. Some are discussed for their immuno-stimulating effects, but research on anti-oxidative properties of wild foods has only started in the last 10 years, accordingly information is still scant.

4.6.2.4 Saps from lianas

Without scientific evidence the author suggests that it is likely that saps from lianas contain high amounts of minerals such as Mg, K, P, Na, Ca, and easily soluble sugars. Indeed the nutrient composition of saps from lianas and palm trees can be estimated as being similar to that of modern sport drinks. References can not be provided here. When villagers report of a "refreshing effect", it might even be possible to suggest that some of the lianas contain energising substances. The lianas are used especially during hunting trips and when villagers are far away from water bodies.

4.6.2.5 Meats, fish, snails, shrimps, crabs, and insects

Wild meat compares favourably to that of domestic species. While the low caloric content of wildlife is pointed out as a comparative advantage in obese industrialised countries, this does not apply to the nowadays marginal Katu diet. While the Katu mammal meat averages about 200kcal, which is still a bit higher than the average for Thai beef (189kcal), it is much lower than that of Thai chicken (261kclal) and Thai pork (255kcal). However, when eating meat parts with skin, caloric content can increase up to 454kcal (ferret badger), which compares to the typical Thai dish of "three layered pork". This can also be assumed for wild boar meat, containing only 160kcal. Generally, the caloric content of toads, frogs, freshwater snails, crabs, and shrimps is lower than 100kcal. The average for Katu freshwater fish shows 129kcal, which is still a bit lower than the calculated average for wild birds (157kcal).

It has been argued that protein composition of fat-free, dry body mass is fairly constant. Reid *et al* demonstrated this for pigs, cattle, and sheep (Reid, Bensadoun et al. 1967). Given the relative constancy of the protein content of fat-free body mass, the energy density of a mammal's edible carcass is almost entirely dependent on the percentage of body fat. Except for the liver and possibly the kidney and tongue, there is virtually no carbohydrate available for consumption in the carcass of post-mortem animals. The average size of the wildlife will most likely influence the total amount of fat obtained. Therefore, larger and older animals will usually supply more total dietary fat than smaller and younger animals do on both a relative and an absolute basis (Cordain, Brand-Miller et al. 2000). With about 14g chicken meat and pork contain more fat than wild mammals do. Bear meat contains 13.4g, Sambar Deer 6g, wild boar 4.4g, rat 2g, and squirrel 0.4g. Snails, crabs, and shrimps are very low in fat (1.05-1.67g), while fish shows a fair amount (4.5g) which compares to that of beef (4.3g). Katu lizards show an unexpectedly high value of 6.4g, which is only slightly lower than the average for all mammals (8.3g). Linear and cubic relations between the percentage body fat, energy density, percentage of energy from protein, and percentage of energy from fat are universally apparent in vertebrates with only slight differences between phylogenetic orders. Conclusively, the major difference between domestic and game meat (muscle) is in the total amount of fat (Cordain, Watkins et al. 2002).

PUFA intake derives mainly from aquatic and insect species such as fish, frogs, arthropods, and caterpillars. The PUFA profile of the toad in particular reveals a very positive ratio of saturated to unsaturated fatty acids (see table 43).

Table 43 also reveals that the unsaturated fatty acids are the predominant fatty acids (>50%), with the exception of deer. Data from the toad is similar as to what has been indicated by the USDA for frog's legs, indicating C16:1, C18:1, and C18:2 as the highest fractions of unsaturated fatty acids. *Axiu cho*, the wild fish species with the highest consumption frequency in Kaleum, shows, with 50%, a higher fraction of unsaturated FA than promoted fish pond species such as *Nile tilapia* (boiled) with only 37% in 4.2 g total crude fat (Judprasong 1996:70). The fat content of aquatic animals however is quite low (range of 0.6-1.5 g/edible portion), so that the actual intake of unsaturated fatty acids is low as well (e.g. 37% fat in the toad is not more than 0.36g in 100g edible portion).

Table 43: Share of unsaturated fatty acids in total fat of selected Katu foods with total fat > than 1% (per 100g)

Fatty acid		Toad	Crab	Deer	Padek	Caterpillar	Fish
Myristoleic acid	C14:1	0.2	0.3	1.2	0.1	0.8	2.4
Palmitoleic acid	C16:1	3.0	2.2	3.7	10.5	7.2	11.6
Oleic acid	C18:1 (cis)	37.2	36.8	23.7	30.5	23.0	28.5
Linoleic acid	C18:2	13.6	12.0	1.4	11.1	12.2	0.0
Gamma linolenic acid	C18:3, n-6	1.5	1.5	0.3	0.0	0.7	6.6
Linolenic acid	C18:3, n-3	0.2	2.8	0.4	2.6	6.0	0.2
Eicosatrienoic acid	C20:3, n-6	0.9	0.5	0.0	1.1	0.0	0.3
Eicosatrienoic acid	C20:3, n-3	2.1	6.5	0.0	0.5	5.4	0.8
Eicosapentaenoic acid	C20:5	0.4	2.7	0.0	1.9	4.3	0.0
Docosahexaenoic acid	C22:6	0.9	0.1	0.0	3.7	0.0	0.1
% of total fat		60.0	65.4	30.7	62	59.6	50.5

Source: Own compilation

For deer, antelope, and elk Cordain *et al* have shown that total PUFA in bone marrow ranged between 5.8-6.2% (Cordain, Watkins et al. 2002). At the same time it was shown that the highest levels of PUFA were found in muscle tissue (29-31%) compared to marrow, brain and adipose, especially long-chain PUFAs such as C20:3 n-6, C20:4 n-6, C20:5 (Cordain, Watkins et al. 2002). Meats of wild ruminants compare favourably to domestic animals (Cordain, Watkins et al. 2002). Grain-fed beef contains 2-3 times more absolute saturated fat and 3-4 times less PUFA than game meat does (Cordain, Watkins et al. 2002).

Game is particularly rich in C18:3 n-3 compared with pasture and grain-fed beef. Wild birds also contain mono- and polyunsaturated fatty acids, namely 3.3g/1.7g respectively in partridge (roasted) and 5.6/1.6 g respectively in pheasant (Chan, Brown et al. 1995). For the partridge, Chan calculates[101] that 70% of the fat is unsaturated (24% PUFA, 46% MOFA) and 60% in the pheasant (13% PUFA and 47% MOFA).

Insects also contain a fair amount of unsaturated fatty acids. PUFAs have been identified in cockroaches, cicadas, locusts, and hornflies (Dadd 1968:107). Insects range from having low to high fat contents (from less than 10% to more than 30% on a fresh weight basis) and are relatively high in the C18 fatty acids such as oleic acid (C18:1), linoleic acid (C18:2), and linolenic acid (C18:3). Fatty acid composition shows a relationship to taxonomic grouping (DeFoliart 1991). Coleoptera (beetles and weevils) according to De Foliart, are particularly high in C18:2. That insects also contain C20 and C22 fatty acids has only recently become recognised (DeFoliart 1991).

The meat with the highest protein content is grilled lizard (48g). However, its low moisture content of only 34% may distort the picture. Thai beef meat only shows 35g (60% moisture). High protein values are also shown by wild mammals (28.4g) and wild birds (24g) both of which are higher than that of Thai chicken (22g), with even lower water content. The protein content of fish equals that of chicken with 23g, which is much higher than that of snails, crabs, shrimps and *Anura* spp., ranging around 15g.

Pork is a rich source of vit B_1 (0.55mg), which is a well-known nutritional principle. It is therefore interesting to see that wild birds also contain a high value (0.53mg), as do lizards (0.43mg). Here, sparrow and pigeon show a better profile than partridge and quail. Out of the wild mammals, wild boar shows the highest value with 0.3mg. Neglecting the vitamin rich giblets, bear meat shows the highest vit B_2 content with 0.8mg, followed by lizard

---

101 The author did not apply conversion factors to give the total fatty acids in fat, but set the total fatty acids as equal to the total fat. The conversion factor for poultry is 0.945 (Chan et al 1995).

(0.71mg), Sambar Deer (0.6mg), and freshwater crab (0.51mg). Wild pigeon meat contains an exceptional 1.2 mg of vit B_2, which is about nine times more than chicken (0.13mg).

Vit A rich meats are tadpole (745µg), freshwater fish (319µg), and quail (490µg). Domestic meats in comparison are low in vit A; beef (238µg), chicken (38µg) and with even less with pork and other wild meats. Beef liver shows an exceptional high value in vit A with 16,313 µg. Beef kidney is also rich in vit A (274µg), as are chicken giblets (4,800µg). Frog, marten, otter, and weasel meat are rich in folate. A high value of vit B_{12} can be found in martens, beaver, and otter.

Small aquatic animals such as fish, frogs, toads, water lizards, shrimps, and crabs are important Ca sources, especially when they are consumed with their bones and carapaces. This is of special importance since Ca rich legumes (e.g. lentils, chickpeas) and dairy products are not included in the Katu diet.

Laboratory analysis yielded exceptionally high Ca values for lizard (2,756mg), crab (5,266mg), small fish (1,327mg), and fermented fish (3,752mg), which are far higher than that for whole-milk (120mg). In comparison, domestic meats show much lower values such as with beef (9mg) and pork (8mg), lower even than the average for all vegetable groups. Chicken meat, however, often nibbled with its softbones, can yield values higher than 500mg. When wildlife including bony fractions is prepared and mashed in the traditional *tcheruak* the Ca content of the dish can be very high, such as with Sambar Deer (2240mg) and rat (944mg). Wildlife dishes without bones such as those made from bear or venison, show low Ca levels similar to domestic species. Insects consumed with their carapaces can be assumed to have high a Ca content, the *papoll* caterpillar however shows only 26mg.

Freshwater crab shows extremely high levels of Cu (2.49mg), which is equal to that of almonds, but outstanding in comparison to other meats, both domestic and wild. Freshwater fish is also rich in Cu (0.78mg), but not as rich as sesame seeds (1.17mg). Substantial amounts of Se are provided through marten, otter and weasel meat (43µg), followed by shrimp (40µg), snails (27µg), and pheasant (21µg), while other meats contain about 10µg only. Bear meat is incomparably rich in Zn (10.3mg), about double that of the serow (5.3mg), of the lizard (4.5mg), of freshwater fish (6.13mg), and of fermented fish (5.3mg) all of which are also good sources of Zn. Chicken and pork with 2.8mg and 1.5mg respectively are not good sources for Zn, and are indeed surpassed by many plant foods. The highest Fe values were found in Sambar Deer (24.1mg), tadpole (22.2mg), freshwater fish (10.7mg), partridge (7.7mg), and lizard (8.5mg), exceeding those of beef (3.8mg), chicken (2.0mg), and pork (1.4mg). A mean of the various mammals shows an average of 7.8mg, which is still higher than the mean of 5.1mg for giblets of beef and chicken (including blood).

In conclusion table 44 is presented to provide a summary of the nutrients for each food group.

Table 44: Key-nutrient profile for food groups in the Katu diet

Food groups	Subgroups	Key nutrients
Staples	Roots and tubers (wild and cultivated)	Carbohydrates, vit C, β-Carotene, K, vit B_1 and vit B_2
	Cereals (whole grain, hand-pounded)	Carbohydrates, vit B_1 and vit B_2, Fe, Zn, Ca
	Coarse grains	Carbohydrates, vit B_1 and vit B_2, Fe, Zn, Ca
	Bulky "filling foods" such as wild fruits, stems, ferns, etc.	Carbohydrates, β-Carotene
	Pulses (e.g. soybeans)	Protein, Ca, Fe
Vegetables	Wild leaves, leaf buds, pith, stalks, sprouts (raw, cooked)	Carbohydrates, β-Carotene, Fe, Zn, Ca – if pickled, vit B_{12}
	Cultivated vegetables (incl. flowers)	Carbohydrates, β-Carotene, Fe, Zn
	Mushrooms (wild)	Protein, Ca, Fe
	Flowers, pollen, nectars (wild)	Niacin, β-Carotene, Fe, vit C
Fruits	Fleshy fruits (wild and cultivated)	Water soluble vitamins (e.g. vit C, B-vitamins), Fe and special enzymes
	Oilseeds and nuts, oily fruits (wild and cultivated)	High fat (esp. PUFA) vit E, Ca, protein, Fe, Cu, vit B_6
Gums and saps	Palm and vine saps (wild and cultivated)	Vit C, Fe and other minerals
Fish	Freshwater fish	Protein, fat, niacin, Ca*, Cu, Fe, Zn, vit B_1, vit B_2
	Freshwater snails, crabs, shrimps	Protein, fat, Cu, Ca*, Fe, vit E,
Meat	Wild mammals	Protein, fat, Fe, Zn, vit B_1 and vit B_2, Folate, vit B_{12}
	Wild birds	Protein, fat, Ca*, Fe, Zn
	Amphibians, reptiles	Protein, fat, Ca*, Fe, Zn
	Insects	Protein, fat, PUFAs, Ca*, Fe, niacin, vit B_{12}
	Domestic animals	Protein, high fat, Fe, vit B_1 and vit B_2
	Animal lard	Fat

*If consumed with bones and carapaces.

Source: Own compilation

4.6.3 Nutrient intake

Due to the absence of Lao RDA levels, in this chapter the author wants to compare Thai RDA levels as outlined by the INMU in Bangkok, with contemporary Katu consumption patterns. For this purpose the identified consumption amounts for various food groups were multiplied by the mean nutritional values of each food group and related to current Thai RDAs. The necessity of using this "mechanical" approach has already been outlined in chapter 1.3.3.4. The data sets of KDM were inconclusive and are therefore not indicated in table 45[102].

Table 45: Overview of daily per capita intake of macronutrients (mean) of ten families

	Gross energy	Energy from rice	Crude protein	Plant protein	Crude fat	Plant fat	CHO
	kcal	%	g	%	g	%	g
NB-TM*	2,032.62	86	61.86	61.00	13.42	43.97	422.05
TK	2,326.19	82	64.22	69.00	11.17	64.80	485.88
TD	2,387.34	83	71.41	62.00	14.02	51.02	498.83

*Biased high consumption (see table 36).

Source: Own compilation

102 *The calculations per se confirmed the trend. Critical, however, was the very high discrepancy with RDAs.*

To begin with, it cannot be underestimated that nutrient intake might be severely hampered by several factors influencing bioavailability, such as extrinsic and intrinsic factors, and also diseases such as malaria, etc. In such cases, RDA levels have to be higher than standard calculations. The data presented here therefore can only be seen as overall trend.

What becomes clear in table 45 is that the contemporary Katu diet involves a moderate caloric intake, derived mainly from rice. At the moment about 61-69% of protein and about 43-65% of fat derives from plants; a profile typical for rural diets in developing countries. Carbohydrates provide a bulky share of 422-499g. The villagers of TD appear to have the highest caloric intake, as well as having the highest crude protein and fat intake. The results however are not that dissimilar for all three villages.

Table 46: Overview of daily per capita intake of vitamins and minerals (mean) of ten families

	β-Car	Vit B1	Vit B2	Niacin	Vit C	Ca	Fe total	Haem Fe	Zn
	µg	mg	mg	mg	mg	mg	mg	%	mg
NB-TM*	388.89	0.56	0.43	14.12	41.69	640.49	7.34	71.47	11.20
TK	860.84	0.77	0.64	19.40	114.03	1,218.52	14.72	62.63	15.17
TD	644.97	0.72	0.77	18.16	95.09	953.09	13.79	68.52	15.26

*Biased high consumption (see table 36).

Source: Own compilation

The β-Carotene, vit C, and Fe intakes for TK and TD are significantly higher than in NB-TM, almost double in fact (see table 46). The percentage of Haem Fe, however, seems to be higher in NB-TM, which is due to the biased high consumption of domestic meat due to livestock diseases. Villagers in TK and TD also seem to have a higher intake in vit B_1, vit B_2, niacin, and Zn. The Ca intake in TK is double as much as in NB-TM, which can mainly be attributed to TK's high consumption of small indigenous fish. Also TD villagers consume one third more Ca than villagers in NB-TM. This might be explained by the changing cooking methods; NB-TM women do not prepare foods in the traditional bamboo tube anymore (*tcheruak*).

Table 47: Ratio of macronutrients for energy supply (in %)

	Protein	Fat	CHO
NB-TM*	15.9	5.6	78.5
TK	14.9	4.2	80.9
TD	15.8	5.1	79.1
Total	14.8	4.6	80.6
National average*	10.8	10.3	78.9

*Biased high consumption (see table 36).

Source: Own data compiled with national average from the FAO online database FAOSTAT

As suggested in table 47 the energy ratio profile shows similarities to the national profile provided by FAOSTAT, but has a significantly lower contribution of fat. This dilemma can be attributed to the absence of the use of cooking oil and an increasingly smaller meat intake, especially in the case of wild meat. The author ventures to argue that in the past (Upper Kaleum), the ratio would have shown a lower contribution of carbohydrates and a higher contribution of protein and fat, mainly associated with rice scarcity - but also with a higher wildlife intake.

The comparison of the estimated requirements and consumption reveals an inadequate situation (see table 48). Only in TK and TD does the energy intake compare favourably to the estimated RDAs, with NB-TM slightly below the requirements.

Adequately evaluating the protein intake is difficult as we must know the exact body weights of all individuals. This data was only partly available. The results here are therefore calculated from the means of seven age groups (see Appendix 4). Using this method protein intake appears to be more than adequate in all three villages.

The Katu's low energy consumption is associated with their low fat intake. With an average intake of 4.6% fat, all villages are far away from the recommendation of fat making up 25%-30% of the energy intake. An average diet of 2,015 kcal would yield approximately 58g fat, but in TD, the village with the highest fat intake, they only take in 14g. Low fat intake is likely to result in a low absorption of fat soluble vitamins. The types of meats consumed also allow the assumption that the ratio of PUFA to MOFA is bigger than one. The consumption of about 10g frog or toad UMEP per day (with 1.7% fat), would yield 1.02g PUFA.

Table 48: Comparison of required RDAs (per cap in g)[i] and actual intake (% of RDA)

[i]Calculated as mean of ten families (both sex and all age groups)

		NB-TM (n=54)	TK (n=61)	TD (n=53)	NB-TM (n=54)	TK (n=61)	TD (n=53)
		Required RDA			Intake compared to RDA		
		g	g	g	%	%	%
Kcal	kcal	2,082	1,977	1,835	97.61	117.66	130.09
Protein	g	47.11	43.87	40.22	131.30*	146.39	177.54
Ca	mg	838.33	768.41	771.13	76.40	158.58	123.60
Fe	mg	19.37	17.16	16.47	37.92	85.78	83.70
Vit B_1	mg	1	0.94	0.88	55.73	81.77	81.69
Vit B_2	mg	1.04	0.98	0.9	41.04	65.38	85.48
Vit C	mg	68.71	66.51	61.02	60.68	171.44	155.83
Vit A	µg	614.81	588.1	558.49	63.25	146.38	115.49

*Biased high consumption (see table 36).

Source: Own compilation

In all three villages, Fe intake does not meet the recommended requirements. In NB-TM it is especially low, making up only 38% of RDA. In all villages, however, more than 50% of Fe intake is Haem-Fe, which has an absorption rate of 50% (Biesalski, Fürst et al. 1995:151). In TD and TK, sufficient vit C intake can be assumed at least to optimize the intake of Non-Haem Fe, whereas in NB-TM the low vit C intake might hamper favourable Non-Haem Fe absorption, which is only 5-10% (Biesalski, Fürst et al. 1995:151). Vit C is also known to reduce the negative effects of phytates and other ligands. The incessant smoking of the Katu further adds to this picture. Studies have shown that smokers only reach plasma vit C levels if they consume as much as 50% more than what is considered to be standard intake (Biesalski, Fürst et al. 1995:132). Vit C intake might be a highly seasonal affair, therefore highest in the month of augmented fruit consumption.

Vit B_1 intake is inadequate at an average of 82% in both TK and TD and 56% in NB-TM. Vit B_2 intake shows a similar picture, with only 85% in TD, 65% in TK and 41% in NB-TM. Vit A intake is more than adequate in TD and TK, but inadequate at an average of 63% in NB-TM. Niacin and biotin intake can be assumed to be adequate.

Ca intake only reaches 76% of the RDA in NB-TM, but is adequate in TK (159%) and TD (124%). Zn intake in NB-TM of 11mg, and of about 15mg in both TK and TD appears to be at the lower limit, although, there is no Thai RDA established for comparison. DGE recommends 15mg/d for adults, 20mg for pregnant and 25mg for lactating women and about 8-12mg for children (Biesalski, Fürst et al. 1995:156). Zn and vit A metabolism are interrelated in that Zn supports retinol-binding protein (CRBP) and is also an important factor in the immune answer (Biesalski, Fürst et al. 1995:156).

4.6.4 Conclusion

The analysis of the traditional and the contemporary Katu diet has shown that the traditional Katu diet of Upper Kaleum had been seasonally variable, diverse, and although never more than adequate, it was arguably still in the range of sufficiency. It was calculated that the contemporary diet is deteriorating towards inadequacy due to unbalanced ratios of food groups. As such, the traditional Katu diet witnessed before the onset of the war (although still reported to be practiced in Upper Kaleum) was fundamentally different from that of today. One of the most striking differences found is the contemporarily higher consumption of rice, but lower consumption of various species of wild and cultivated roots and tubers together with coarse grains, maize, and other starchy "filling foods". This was paralleled by the finding of lower wild meat consumption which could not be supplemented by domestic meat intake. Decreased meat consumption has coincided with the lower vegetable intake as forest vegetables were part of the cuisine, used not only as filling foods, but also as aromatic condiments for meats. The lower consumption of forest fruits and vegetables was found to have been continuously substituted by cultivated species. Taken together, it can be concluded that changes within food groups are much more significant than changes of food groups within the diet.

The results of the chemical nutrient analysis of 40 Katu food items alongside an extensive review of the literature, infer that the change in the Katu diet has not been favourable. Proximate nutritional values of staples show that the rice has the highest value for energy and protein, but unfavourably low values of Ca, Fe, and B-vitamins due to adverse processing. Comparing forest and domestic Katu vegetables, on average the wild ones show higher values of β-Carotene, protein, vit B1, vit B2, Ca, Fe, and Zn. With the lower consumption of fermented vegetables a good source of vit B12 has been lost, which has been further aggravated by the lower consumption of meat. The same is true for mushrooms, which are rich in B-vitamins, Zn, and Fe. On average the Katu forest fruits are far richer in Zn, vit B1, and vit B2 than the cultivated species, with the exception of β-Carotene where the opposite trend was observed. With the decrease in mammal meat the Katu diet is losing one of its only sources of fat, especially with the decrease in larger and older animals. This loss of protein cannot be made up by consumption of increased levels of OAAs. However, it would be wrong to infer that only big sized mammals show exceptional nutritional values. Meat from lizards, frogs, wild birds, otters, weasels, as well as insects and tadpoles all show good nutritional values. The vit A, Ca, and Fe content of small indigenous fish species also compares favourably with that of larger or domestic fish. The result of dietary change seems to be a lower intake of B-vitamins, Fe, Zn, Ca, fat and protein, although the caloric supply has remained fairly constant.

Taken together with the lower dietary breadth, the Katu diet is now less likely to provide all the necessary nutrients in adequate amounts. When comparing Thai RDA levels with contemporary consumption patterns it becomes clear that in TD and TK the diet is not high in calories, but still within the level of adequacy for protein, Ca, vit C, and vit A. This contrasts with NB-TM where the diet (with the exception of protein) does not reach any of the RDAs, even with a biased high intake of domestic meat[103]. On average the most critical nutrients are Fe and B-vitamins. As long as OAAs and meat are prepared in the *tcheruak*, Ca intake is likely to be sufficient.

103 *During the times of food recalls many domestic animals died of diseases.*

4.7 The Katu health and nutritional status

Structurally, as presented in chapter 2.1.3, the nutritional status can be seen as the outcome of dietary intake and the health status. The previously presented continuum in the disruption of the food chain, in the increase of culinary monotony, and in the lower dietary intake applies neither to the assessed Katu health nor to the nutritional status. Therefore we can assume that there are other intricate relationships which cannot be identified using the current methods of analysis. In particular, the extent to which the health situation influences the nutritional status needs further investigation. The discussion here is therefore only a preliminary one. Moreover, the anthropometric data presented here only reflects the situation in the dry season. Usually this is a month with a high level of food uncertainty.

4.7.1 Change in the Katu health status

In general, the villagers perceive that there are more diseases today than in former times. It remains unclear if this is due to increased knowledge, romanticism for the past, or an increasing spread of vectors. The perceived change in the overall health situation is presented in table 49. All villagers claim that "*in Upper Kaleum we have been strong without eating a lot of rice and without a supply of Western medicine. We could drink unboiled water and had few stomach problems*". Nevertheless the traditional health situation was characterised by many epidemics. All four villages evoked the memory when up to 80 people died due to epidemics (probably cholera), up to ten people per day. In KDM a villager recalled "*you witnessed one death during the night, left your house in the morning, and when you came back home, three more people had died*". Usually, the epidemics showed a ten year cycle and were especially strong in 1945 and 1954.

Table 49: Perception on changing health situation

		1960s	early 1970s	1980s	1990s	1999	2000	2001	2002 and 2003
NB-TM	n=10	Good	Moderate	Moderate	Bad*	Bad	Bad	Bad	Bad
KDM	n=10	n.d.	Moderate	Good	Good	Moderate	Moderate	Moderate	Bad
TD	n=10	Good	Good	Moderate	Moderate	Good	Good	Good	Moderate
TK	n=10	Good	Good	Moderate	Moderate	Bad	Moderate	Moderate	Bad

*Reported epidemic for the mid 1990s.

Source: Own compilation

All four villages claim that nowadays people die younger, which villagers in KDM and TK basically relate to increased levels of tuberculosis, or what they identify as *pot haeng*. The teacher in NB-TM attributes this to the use of agrochemicals used in agriculture and also to the contamination in the environment. "*Before the onset of the war, our physical fitness was much better*", he pointed out.

After the war many villagers did indeed suffer direct affects from chemical intoxication, such as from Agent Orange containing 2,3,7,8-TCDD. After the years of bombing various new health problems were noticed. According to the villagers there was the onset of *pot haeng* together with other infections of the upper respiratory tract, increased frequencies of diarrhoea and dysentery, short stature[104], and post-delivery problems e.g. as failure to discharge the afterbirth. Some children also started to limp and some developed night blindness.

[104] *The author has no means of verifying these accounts; however, meeting the village head of TP was a stunning encounter with a man at least 1.9m tall.*

Only in TD do villagers claim that there is no big difference between the health situation of the past and the present. In 2002 however there were outbreaks of conjunctivitis[105], skin rashes, and eczema. In TK in the year 2002 even young people died from what first seemed to be ordinary diarrhoea. The villagers reported the same trend for adjacent villages. The ranking of the major contemporary diseases is detailed in table 50.

Table 50: Ranking of major diseases[i)]

[i)]Only those diseases for which the villagers know the proper Lao term are listed so that the author was able to identify the English name. Especially in TK, many villagers could not describe the various pathogens and were confused with various overlapping symptoms of probably 2-3 causal diseases.

Ranking	NB-TM	KDM	TK	TD
Major disease	Diarrhoea*	Malaria**	Diarrhoea*	Malaria**
...	Malaria**	Diarrhoea*	Malaria**	Diarrhoea*
...	Stomach ache	Trachoma/conjunctivitis	Tuberculosis	Trachoma/conjunctivitis
...	Trachoma/conjunctivitis	Dysentery	Headache	Skin rashes
...	Tuberculosis	Stomach ache		Flu with fever
...	Flu with fever	Tooth ache		Coughing (not Tuberculosis***)
...	Urinary infections	Tuberculosis		
...	Night blindness			
Minor disease	Gynerae (vaginal discharge)			

*Especially from January until February and then again from May to June.
**Especially from April to May.
***Only one case of TBC, which ceased in 2003.

Source: Own compilation

As mentioned before, the health situation has a clear seasonal pattern. The natural breeding cycle of malaria mosquitoes as well as other water borne diseases, together with the lower temperature in the dry season months, insufficient clothing, and lack of blankets, etc. cause cyclic flu and fevers. Villagers state that they are increasingly suffering from 'forest fever', which is likely to be malaria.

In Sekong, malaria strains of both *Malaria tropica* and *vivax* are found. The infection rate in the province is one of the highest in the country (Gebert 2004). A special conundrum is malaria during pregnancy, which also affects the child. The developed immunity against malaria stops after the first or second pregnancy (Gebert 2004). In TD and TK the surrounding forest belt, dissected by various water bodies, can be related to a potential risk of infection with malaria. In NB-TM and KDM, wetland rice production systems are potential nearby mosquito breeding areas. Children are especially vulnerable to malaria[106]. The high number of infections through malarial parasites is an important issue to be considered for the nutrient intake. An increased meat intake does not necessarily translate into higher Haem Fe availability (see Gebert 2004).

The women in NB-TM mentioned that they are increasingly suffering from vaginal discharge. Other studies in Laos have found that when switching from bathing in the river to washing under a jet of water in GFWS, the incidence of vaginal infections increased (p.c. R. Dechaineaux 2004). What is not listed in table 50 is that women are now suffering severely after having given birth; as a result there are many cases of post-maternal deaths.

Women recognise that frequent births make them weak and vulnerable. Frequent pregnancies are known to negatively impact the nutritional status of the mother, which in turn has an effect on the baby's birth weight and cause mal- and undernourishment. But only few women practice birth control. Some women in NB-TM and KDM have started to

---

[105] *Eyes are very swollen with facial oedemae. Affected villagers were not able to work in the fields and had to rest at home.*

[106] *Firstly, in the presence of guests, it is often the children who are excluded from sleeping under the mosquito net. Second, often children fall asleep not in their parent's houses. Thirdly, many of the children up to age of five have no clothes, resulting in a higher risk of exposure. At high risk times, such as shortly after sunset or shortly after sunrise, it is also children who go for frog hunting in the mosquito prone wet areas.*

take oral contraception or to use injections. In Kaleum such practices have failed to be accepted; the concept of condoms is almost unknown in TD. The wish for birth control, however, is very high.

In Upper Kaleum, the women never discard their colostrum, as is still being practised in TK and TD. In NB-TM, some women have recently adapted from outsiders the practice of discarding it, starting breastfeeding only the second day after delivery. Those mothers having problems with sufficient milk production give pre-chewed rice. Breastfeeding in most cases lasts more than six months, sometimes up to three years.

Other issues frequently mentioned were "*today women have to rest a long time after giving birth. In the past, they drank hot water in the bamboo tube and rested for only a few days. Now, the women are much weaker*[107]. […] *Nowadays everyone bathes daily, but we have many health problems. In the past, there were periods during which we did not bathe for 2-4 days*".

According to the villagers in Upper Kaleum parasites used to be easily discharged. Now they observe that parasites remain longer in the body. "*In the past, we could easily defecate the worms. Today, even Mebendazol (500mg) does not help*". Tests should have done to see if there are anti-helmitic properties in any of the traditional food items. Villagers do assume that pumpkin seeds and some wild fruits have such properties. However, the increased intake of glutinous rice with its high content in amylose (see also chapter 4.6.2) might also have contributed to this phenomenon.

Table 51: Infection with parasites (in %)

	NB-TM	KDM	TK	TD
	n=82	n=129	n=62	n=99
Ascaris lumbricoides	42.7	57.4	51.6	63.6
Anclystoma duodenale	22.0	48.8	25.8	22.2
Trichuris trichuria	0	31.0	12.9	36.4
Ophisthorchis viverrini[108]	1.6	0	0	0

Source: Own compilation

Today - as has been shown in the health survey - all villages suffer from very high rates of parasitic infection as can be seen in table 51. The highest infection rate is found with roundworm (*Ascaris lumbricoides)*, followed by hookworm (*Anclystoma duodenale)* and whipworm (*Trichuris trichuria)*. In the health survey the team did not test for other species. Significant differences for women and men were not observed. The parasitic infection rates are similar to the national levels of infections with *Ascaris lumbricoides* (54%), *Anclystoma duodenale* (30%), and *Trichuris trichuria* (21%). For the Sekong Province, there is not a single study.

Until now liver fluke infections (*Ophisthorchis viverrini)* have been almost nil, but are likely to increase with the escalating consumption of raw minced fish (a practice adapted from the lowlands, see 4.5.2).

The level of multi-infections is very high which is likely to reduce the Katu's bioavailability of nutrients. The author therefore assumes that as long as parasitic infections together with malaria, diarrhoea, respiratory infections, etc. prevail, even nutrients from a balanced diet will not be able to be utilised for biochemical body functions. In Venezuela however it was

107 Traditionally, the women delivered their babies in the forest, with the umbilical cord being cut with a bamboo knife. This is still practiced by 100% of the women in TK and TD, since it is taboo to give birth in the house. Nowadays however in NB-TM and KDM, some women have started to give birth on the village ground, in close vicinity to the house, preferably under a tree. A common practice is to cut a papaya into two pieces and press on them with the feet. In the past, an infusion of herbs was drunk for pain relief and muscle relaxation.

108 The liver flukes are biologically similar, food-borne trematodes which chronically infect the bile ducts and, more rarely, the pancreatic duct and gall-bladder of human beings and other mammals. Infection is acquired by eating raw or undercooked freshwater fish which contain the infective stage (metacercaria) of flukes.

shown that there was no correlation between the number of species parasitising an individual and nutritional status (Holmes and Clark 1992). Apparently, referring to their work in 1984, populations have adapted to the parasites in their environment (Holmes and Clark 1992). For the Katu and other ethnic groups in the Lao PDR, this issue needs further investigation.

Unhygienic behaviour appears to be the main reason for the Katu's high rates of parasitic infection, despite having some basic knowledge on oral faecal transmission. Villagers however do not know how to put this into practice. Their knowledge pool is very patchy; elements of knowledge are not interrelated. The invisibility of bacteria, germs, etc. poses the main conundrum. Outside the village, contact with contaminated soil might (picking fruits fruits) carry the risk of infection from wild animal diseases e.g. tapeworms. Other vector carriers can be the faeces of civets, macaques, muntjac, or deer.

Most of the households boil their water in the house, but not if they are going to the field. When not contaminated with animal excrement, it is reasonable to assume that the little mountain streams in Kaleum still provide safe drinking water, even when consumed unboiled. In TK when river water dries up, and the water is choked with algae and bacteria, some families are adept at using riverbank filtrates. Those families, who do not use filtrates, were reporting skin rashes, itching, and stomach problems. In NB-TM and KDM it appears that even water from the pump well is not safe; villagers are assuming that the water is "dirty". The frequent break downs of NB-TM's water pumps also often force the villagers to use dirty canal water. But given the usage of safe drinking water, the "kitchen" water is seldom taken from safe water places, often being used unboiled for the washing of vegetables, crockery, and hands.

Toilets are only used in KDM. The ones installed by UNICEF in NB-TM are slowly being accepted, while in TK and TD toilets are lacking. Animals roam freely in the village enabling vectors of various diseases to be easily diffused through animal excrement. The introduction of human excrement as a fertilizer, as seen in KDM is further increasing the risk of parasitic infection.

While these issues are also found elsewhere in Laos or Southeast Asia, two other individual factors in particular might be influencing the Katu health status. This is firstly the Katu's excessive levels of smoking and secondly, the long-term impacts from chemical detergents from the war which are likely to impact their overall health - and particularly their immune system.

Smoking is deeply embedded in the culture of Austro-Asiatic groups, as in: "*the Katu cling to their habits as part of their struggle to preserve timeless traditions*" (Pennington 2001). The elderly, adults, and children over four or five years are addicted to excessive smoking, so are pregnant and breast-feeding women. In the absence of sweets, the Katu highly appreciate the taste of the tobacco boiled with sugarcane juice, or with peel from pineapple, banana, or from other fruits. The heavy smog in the houses alone often causes headaches, both amongst the Katu and their guests. The Katu build long pipes out of bamboo, some up to one metre long, which they carry everywhere, even out to the fields and the forest. Every adult has their own pipe.

As suggested in the chapter 4.6 various medical studies have shown that smoking is known to reduce levels of plasma vit C. Moreover, high levels of infectious diseases and communal sharing of the pipe[109] might be interrelated (e.g. that of tuberculosis). When entering a house, the Katu custom stipulates the offer of sharing the pipe (*aro kok*). In TD, there were only two non-smokers, in TK none. Due to the unsuitable soil for tobacco production and the low availability of large bamboo trees, people in KDM and NB-TM

[109] *Usually a group of three sit together, with the one in the middle offering the pipe to his neighbours. Usually, little children have to light the pipe with new charcoal and bring it to their parents, friends, or guests.*

appear to smoke less. There, tobacco has to be partly purchased at the market. To the author however, the crucial point is that it is the very young children who smoke, not the adults. That this is not a Westernised imperative is substantiated by the fact that in Upper Kaleum, young children did not start smoking excessively before the age of ten years. In the last few years, many parents have unsuccessfully tried to wean their children off smoking.

The author hypothesises that the Katu are still suffering from health impairments from the long-term effects of the war. HANDICAP emphasised the need to undertake further studies regarding the impact of defoliation, since current information "*was found to be inconclusive*" (HANDICAP 1997). The best known defoliant is Agent Orange, a herbicide mixture included 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), which was contaminated with various levels of dioxins, mainly 2,3,7,8-trichlorodibenzo-p-dioxin (TCDD) and furans (Hatfield 1998; Stellmann, Stellmann et al. 2003). In Viet Nam , the total spray volume from planes is estimated to have contained 366kg TCDD, not including sprays used by trucks, boats, hand sprayers, and helicopters (Stellmann, Stellmann et al. 2003). For Laos, the data remains highly inconclusive.

From all known PCDDs (dibenzo-p-dioxins) and PCDFs (dibenzofurans), the 2,3,7,8-TCDD is defined the most toxic (Narbonne 2000), and has caused much detriment to health (Schecter 1994; WHO and IARC 1997; Narbonne 2000). 2,3,7,8-TCDD is known as a human carcinogen, other acute effects reported are chloracne, porphyria cutanea, liver dysfunctions, respiratory and neurological disorders, increased diabetes susceptibility, and changes in lipid parameters. There is also an ongoing controversial discussion on the hazards of terratogenity, birth defects, abortions, thyroid dysfunctions, etc.

Although there is no scientific evidence the author contends that the Katu's immune system might still be impaired from TCDD and congeners. For TK, she observed odd skin diseases which she relates to potential defoliant contamination, especially at the beginning of the rainy season[110]. Many villages in Kaleum reported miscarriages, natal abnormalities during and after the war, etc. Some pointed out that buffalos had been born with 2-3 claws and other anatomical abnormalities. During the war, one family in NB-TM has lost ten of their 12 children within months. Others claim that the consistently high number of albino buffalos (*khuay don*) can be connected to continuous toxic exposure. Consumption of its meat is tabooed by various ethnics especially for women during pregnancy. Many villagers were also directly exposed or sprayed "*like rain from the sky*".

Besides direct contact, there is the consensus that the greatest risk for human contamination is through the food chain (WHO and IARC 1997; Schecter 2001). Schecter (2001) hypothesises that a major route of current and past exposure is chemical movement from the soil into the river sediment, then into fish, and from fish consumption into people. For the Katu, intake from wildlife, which preys on fish, poses the main risk.

Generally, animals' fatty tissues are the most significant carriers of 2,3,7,8–TCDD and other congeners. Some scientists argue that contamination levels would certainly trigger prohibitions against consumption if they were from a location in western jurisdictions (Hatfield 1998). One single sample of fish fat taken in the bordering *Aluoi* valley in Viet Nam held up to 53.7ppt (TEQ[111]). Hatfield refers here to a study by Quynh[112], summarising the concentration of 2,3,7,8-TCDD in fish fat dating back to 1970, values

---

110 It appears that with elevated water levels, some contaminant detergents are cyclically unleashed into the water, causing skin rashes and immuno difficulties. The phenomenon commences with the rainy season in May and ceases with the rainy season's end in October.

111 TEQs, or toxic equivalents, are used to report the toxicity-weighted masses of mixtures of dioxins.

112 Quynh et al (1994). First results on the transfer of 2,3,7,8-TCDD iton nature and its persistence in the human body in south Vietnam (p.81-91). In: H. Cau et al (Ed). Herbicides in war – The long-term effects on man and nature. 2nd International Symposium. Hanoi, 10-80 Committee, Hanoi Medical School 1998.

ranged from 18ppt to 540ppt. Schecter *et al* (2003) hypothesises 2,3,7,8-TCDD levels of up to 810ppt in the past. In a recent study a marked elevation of 2,3,7,8-TCDD in meats was found, including ducks with 276ppt and 331ppt wet weight. Values for chickens ranged from 0.031-15ppt (wet weight) and for fish from 0.063-65ppt; there was also a toad with 56ppt.

Total TEQ in lipids for ducks ranged from 286 to 343ppt (wet weight). Values for chickens were from 0.35 to 48ppt (wet weight) or 0.95 to 74ppt and for fish from 0.19 to 66ppt or from 3.2ppt to an extreme 15,349ppt in their lipid. In the toad they found 11,765ppt in their lipid. Usually, TCDD levels in food are less than 0.1ppt (Schecter, Quynh et al. 2003) and according to WHO total daily intake for fish, should not exceed 4ppt TCDD/g wet weight or 2ppt for fish oil respectively.

Hatfield's detection of elevated levels of dioxin in the younger generation's blood (14.3-37.2pg/g TEQ in the lipid basis) provides evidence that the environment is still contaminated today, and that dioxin is still moving through the food chain (Hatfield 1998: Appendix see tab 4.4). This is supported by Schecter (2001), who found elevated TCDD blood levels around Bien Hoa (South Viet Nam) and up to 217ppt, including persons new to this region and in children born after the war.

4.7.2 Change in the Katu nutritional status

The Katu raise the question "*what is the difference between families who eat the same food, but some come out healthy and some do not*". The data however shows that in terms of stunting, wasting, and being underweight, no clear trend can be deduced (see table 52).

Table 52: Incidence of stunting, wasting, and being underweight (in %)

	Z-Score*	NB-TM	KDM	TK	TD
		n=43	n=100	n=17	n=37
Stunting	HAZ ≤ -2	50.5	63.6	31.3	59.4
Wasting	WHZ ≤ -2	4.8	10.1	37.5	8.1
Underweight	WAZ ≤ -2	23.8	50.5	46.6	37.8

*Indicating a Z-Score below -2 standard deviation of the median value of the Thai reference population.

Source: Own compilation

The levels of stunting are highest in KDM and TD, and moderately low in NB-TM, which is however still above the national average of 41% (GOL 2001a). To date no conclusive evidence exists to explain the differential levels of stunting between TK and the other villages. On the other hand, TK shows the highest rate of wasting, eight times higher than in NB-TM and almost fives times higher than in TD. With the exception of TK, levels of wasting were found to be lower than the national average of 15% (GOL 2001a).

As already stated in chapter 3, ethnic minorities in Laos are highly vulnerable to mal- and undernutrition. Nevertheless, a GTZ study on the nutritional status of ethnic minorities in the uplands of the Luang Namtha Province revealed that during the course of project work, stunting dropped from 69.3% in 1998 to 58.6 in 2001, wasting dropped from 6.0% to 3.7%, and being underweight from 54.0% to 43.8% (Kaufmann 1998).

Table 53: Incidence of vit A deficiency (in %)

	NB-TM	KDM	TK	TD
	n=128	n=87	n=69	n=78
Night blindness	0	0	0	0
Coronea change	0	0	0	0

Source: Own compilation

The doctors in the health survey could not identify any clinical symptoms of vit A deficiency such as coroneal xerosis or Bitot spots (see table 53). The survey did not identify cases of night blindness. Until now, Laos has been a country with low levels of vit A deficiency. This situation, however, could change rapidly if dietary patterns continue to transform negatively.

Table 54: Incidence of iron deficiency (in %)

	Haem blood level	NB-TM	KDM	TK	TD
		n=101	n=125	n=69	n=73
Marked anaemia	6-7 g/dl	0	0	0	0
Mild to moderate anaemia	8-11 g/dl[113]	11.9	8.0	28.9	2.5
Not anaemic (upper limit)	12 g/dl	71.3	84.0	62.3	90.0
Not anaemic	≥ 13 g/dl	16.8	8.0	8.8	7.5

Source: Own compilation

Forms of mild to moderate anaemia were identified in all villages as indicated in table 54. But haemoglobin levels of under 6-7g/dl as for marked anaemia were not found. The lowest levels of anaemia were found in TD and the highest in TK. In total, the vast majority of villagers were not anaemic at all. This situation compares favourably to the national averages which show 27.4% of the population to have levels lower than 11g/dl, (30.2% for rural areas).

Table 55: Incidence of iodine deficiency (in %)

	NB-TM	KDM	TK	TD
	n=101	n=125	n=69	n=79
Grade 01	11.9	4.8	7.2	7.6
Grade 02	4.0	2.4	1.4	1.3

Source: Own compilation

Palpation revealed that there were some cases of goitre in all villages, mainly the women as can be seen in table 55. The overall levels of goitre were however low and were classified as grade 01 or 02. Incidences of grade 03 were not identified in the sample. In the past, villagers reported that in Upper Kaleum there were only ever a few cases of women with enlarged thyroid glands. Proper analysis of thyroid stimulating hormone or of thyroxin would reveal whether any iodine deficiency disorders (IDD) were prevailing. In many countries it has been shown that low goitre levels do not necessarily coincide with the absence of IDD.

To summarise, the present nutritional situation including high levels of stunting and wasting can be partly seen as a failure to adapt to changes in the food chain and cuisine and because of an increased susceptibility to infectious diseases. This is based on the finding

[113] *In all four villages, no haemoglobin values were lower than 10g/dl.*

that the villagers of TD who almost meet their RDA might have factors other than nutrient intake impacting upon their nutritional situation such as health related factors. This contrasts with findings in NB-TM, where a lower nutrient intake might be buffered by better health - or by access to medicines especially for malaria. For Northern Laos, Kaufmann suggested that when an improved nutritional status occurs it is not necessarily an outcome of a better dietary intake but rather one of a better health status (Kaufmann, Phanlavong et al. 2001; FAO 2003a).

4.7.3 Change in the belief system

In the past, the Katu did not establish a clear causality between diseases and their physical behaviour. Explanations for diseases were tied to unbalanced spiritual powers, i.e. that certain spirits had been offended.

In all four villages there is no clear concept of what causes parasitic infections, malaria, diarrhoea or other diseases. There is also enough evidence to suppose that those individuals, who are able to point towards a scientific explanation for diseases, have only a very eclectic understanding. Increased knowledge happens more through repetitive problems and treatment, rather than through a true understanding of the problem or its context. To give an example, in TD, most of the villagers claim that malaria is most likely to be contracted during their activities in the forest and fields. There is also the idea that there are malaria prone water bodies. Drinking such water or bathing in them is believed to infect people. The idea of contracting malaria whilst in the village is not widely known.

Table 56: Traditional Katu medicine of animal origin[i)]

[i)]Information derived from two sources only: Ajan Vipon and TD villagers. Usage in other Katu villages is therefore not necessarily congruent so e.g. with the work from Sulavan, Kingsada *et al* (1995).

Animals	Usage
All primates	Bones and cartilage are boiled into gelatine.
Ant nest	The nest is put on the wound of a snake bite.
Bear	Blood, gall bladder, oil.
Bintorung	Dried gall bladder in hot water provides a strengthening tonic for women after having given birth.
Elephant	The skin of the elephant is dried, finely ground and dissolved in hot water together with lemon and *hin som* (if available) as a treatment for urinary infections. Parts of the tusks are finely ground and then dissolved in water and used to alleviate tooth ache.
Flying Lemur	Burnt hairs from the fur are pulled out and put on strained muscles. It also stops bleeding.
Gaur	The horns are not used, but some other body parts for soothing a kind of neurological disorder (*jaa pen pasat*).
Pangolin*	Scales are grounded and dissolved in water and put on burns. Recently, the solution has also been consumed to alleviate headaches.
Porcupine*	The black parts from the quills are ground and dissolved in hot water as a treatment for stomach ache. The white parts are discarded. The mouth of the stomach is also used for stomach problems, but is grilled before.
Sambar Deer	As with the tiger a jelly is produced from the bones. Consumption is taboo for children. As with the Little Mouse Deer the usage of the Sambar Deer's horn is only a recent phenomenon.
Serow	Used body parts are tongue, feet, gall bladder, stomach content, and bone marrow (*trrlong cheluang*). Horns, blood, liver, skin, and dried bones as used by other ethnic groups are still not considered to have medicinal properties. In 2001, villagers started to use the serow's excrement.
Tiger	Bones and paws are boiled into a gelatine-like jelly, which is then dried and could be dissolved in *lao lao* or hot water to create an energizing tonic, both for men and women. The gall bladder is also dissolved in *lao lao*.

*The author suggests that this is not genuine Katu, but has somehow been adapted over the years.

Source: Own compilation

In the traditional Katu medical system, the preventive momentum was stronger than the curing one. For example they used various animal extracts, which the author would classify as food rather than medicine[114] (see also table 56). Additionally, there was - and still is - the view that rice makes one strong, in a sense of "providing life" but that is was meat that was sustained one's physical strength. Many people still believe that after the slaughtering of livestock, it is not the subsequent consumption of meat, but the ritual offering, which invites a rapid recuperation. Today, mainly rice soup (*khao piak*) or chicken soup are viewed as energy providing dishes.

The Katu have not developed a strong body of traditional medicine and any medicine they have is mainly based on wildlife. The low elaboration of traditional medicine amongst the Austro-Asiatic groups was also observed by Baird (1995). Comparing the Katu idea of traditional medical knowledge with that of some the Sino-Tibetan or Yao groups, Dr. Viengxay corroborates Baird's initial finding. This finding supports the idea that the Katu enjoyed better health in the past, the corollary of which clearly resulted in their need for fewer treatments.

In the distant past, the Katu's traditional usage of wildlife for medicine was limited to a few animal species and a few selected body parts. Information from outsiders has however expanded the knowledge pool, so that at present more animals body parts and species are used. But it is now taboo to hunt most of the species listed in table 56. In the past, the purchase of Western medicine was an unknown concept and unavailable to all those who had not been in contact with the French or engaged in wage labour. Western medicine was first introduced by soldiers during the Viet Nam War. This was at a time, when the first signs of reduced wildlife populations were being seen.

Today most of the diseases described remain untreated. Villagers are negotiating between new access to Western medicine (perhaps accessible health services) and the traditional belief system. If available, traditional medicine is tried first, because it costs nothing. In the case of someone being hospitalized, they or their family face a huge bill when they return to the village after convalescence (see also chapter 4.4.2 for expenditures). People in all of the subject villages told stories of families who had sold some of their assets after sickness or were in debt, as a result of medical bills, or by tradition were still obliged to perform a ritual slaughter of a buffalo or cow.

Despite the fact that the overall acceptance of modern medicine is very high throughout all the villages, only in cases of severe illnesses are strong efforts undertaken to reach medical services. Moreover in Kaleum most villagers do not have access to medical services. In the rainy season many villages are barely accessible, which often means that the sick are left isolated because nobody is able to handle a stretcher in the currents of the streams or rivers.

Health facilities in Sekong's provincial hospital are very basic and even worse in the district health stations (see table 57). Depending on the level of geographical isolation, the frequency of visits from the health department also varies[115]. As with other GOL institutions, the health department lacks a sufficient number of educated personnel and also basic equipment for diagnosis and treatment. Tuberculosis e.g. which is widespread in Kaleum, cannot be diagnosed. Villagers suffering from severe cases of malaria have often to be admitted to the provincial hospital in Sekong town, from where many patients are transferred to Pakse or Vientiane. In all four villages however standard vaccination campaigns are continuously being conducted. The system of the village medicine bag (*tong jaa)* has also been installed in all four villages. In TK however, no villager has ever been trained as a health volunteer.

---

114 In the past for example the Katu relished soups made from bones and cartilage. Depending on the size, one tiger carcass could yield up to 10-20 kg of bones. These were often boiled into gelatine.

115 While in KDM staff from the health department come more than five times a year, its staff only visits TD maybe twice a year. NB-TM, although still close to Sekong town, is seldom visited by the provincial staff. Instead, people from the neighbouring village's health station pass by 1-4 times per year, to do health checks and to conduct medical interventions - but without professional supervision from the province.

The deterioration of traditional explanations and medicine is being mirrored by a lack of comprehension of the new medicine imported from outside. Villagers are being left in a vacuum for negotiating proper treatment. In NB-TM, the village head reasoned that his rheumatism problems were due to the location of his wetland rice field, which is allegedly located on the tomb of a child. To induce healing he provides little offerings such as sweet foods to the child's spirit.

Table 57: Overview of new health facilities

	NB-TM	KDM	TK	TD
Access to health facilities	a) 1 Suksala* b) Provincial hospital	a) 2 Suksalas* b) Provincial hospital	a) District health station	a) District health station
Village medicine bag (*tong jaa*)	Yes	Yes	No	Yes
No. of village health volunteers	2	2	0	3
Safe water supply	2 Pump wells **	5 Pump wells ***	0	1 GFWS
School	Yes	Yes	No	Yes
Toilets	Mainly unused	51	No	No

*Small health care centre with basic medical supply, but often closed and understaffed.

**One is broken, the other one needs frequent repairs necessitating external support.

***But villagers claim the water is "dirty".

Source: Own compilation

The lack of access to new medicine and treatment has supported the trend of sticking with the old belief system. New medicine can often not be afforded. When new medicines were tried out however there have been many cases of intoxication, since villagers deliberately changed the dosage ("*the more the better*"), or mixed up various medicines, etc.[116]

4.7.4 Conclusion

Combing the data of the previous chapter with the results of the health survey supports the argument that in the years to come the Katu will be at the edge of a far more pervasive nutritional dilemma. The people in all of the villages show high levels of stunting, wasting, being underweight and parasitic infections (*Ascaris lumbricoides*, *Anclystoma duodenale*, and *Trichuris trichuria).* Low levels of anaemia and iodine deficiency disorders were identified. Vit A deficiency was not detected.

It is instructive that negative dietary change can be ascribed in particular to the two villages which are apparently more "modern", and which have the easiest access to infrastructure, markets, and governmental services. There, the lower nutrient intake might only be buffered by a better health system or by access to medicines. The two villages in the forest, away from the lowland societies, show a more acceptable nutrient intake, but factors other than nutrient intake probably have had an impact on their nutritional situation. These could be, for example, disease, excessive smoking and a continuous exposure to potential sources of dioxins, furans or other congeners from the war.

The health data set helps to expose current lacunae but has only a tentative cast; many intricacies remain therefore unknown. Further anthropological and health analysis is required. Thus far, accepting the accounts of the elderly Katu, the overall health situation has declined. Epidemics are absent now, but the villagers are increasingly suffering from what might be malaria together with infectious diseases (upper respiratory infections such as tuberculosis, etc.). It became clear however that the disruption of the traditional belief

[116] *The author once witnessed the village head of TD simultaneously taking, alongside other pills, maybe five Paracetamol and two Chininsulfate, desperately believing that this cocktail would bring his fever down. In KDM, the daughter of the village head mistook medicine for sweets and died from an overdose.*

and medical systems, coupled with inaccessible health services, has left the villagers in a vacuum regarding how to cope with new diseases, which spread rapidly. It appears crucial that good food and nutrition are available in order to prevent further diseases and physical impairments.

CHAPTER 5: EXTERNAL DETERMINANTS OF THE KATU'S DIETARY CHANGE

Chapter 4 has shown that change in the traditional Katu food system has been taking place on a continuous basis. This transformation has manifested itself by a disruption of the food chain and increasing culinary monotony. In turn, this has resulted in decreased food variety, and a nutrient intake below the recommended level. The established research framework which was presented in chapter 2 (figure 2) accommodated four external influencing factors. These were assumed to indirectly impact the Katu food chain and the cuisine. In the following chapter these external determinants will be investigated. Subsequently, chapter 6 will address whether the Lao food security concept applied by the GOL and the development institutions sufficiently have address these underlying causes of dietary change.

5.1 PAST BIOCULTURAL ADAPTATIONS

The Katu's past biocultural adaptations, as expressed in their knowledge of shifting cultivation, hunting and gathering edible forest products (food chain level) as well as in their culinary behaviour (cuisine level), are coming under more and more stress. In NB-TM and KDM, villagers have already lost some of this knowledge, including the related techniques and skills attached to them. At the same time, villagers are not able to respond to new and emerging circumstances. As a result, failures such as in *naa* production, in repairing GFWS and water pumps, etc. are becoming increasingly menacing. Fall backs are especially harsh, if formerly used techniques have failed to be contained.

It appears that maladaptation poses a major threat. Until now, the adaptation of new elements in the food chain and in cuisine has not made up for the loss of traditional Katu knowledge. Customary practices still show the highest resilience to cope with uncertainty in the food system. Ergo: the risk for uncertainty in food supply and in culinary practices is burgeoning.

In cases of rice shortage, for example, only in TD are separate cassava gardens being maintained. It is also only in TD where villagers can potentially draw from a broader staple variety. With regard to other food groups only in TD and TK are many of the wild RTs, vegetables, and fruits still many known and available. This trend is being accelerated by an increasingly pejorative attitude towards RT consumption, which is propelled even further by the adopted concept of rice security. With the decreased availability of wild meats, villagers have not yet been able to adapt to alternative sources of protein and minerals. The current Katu cuisine has few recipes for non-meat dishes. The Katu don't know how to best prepare vegetables. This goes together with the fact that many of the younger generation do not know how to prepare wild RTs, mushrooms, or other edible forest products, thus increasing the risk of poisoning.

It is hoped that the practice of incorporating new seeds and species into the planting material will be maintained. However, only for TD and KDM villagers, visiting the relatives in TP and KD provides the opportunity to exchange seeds. In this sense, TP and KD constitute a kind of "knowledge box", to be drawn from. Set backs, such as the loss of seeds, can therefore be made reversed. Seeds of species lost in NB-TM and TK, however, are irretrievably lost because villagers there have no relatives in the Kaleum District, where traditional varieties and species have not yet ceased being planted.

With regard to the generation of new knowledge, increasingly, information from outsiders such as traders, poachers, Vietnamese, and Lao lowlanders is incorporated. However, there exists the dangerous situation that this new knowledge cannot be verified. New practices are often adapted without being understood. The adaptation of new ideas is especially dangerous for women, because only a few of them are able to speak Lao which excludes them from the benefits of information exchange. It is safe to assert that knowledge provided by relatives who have returned from external wage labour, etc. is more easily adapted. With the generation of new knowledge, the Katu language is rapidly changing. At school there is no bilingual education. With the loss of the Katu language, the knowledge of species and their concomitant usage is disappearing. Only the elderly can still recall the full spectrum of traditional Katu plant and animal resources which can be used.

The disappearance of traditional Katu rules and attitudes in relation to food and nutrition, as well as the loss of social ties also affects the ability to cope with uncertainty in food and nutrition. Increasingly, reciprocal ties between individuals and kinship groups - on which the traditional food system has been based - are being broken up. As indicated in table 32, in the past, support by relatives in case of food shortage ranked first, whereas today, some families are not supported by their relatives at all. With the lower availability of wildlife families are also becoming less able at sustaining their kinship bonds through the sharing of meats. As a result, the poor strata of families especially are becoming increasingly vulnerable. With fewer festivals possibilities to benefit from the occasional provision of meat are diminishing even further.

To summarise, the argument surfaces that the traditional Katu bio-cultural adaptation has changed mainly due to negotiations with the GOL and their policies. Theoretically access to markets and governmental services, availability of land for wetland rice production and having the access to an income are becoming more important for the current generation. However, if new means of food acquisition continue to respond poorly to geographical and biocultural necessities: i.e. if the Katu further adapt to the lowland way of living and abandon their traditional knowledge, it is likely that their capacity to respond to the dynamics of dietary change will decrease substantially; assuming reasonable alternatives are not provided.

5.2 Local environmental conditions

The condition of the Katu's local environment and their agroecosystem respectively, is of crucial importance for the Katu's food acquisition and income generation alike. Degraded forests in NB-TM and KDM now harbour few wild animals, fish, OAA, or edible forest products or other NTFPs. This contrasts with the pristine forest patches in TK and TD which provide higher biological diversity resources. Only in TD does the ratio of animal "sources" to "sink" (for definition see footnote 51) still appear to be balanced, with animal kill rates maintaining a stable trend.

The fact that TD has the best forests by comparison with the other villages is also reflected by the number of edible fruit trees[117], which provide fruit but also safeguard various mammalian, avian, and aquatic species. Villagers in TK claim, for example, that the low populations of Red-shanked Douc Langur (*Pygathrix nemaeus*) in their region are due to the absence of the appropriate fruit trees. Lower populations of arboreal animals such as flying squirrels might also be the result of a lower tree density.

Accordingly, wildlife consumption is significantly higher in TD and TK than in NB-TM and KDM. Also, the latter villages show between a twofold and threefold higher per capita income than NB-TM and KDM do. Undisturbed forest areas further support agricultural production in TK and TD. Conversely, NB-TM and the rest of Lammam suffer from a hot climate, impacting on fruit and vegetable production. In all villages, however, environmental change is apparent in varying degrees.

[117] *With the one exception of the forest mango, which is reported to grow better in the lower plains.*

Logging

Table 58 provides an overview of logging activities conducted by outsiders entering the village areas. To the author's knowledge none of the villagers were ever engaged in the timber trade.

In NB-TM, excessive logging took place in the 1990s, although this practice has significantly decreased over the past five years. However, a state sawmill has been operating close to the village for a while and, since 2004, two new ones have opened, mainly exploiting woods such as *may chik, may dou, may seuap, may hang*, and *may tae*. Additionally, the GOL has flooded some high quality forest area in order to create a reservoir to enable irrigated rice production, and also to attract Lao tourists to the aquatic resources. Until now, the reservoir has not been used: neither for rice production, nor has any tourist ever visited the village. Instead, the area of arable land has been reduced, and villagers are concerned about alien encroachment, including the start of timber extraction in the still pristine *phu ba* area (e.g. through underwater logging as happened in other places of Laos).

In KDM logging activities were taking place before settlement. Between 1990 and 1992, a two year concession was granted to a Vietnamese company to extract *mai dou* (*Pterocarpyus macrocarpus*), *may khen* (*Hopea sp.*), *may bak* (*Anisoptera cochinchinensis*), and *may nyang* (*Dypterocarpus sp.*) under the Forestry Department Sekong (Goudineau 1997). The author herself recorded the period of 1994-1995, which let assume that after the expiration of the concession, logging continued.

In TD, the author observed the first logging activities to have ever taken place there. In 2003, some illegal logging of *may ketsana* (*Aquilaria spp.*) by a Vietnamese company was witnessed. Villagers of TK claimed that neither in the past nor the present have any logging activities taken place, though illegal logging activities are continuing to increase in adjacent areas. Some illegal Vietnamese loggers were seen by the author herself erecting camps in various forest patches of Kaleum District.

All in all it is the villagers who are losing out. Besides the destruction of the forest ecosystem, illegal logging has prevented the villagers from gaining any monetary benefits from legal logging due to an intricate system of rent seeking[118]. An example is detailed in the food note.

Table 58: Logging activities in the village areas by outsiders

	1980	1990	1998	1999	2000	2001	2002	2003
NB-TM	None	Heavy	Heavy	Heavy	Reduced	Reduced	Reduced	Reduced
KDM	None	Heavy	None*	None	None	None	None	None
TD	None	None	None	Starting	Starting	Starting	Starting	Starting
TK	None	None	None	None	None	None	None**	None

*Excessive logging in the early 1990s did not leave much valuable timber to exploit further.

**Logging has been practiced close to the district area since 2001, but only at a moderate level.

Source: Own compilation

The extent of this logging remains unknown. As mentioned before in the last few years the official logging quotas have however been exceeded (see WWF 2003). It also reasonable to

118 *E.g. the case of Aquilaria spp (eagle wood) in TD: A Vietnamese company paid in Vientiane 500,000 Kip, in the Sekong Province 70,000 Kip and in the Kaleum District only 50,000 Kip as "tax". The villagers, however, were not been properly compensated, despite being promised 10,000 Kip per logged tree. When they inquired, the Vietnamese claimed, that they had not received any cash from their bosses to pay the villagers. At the same time, the Vietnamese (since they were sleeping in the forest with almost nothing) came regularly to buy alcohol, chicken and pigs (goats are too expensive), etc. When asked if the police got notice of the unfair conditions, the villagers claimed, that even the District police have problems in receiving their money, because it is first transferred to the Province.*

suggest that logging in the Lao PDR does not follow the code of practice for the Asia-Pacific (FAO 1999). Various studies in tropical forest areas worldwide have shown that the decrease of wildlife populations in logged forests could possibly be reversed if logging would follow alternative practices such as those which Fimbel describes in his book "Cutting edge. Conserving wildlife in logged tropical forests" (Fimbel 2001).

Shifting cultivation

The GOL intends to ban shifting cultivation for the sake of forest conservation by 2010. Now, all villagers are obliged to reforest in fields formerly used for shifting cultivation: annually, one hectare has to be replanted with 2,000 teak trees, under the threat of a 50US$ fine. All villagers do see the need to protect their forest areas, but are under heavy population and production pressures. From the notes in chapter 2 it is clear that a reduction in the fallow period poses the major conundrum in today's shifting cultivation systems. The change in the four villages' fallows is outlined in table 59.

Table 59: Change in fallow periods (in years)

	1960s	Mid 1970s	1980	1990	1998	1999	2000	2001	2002
NB-TM	10-20	7-10	5	5	5	3	3	2-3	2-3
KDM	15	15	15	15	1-3	1-3	1-3	1-3	1-3
TK	15-18	15-18	10-15	10	5	5	3-5	3-5	3-5
TD	10-15	10-15	10-15	10-13	10	4-5	4-5	4-5	4-5

Source: Own compilation

The Katu's traditional long fallows averaging about 10-15 years cannot be sustained anymore[119]. For many families in KDM and NB-TM, the major impulse for reducing their fallows was the introduction of the concept of land tenure by the land allocation scheme. Further investigation is needed to explore the contemporary sustainability of the Katu shifting cultivation systems. Up until now, the only view on these systems is the polarising one at national level, with the main faction claiming that the current shifting cultivation systems are unsustainable and should be abandoned.

Fertilizers and insecticides were not used in the past. A couple of years ago, however, some families started to mix their rice seeds with E 605 in order to keep ants and birds away. Accordingly there is a serious danger of environmental and human contamination - a fact entirely unknown by the villagers.

Wildlife trade

Before the advent of the Viet Nam War, the majority of the Katu were not engaged in any form of wildlife trade. In Upper Kaleum, the Katu were opportunistic subsistence hunters; a way of food acquisition kept up by most men to the present day. Meanwhile, selective hunting by outsiders is increasing (including by poachers from Viet Nam). If other means of income generation continue to fail, in the future it is likely that some Katu villages will also get involved in the organised wildlife trade. The author witnessed several cases of people coming into the villages and providing bullets (e.g. four for a hornbill) and a commission for the successful hunting of animals. Contracting villagers for selective hunting has long been practice in Lammam[120]. The greatest risk, however, appears to be posed by the increasing force of the international wildlife trade resulting in less hunting

---

[119] *Roder (1997) reports that generally in the Lao PDR fallow periods decreased from 38 to five years.*

[120] *E.g. an outsider orders the villagers to shoot a muntjac, provides the hunters with bullets or money to buy some (2,000 Kip for each bullet) and comes back after 2-3 days to check if they were successful. Increasingly, villagers are being unable to fulfill to their contracts due to lower wildlife populations.*

being done by the villagers for themselves, which has an obvious effect on their food security.

At the Sekong market, wild meats are still far cheaper than domestic meats - ranging from 15,000 to 18,000 Kip/kg - which is opposite to other parts of Laos. Between 2002 and 2003, the author recorded mean wildlife prices: e.g. one Serpent Crested Eagle for 10,000-15,000Kip, muntjac 20,000 Kip/kg, cuts of dried Sambar Deer 15,000 Kip/bundle, fresh Sambar Deer 18,000 Kip/kg, medium-sized Clouded Monitor 15,000Kip (max. 20,000Kip for large-sized one), small civet 10,000-13,000Kip/kg, python 15,000 Kip/kg, etc. Trade monitoring, which is being carried out in other areas rich in biodiversity in Laos, is not taking place in Sekong, where the application of the GOL laws and the Prime Minister's decrees are very obstructive. The excessive wildlife trade at Chong Meck (which is a 5 hour bus tour away from Sekong town) has been monitored by WWF and TRAFFIC (Baird 1993; Nash 1997).

Ecosystem imbalance

Traditionally, insects have been a major menace to food supplies such as a) the insect *sah*, especially from April till May after sowing, b) beetles (e.g. *ayum kadarr*), c) worms (*parui*), d) crickets (*arid*), and e) bugs (*ayum aniz*). As well as insects, squirrels, rats, wild birds - such as the *Fringillidae* species - and porcupines also damages crops.

Nowadays, in NB-TM and KDM the destruction of rice and cassava crops by wildlife was noted by the villagers as a major problem in *hai* production. Cassava destruction for example by wild boars amounted to 300-400kg per family in NB-TM in 2002. As such, wild boar populations were not an endogenous problem related to shifting cultivation, but rather a question associated with environmental degradation. Wild boar populations have risen sharply in NB-TM and KDM due to the greatly decreased population of big cats (*Felidae* species). At the same time, villagers reported being unable to hunt them.

Nowadays in *naa* production, crabs and domestic animals[121] are adding to the damage. In KDM, elephants are causing considerable losses regarding banana and sugarcane production, estimated to be around 30% of the total harvest. To ward them off, KDM villagers attempt to use a "magic plant", which they acquire from KD. The village head states that it "*makes the elephants unable to see the crops he feeds on*". The augmented trend of conflicts with wild animals has also been reported for other provinces such as Khammuan and Luang Nam Tha (p.c. A. Johnson, WCS 2004).

Hydropower dams

For Sekong, there is a plan by six Vietnamese state-run power and construction firms to construct five hydropower dams. These plants would be the 340-megawatt Sepian Senamnoi, the 300-megawatt Sekamang 1, the 55-megawatt Sekamang 4, the 310-megawatt Sekong 4, and the 200-megawatt Sekong 5 (p.c. I. Baird 2003). The one intended for the Kaleum district would completely flood Kaleum village and the adjacent areas.

If these plants are approved by the GOL, access roads will provide carte blanche for logging and illegal wildlife hunting; and it is likely that the proposed inundation will threaten the livelihoods of many people even further. There are also plans for gold mining and titanium extraction (p.c. Vice Governor Kaleum 2003).

---

121 Paxay's buffalo contribute significantly to TK's production loss and have frequently been the reason for arguments between the villages TK and PX. In the past, problems like this have often been brought to the Katu villagers' council (sum arez) and solved fairly, often through the payment of a fine. In KDM the small land size adds to the picture.

UXO and other impacts of the Viet Nam War

One of the most limiting factors in the Katu rice production is finding suitable land uncontaminated by UXO, making clearance essential. Almost everyday when firing the farmland, bombs and other UXOs explode, posing a threat to the Katu and to domestic and wild animals.

Between 1961 and 1971, during the Viet Nam War, herbicide mixtures were sprayed by the forces of the United States and the Republic of Viet Nam for military purposes. This resulted in deforestation and the destruction of crops, especially rice[122] (Stellmann, Stellmann et al. 2003). It is estimated that over the course of the 580,344 bombing missions during the war, more than 2 million tons of ordnances were dropped (GOL 2000a). Because some areas were sprayed more than once, and indeed up to four times in upland forests, Sekong suffers from very high levels of UXO contamination, with the most affected areas being those nearby the main trail of the former Ho Chi Minh supply network (UXO 2000). Indeed, 670km^2 of the land in the Sekong Province is contaminated, half of which is upland rice fields (UXO 1999; 2000).

Where the former Ho Chi Minh trail network passes through TD, contamination is very high, as it is in TK. During transect walks near TD and TK the author also sighted various highly explosive projectiles. On a more positive note however, UXO contamination in NB-TM is almost nil and in KDM it is very low. While in TD, UXO clearance commenced with SEP DEV activities, TK cannot expect to get support from anyone. UXO clearance is far more expensive than rural development activities and it is highly time consuming.

There is no consensus about the extent of spraying missions in the Lao PDR. The Services-HERBS[123] file shows flight paths for 210 missions, which sprayed about 1,8 million litres of herbicides. This information differs however from other, e.g. Lao sources (GOL 2003a). The Hatfield study focusing on the Vietnamese border district *Aluoi,* which borders Upper Kaleum, and is in close vicinity to the former village TM, indicates that Agent Orange - and to a lesser extent Agent Blue and Agent White - were the principle herbicides applied (Hatfield 1998).

Even today it is unclear exactly how and to what extent, the exposure to dioxins, dibenzofurans, and their congeners have affected the environment. In chapter 4.6.2, the effects of 2,3,7,8 –TCDD on human health have already been already discussed.

As a side note, it is grotesque to observe that from the end of the Viet Nam War until today, scrap metal has been an important source of income (1kg for 0,50US$ as for 2004). Villagers also place their dead into the big B52 bombshells, which serve as coffins.

5.3 PROCESS OF NATIONAL INTEGRATION

Today, internal political and economic forces are increasingly introducing factors which compete with and make the Katu's past biocultural adaptations less effective. The attitude of the GOL is that minority groups must change their traditions and become more like the mainstream in order to truly develop. As part of this process, the Katu are being assimilated into the majority population of the lowlands, while the traditions that used to mark them out are withering away. Major determinants in this context are the abandonment of shifting cultivation and the concomitant introduction of wetland rice production. The overall attitude towards ethnic minorities - and the policy of integrating

122 Spraying covered about 10% of South Vietnam (Hatfield 1998), but also parts of Laos and Cambodia. In Laos, this was mainly the territory below the 17th parallel (Stellmann, Stellmann et al 2003).

123 The National Academy of Science's files containing flight path coordinates of Air Force spraying missions.

them into the market economy - also constitutes major factors which will influence the development of the Katu food chain.

5.4 INTEGRATION WITH REGIONAL SYSTEM

Access to roads and markets

Access to markets and governmental services has been hailed as the main precursor for development. However, as shown in sections of chapter 4, access to roads in KDM and NB-TM has not proved to be particularly beneficial. Villagers are not travelling frequently to markets, either to buy supplies or to sell surplus foods.

For Kaleum it can be argued that inaccessibility has prevented the extraction of natural resources from both TD and TK. There is solid evidence to assume that with increased access into Kaleum, extraction of timber and NTFPs, along with hunting of selected key species, would commence without any benefits to the villagers (as has been shown by Marris, Hedemark *et al.* 2002). Road construction may result in a substantial loss of habitat and heavy soil erosion, as well as acting as barriers to mammalian dispersal. Despite the lack of gravel roads however, the Vietnamese have known to use the former Ho Chi Minh trail for poaching and logging.

In Sekong Province, road construction is being undertaken by a Malaysian construction company. Research has revealed however that this company is in actual fact a logging company. Expanding road construction is not only increasing accessibility to non-existent markets and governmental services, but also allowing outsiders to hunt more. Ideas of conservation as included in the land allocation scheme are therefore being turned on their heads. Projects like SEP DEV and ACF cannot touch upon such issues since their activities are sector based in rural development.

As long as there are only a few services available in Kaleum, limited food supplies for sale (at excessive prices) and a lack of money amongst the Katu, the opening up of isolated areas is likely to do more harm than good.

Land tenure

Land allocation phase 1 has already been conducted in all four research villages; phase 2 however has only been started in NB-TM and KDM. There, family plots have already been allotted. In NB-TM only those families with good soil and potential access to water for irrigated rice production seem satisfied with the land allocation phase 2. The unsatisfied families are those who have land but with bad quality soil, which they say is infertile (see table 60).

Table 60: Families' satisfaction with land allocation phase 2 of all villagers (% and real)

	NB-TM*	KDM	TK and TD
Satisfied	5 (13%)	135 (88%)	Phase 2 not yet started
Unsatisfied	26 (65%)	11**(7%)	Phase 2 not yet started
No land at all	9* (22%)	7***(5%)	Phase 2 not yet started
Total	40 (100%)	153 (100%)	Phase 2 not yet started

*The official status is that allocation is not yet finished.

**Due to water supply.

***Newly arrived families and families who have separated have not received their share.

Source: Own compilation

There are also some families who have no land at all, because the GOL has not provided alternative land where it has flooded parts of NB-TM's village area. These families are being forced to look for land by themselves and are continuing to practice shifting cultivation. Ergo, the idea of abandoning shifting cultivation and commencing land allocation has delivered varying results (this trend has also been shown by ADB/SPC/NSC 2001).

Additionally, outsiders are deliberately destroying such forest patches marked out as conservation forest. According to the villagers, the zoning of production forest (*pa palid*) has not worked out, since its extension was mapped on a far too small scale. Before the land allocation in 1997, NB-TM villagers claim that "*some families were rice sufficient and some were even able to sell excess rice. We could go anywhere and had better access to the remaining wildlife resources. Now we have plenty of fish in the reservoir, but it is forbidden to fish there. At the same time, because of all the bark from the sawmill in the water a lot of fish are dying.*"

Land allocation phase 2 has not yet started in TD and TK. The villagers have been provided with scant information about imminent procedures. TK villagers explained that they are looking forward to finalise phase 2 due to the prospect of selling their land.

If this happens, as it has in other parts of Laos, it is questionable whether other means will be sufficient to prevent the emergence of a food crisis. With the deficient state budget (see chapter 3.3) in the Lao PDR, the government is increasingly trying to exercise control over peripheral mountain areas in order to have access to natural resources to obtain cash. It is likely that the land allocation schemes will be used to channel local villagers away from areas potentially rich in natural resources.

5.5 Conclusion

Using the framework from Huss-Ashmore and Thomas (1988) the author has shown that the Katu food system is externally determined by four salient forces, namely a) the Katu's past biocultural adaptations, b) the environmental condition of their habitat, and the forces of c) national and d) regional integration. Increasingly, these factors are slipping out of the Katu's control (directing dietary change, see table 61). It can therefore be inferred that the Katu have to blend their opportunistic rationale for food selection with external development ideas.

Past bio-cultural adaptation is becoming less and less important, as the Katu are increasingly dependent on outside forces, including the search and acquisition of new knowledge modules (e.g. looking for alternatives for the practices of hunting or identifying new ways of generating income generation). Local knowledge on shifting cultivation, hunting, gathering edible forest products and other NTFPs, food selection, manipulation, customary rules, etc. - as a backbone of biocultural adaptation- was observed as being lost at a rapid pace. As a consequence, the Katu are now relatively vulnerable and unable to reverse unfavourable trends.

Table 61: Estimation of significance of main determinants

	NB-TM	KDM	TK	TD
Past biocultural adaptations	Low	Moderate	Strong	Strong
Environmental condition of local habitat*	Low	moderate	Strong	Very strong
Integration with regional system	Moderate	Moderate	Low	Very low
Process of national integration	Moderate	Strong	Very low	Low

*In the sense of potential forest food resources and overall ecological benefits.

Source: Own compilation

The environmental degradation and the loss of ecosystem balance appear to have reached a level whereby the Katu are now unable to intervene, such as with getting control over wild boar populations, over encroaching elephants, or over new strains of livestock and crop diseases. In addition, the Katu's lack of political clout prevents them from having any influence over the decisions that effect their diet - such as logging, poaching, and other causes of the destruction of their habitat.

Attempts at national integration have shifted to "national control" (e.g. the inadequate implementation of the land allocation, the ban on shifting cultivation and on customary practices). With regard to the disadvantages of "regional integration" it is evident that the emerging affiliation with the cash economy is likely to act counterproductively on the Katu food chain, rather than providing monetary or other tangible benefits (e.g. exploitation and disadvantages in marketing).

Maximising rice production serves as the new backbone for underlying food selection criteria. Consequently, through land allocation, together with production and population pressure, the customary principles of food maximization are soon likely to be annihilated. Nowadays, access to infrastructure and services - including markets and formal education - serve as the external assumption for food security. These external assumptions however ignore the subtle concept of maximizing energy and the transformation of knowledge on indigenous food, not to mention the spiritual dimension.

Taken together, the forces for national integration together with the interaction of regional systems and evolving market commodities appear to suppress the Katu's own potential for cultural innovation and occur at the expense of the local environment.

Chapter 6: Recommendations and final conclusions

6.1 Realising positive dietary change

In this chapter the author will submit proposals aimed at initiating positive dietary change with a view to arresting the processes which are causing the Katu's current negative dietary change (see figure 9). From the results presented in the previous chapters there is still an underestimated potential to reverse the negative trends.

Referring to figure 4, negative dietary change should be redirected towards new positive dietary change.

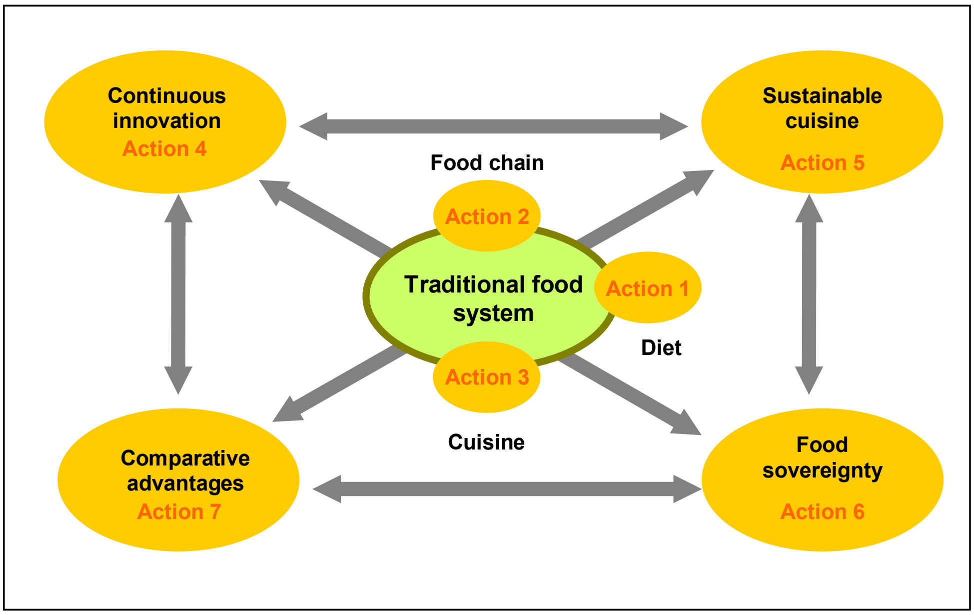


Figure 9: Pedigree with different action levels for realising positive dietary change

Source: Own production

As was argued in chapter 2.6, positive dietary change is the precursor for achieving sustainable food security. Firstly, the author will provide food-based recommendations fundamental towards increasing or sustaining nutrient intake. Recommendations will also be proposed for optimising the food chain and more innovatively, the cuisine. Secondly, the author proposes that the external influencing factors which were identified as having a negative impact on the Katu food system should be reversed. In this vein the author will detail four requisites which are necessary in order to put the food-based recommendations into practice. The Lao food security concept will be discussed in the final conclusion (chapter 6.3). Recommendations for improving the health system are also essential, but this would be far beyond the scope of this work.

6.1.1 Dietary recommendations

From the analysis of dietary change it was safe to surmise that in all four villages there existed the potential to improve the nutritional status by increasing the nutrient intake. In order to arrest negative dietary change at least some of the Katu's traditional biological and cultural diversity resources should be retained. The following theoretical considerations which are summarised in Table 62, should be further investigated. The recommendations are given in relation to the current preparation techniques described in chapter 4.6.2.

Reshuffling nutrient intake through different manipulation techniques, combinations, etc. will be detailed in chapter 6.1.3.

From the argumentation surrounding the Katu cuisine and nutrient intake, the idea surfaces that the dualistic concept of meat and rice should be expanded into a dynamic trilogy of staples, meat, and fruits/vegetables. This idea is supported by the nutritional principle that for a balanced diet, a sufficient intake of various foods is crucial.

Clearly, extrapolation for all Katu villages (or other ethnic groups) should only be judged after a careful study of the local conditions.

Table 62: The Katu's current[i] consumption trend and recommendations for change

[i])Based on the last five years, not on Upper Kaleum

Food groups	Current trend	Desired trend
STAPLES		
Roots and tubers	Decreasing	Increased intake
Rice	Increasing	Reversing further increased intake*
Corn	Increasing	Increased intake
Starchy "filling foods"	Decreasing	Increased intake
Pulses (e.g. soybeans)	No consumption	Reviving intake
Coarse grains	No consumption	Reviving intake
VEGETABLES		
Wild vegetables	Decreasing	Increased intake
Cultivated vegetables	Increasing	Increased intake
Mushrooms	Decreasing	Increased intake
FRUITS		
Fleshy fruits	Increasing	Stabilize trend towards sustainable intake
Seeds, nuts, oily fruits	Decreasing	Increased intake
FISH		
Freshwater fish (wild)	Increasing	Stabilize trend towards sustainable intake
Freshwater snails, crabs, shrimps (OAA)	Increasing	Stabilize trend towards sustainable intake
MEAT		
Wild mammals	Decreasing	Reverse further decrease towards sustainable intake
Wild birds	Decreasing	Reverse further decrease towards sustainable intake
Amphibians, reptiles	Decreasing	Reverse further decrease towards sustainable intake
Insects	Consistently low	Increased in relation to culinary acceptance
Domestic animals	Increasing slowly	Increased intake
Animal lard (extracted)	Decreasing	Dependent on the trend for large-bodied mammals
OIL		
Vegetable oil	Consistently low	Large increase

*If preparation is not changed.

Source: Own compilation

6.1.1.1 Focus staples

In the Katu diet there is neither a marked shortage of calories nor of staples. From a nutritional point of view, however, a further increase in rice consumption should be prevented if the current preparation techniques continue to prevail. This is mainly to reduce the risk of vit A, vit B_1, vit B_2, Ca, or Zn deficiency. If mechanical rice milling continues to increase in NB-TM and KDM, additional action will be necessary in order to substitute for the milling loss (especially B-vitamins).

Besides focusing only on rice, there is also the possibility of returning to the traditional high variety of staples. It should be investigated in order to calculate if the Katu would be ready to accept millets and RTs back into their diet. Millet is a cereal with exceptionally high Fe and Ca content (see chapter 4.6.2). The RTs with low protein levels can be improved by mixing them with a cereal, e.g. rice or millet, or eating them with high protein foods such as fish or meat (FAO 1988). Good sources of lysine should be promoted (e.g. fish) as rice shows a low amount in this amino acid.

6.1.1.2 Focus vegetables

Attempts should be made to increase the overall vegetable intake. Focus on vegetables is a neglected food frontier all over Asia (Ali and Tsou 1997). The decreased consumption of wild vegetables especially should be arrested. In terms of vitamins and minerals some of the wild Katu vegetables provide higher amounts of both than domesticated species. This goes along with the greater diversity of forest species, which are more likely to cover a wider range of nutrients. Domestic vegetables should however also be eaten more frequently. The introduction of vegetable mashes such as pumpkin, squash, or green leafy vegetables simmered in the traditional *tcheruak*, could yield a highly nutritious weaning food. In general, it would be favourable if vegetables were incorporated as the third part of the Katu cuisine. A revival of lost vegetable species (e.g. *mak seuweu*) and an extended domestication of wild species (e.g. mushrooms, bamboo, *aneng*) would provide a broader flavour base to tempt acceptance by the villagers. Chapters 4.5, 4.6 and Appendix 1.1 provide a range of species to work on. In order to optimise the absorption of β-Carotene it should be tested to see if the Katu would approve of new recipes which mix vegetables and vegetable oil.

6.1.1.3 Focus fruits, seeds, and nuts

Fruits should be incorporated into the Katu diet more, as main food. An increased or stable fruit intake is recommended in order to support a sufficient vitamin and mineral intake. An increased fruit intake should also increase the absorption of non-haemoglobin iron - due to the catalytic function of vit C. Attempts should also be made to revive the former practice of topping dishes with peanuts or roasted pumpkin, cucumber, or sesame seeds. The Katu should be informed that this is not only for the taste but also in order to provide “health benefiting ingredients”; basically minerals and PUFAs. This work provides a variety of species to work on. New fatty fruits such as avocado, or *mak khay* (indigenous to Laos but unknown to the Katu) which have a high nutrient density (see Appendix 2), could also be tested for taste acceptance.

6.1.1.4 Focus wildlife, domestic meat, fish, OAAs, and insects

An increased or a stable meat intake should be given high priority. Until now, with the Katu’s derogatory view towards vegetables, there are few other non-meat options available that provide: protein, fat, zinc, and iron. Ca, vit B_1, and vit B_2 intake especially is crucially linked to wildlife intake - in particular fish and small mammals - prepared in the *tcheruak*. Overall fish is an important crucial element in the Katu diet, since it supplements rice which is low in lysine (see IIRR, IDRC *et al.* 2001:53). The traditional consumption of selected insect species should also be retained - or increased. This recommendation however needs close analysis in terms of the Katu’s cultural acceptance. In chapter 4.6.2 it has been shown that insects have outstanding nutritional values. In terms of alternative plant protein sources it could be tested to see if the Katu would revive the former practice of occasionally mixing soybeans with rice, e.g. for children, pregnant and lactating women, and for people in phases of convalescence. In summary, it is crucial to retain the variety of meats consumed such as from avian, terrestrial, and aquatic animals, together with insects with their different nutrient profiles. Nota bene the nutritional quality of domestic animals compares unfavourably to wild species (see chapter 4.6.2).

6.1.1.5 Focus vegetable oil and condiments

The use of vegetable oil has not yet been established in the Katu cuisine despite the high propensity for fatty foods. Until now, fat has almost exclusively been provided through meat, fish, insects, and nuts. It should be tested to see if the Katu would accept the use of vegetable oil for soups, *soup phak*, braising meat, mushrooms, etc. (see also focus vegetables). The combined higher intake of vegetables and oil might help to reduce the risk of vit A deficiency through increased bioavailability of β-Carotene.

As chemical research has shown, the traditional Katu means of flavouring such as vegetable salt, fermented vegetables and ash amongst others show high nutrient values, especially regarding minerals (the Katu salt contains 5,542mg Ca, 163mg Fe, 22mg Zn, and 1.77mg Cu per 100g) and vit B_{12} (10.5μg per 100g in fermented mustard greens). Tests should therefore be carried out to see if the Katu would accept the retention of some of their traditional flavouring principles.

6.1.2 Recommendations for the food chain

The greatest challenge is to find "alternative ways of food acquisition" when the Katu's agroecosystem starts to fail. This could be due to further population increase and shorter fallow periods as well as due to an improper implementation of the land allocation scheme. This problem could be exacerbated by the fact that the hunting of key species is mainly tabooed, that wild forest and vegetables are becoming more difficult to find, and that market commodities as well as the income generation are not working properly.

Until now the purchase of foods has been almost nonexistent, and this situation cannot be expected to change in the near future. In Kaleum especially, the possibility of meat purchase is irrelevant due to the distance to the markets, the lack of supplies in the markets, transport, and storage difficulties. In chapter 4.6 we have seen that the total off-take of wildlife can theoretically not be substituted by domestic meat. In TK, TD and areas where wildlife consumption is still high, ways have to be found to maintain sustainable consumption levels. This includes mammals, birds, fish, and OAA. However, great care has to be taken to prevent the risk of overharvesting fish and OAA due to decreased amounts of large-bodied mammals (p.c. I. Baird 2004). As it is unrealistic to assume that the Katu would slaughter much more of their livestock for daily meat consumption[124], ways of "mini-livestock" production should be tested. This could include the farming of insects, OAAs, or small mammals such as rats or bamboo rats. While there have not been many extensive studies completed in Southeast Asia, agricultural extensionists could draw upon experiences in biodiversity rich countries in South America (e.g. Ecuador, Guatemala) or Africa.

In order to increase vegetable intake, sheltered vegetable production[125] in the rainy season could be introduced. Attempts could also be made to domesticate some of the wild fruit and vegetables species (as has already happened with the bamboo) and to expand the current domestic base which is limited to only a few core species. In Kaleum for instance, villagers reported on the lack of seeds for papaya. Baehler showed, in his Greenlife project in the Attapeu Province, that the domestication of indigenous tree species is possible. Further attempts could be made to regain some of the traditional domestic garden vegetables which have been lost over time (e.g. *mak seuweu*). In KDM and NB-TM, where the local food base is already severely limited, new and classical foods should be blended to form a judicious mix. The author however warns against the introduction of too many

---

124 *Firstly, livestock is seen more as property and a means for attaining spiritual power. Secondly, livestock production already appears to be at the borderline of sustainability.*

125 *The sheltered places could be made from rattan or bamboo (note the successful experiences from Family Planning Australia in the Central Provinces of Laos).*

alien species, as the full potential of the local food has not yet been optimised. In Kaleum especially the Katu cuisine needs neither peaches nor strawberries, as some have proposed.

In relation to the food chain, the concept of maximising energy return rates for various means of food acquisition is crucial. It appears especially necessary to reduce the workload for women and children (e.g. through feet-powered rice milling, water-powered rice milling, and pack horses). Under the current conditions it would not be favourable to introduce mechanical mills due to the unfavourable nutrient loss. Mechanical rice milling can indeed only be afforded by those whose diets are very rich in minerals and B-vitamins. Moreover, the aim to increase rice production in unsuitable upland areas, or in areas without the proper equipment, appears to be futile (see problem description in chapter 4.4.1.1). Indeed it should be tested to see if rice purchase is more viable than self production. Efforts should be undertaken to increase RT production, both for the livestock and for those who are open to incorporate RTs into their diets inside new recipes (see also 6.1.1.1). This advice surfaced from the argument that the average yield per hectare is estimated to be 2.6t for rice, but 9.6t for sweet potato, 7.5-30t for taro or 100-200t for yams based on estimations of 1977 which implies traditional farming techniques (Schwerin 1985).

One proposal could be the reviving planting of cassava gardens as has occurred in Upper Kaleum. In chapter 4.4.1 we have seen that nowadays cassava is mainly planted in a ring around the rice fields. At the same time concerted efforts should be undertaken to support the villagers in their attempts to arrest crop destruction by wild boars, porcupines, etc. Further attempts to improve the consumption of staples could be achieved by reducing storage losses.

In order to enable villagers to introduce oil to their cuisine, income must be increased. The author does not see any means of producing vegetable oil in the villages. Reviving the production of vegetable salt could save money which in turn could be spent on oil purchase. The potential for income generation differs substantially between villages; however, up until now NTFP collection and handicraft production appear to be the most promising due to the storage difficulties, the cost, and the absence of the pressure for land unlike in relation to food production (see alsoNurse and Soydara 2001; IUCN 2002; SNV 2002). NTFP production could be expanded to include the fermentation of domestic and wild vegetables.

6.1.3 Recommendations for the cuisine – The "cooking pot approach"

If the recommendations for the food chain and the diet are put into practice it will be necessary to address the Katu in their own "universe". To them, the food problem manifests itself in the cuisine, going beyond the general preoccupation with food acquisition (see Krahn 2003b). Therefore any nutritional recommendations should additionally target the kitchen or literally "the cooking pot". Recommendations proposed only for their nutritional benefit are likely to be unsuccessful.

The overall objective should be to innovate the Katu cuisine further, and to prevent it from taking on too strong a lowland character. The Katu cuisine shows some unique qualities, which might help to increase nutrient intake without high external input. One advantage is that the traditional Katu cuisine harbours a large selection of edible plants and meats. The greatest challenge therefore is posed by 1) the containment and 2) combination of local foods for maximum nutritional benefit. Also 3) new plants should be introduced, but only to a limited extent.

The author therefore proposes that further investigations should be made to discover which past food items have been lost due to transformations in the food system and which new foods and techniques are genuinely worth introducing. This is a timely process and one which should be carried out over the coming years in more than four villages. Further investigations should be carried out to see why the Katu abandoned preparation techniques and flavouring principles in the past. Theoretically, these insights should give some understanding as to how food with a now low taste scoring (see table 25) could gain new acceptance[126].

Novel preparations might reverse the rejection of RTs, mushrooms, certain shoots, and vegetables. Theoretically, with a high variety of species there is a high potential to meet nutrient requirements. These foods however, first have to be transformed into appreciated "novel comestibles". New preparation techniques and flavouring principles need to be tested carefully for acceptance. Successes should be recorded in a "recipe bank" which should also include traditional methods of preparation, fermentation, and drying.

Should attempts be made to see whether RTs and coarse grains could be "brought back" into the Katu diet, then these should include the revival of the traditional, thick staple soups (*trrong*). Additionally, a mixture of RTs and vegetables could create a dish resembling the German potato salad. Culinary experiments like this might be especially beneficial to those who suffer from rice deficiency, and to those who have no income to purchase rice at the market. Using rice water for soups, as the Hmong practice in Northern Laos, could also be promoted. The flavour of lemon or citrus fruits embellishes the taste of vegetables. As a corollary, besides the introduction of fat-added vegetable dishes (see chapter 6.1.1), the introduction of vegetable salads with the juice or leaves (e.g. *aloz podge*) from citrus species could be tested. The "*cheo seu seu*" could either be mixed with more fresh herbs, or with sour fruits. In terms of insects, tests should be carried out to see if the Katu would accept the fermentation of them like the lowlanders practice (e.g. *Lethocerus indicus).* If sufficient oil was to become available, more types of insects could be fried. The mashing of foods in the *tcheruak* is a very useful way of increasing bioavailability, especially that of Ca rich foods (see chapter 4.5.2). Since large bamboo is becoming increasingly rare in areas of Thateng and Lammam attempts could be made to see if the villagers would adapt to produce and use a replica made out of scrap metal. The ones used in TD could be used as models.

In summary, these ideas all attempt to expand the dualistic concept of Katu cuisine into a dynamic trilogy of staples, meat, and vegetables/fruits. The ever-increasing risk of a rice humdrum must be prevented. In chapter 4.7.2.1 it was shown however, that it is not high rice consumption which is the problem, but its nutritionally adverse preparation.

6.2 PREREQUISITES TO HARNESS POSITIVE DIETARY CHANGE

As we have seen in chapter 5, changes in the Katu food system and diet are also linked to various underlying causes. These determinants were a) the Katu's bio-cultural adaptation, b) the environmental condition of their habitat, and forces of c) national as well as d) regional integration. In this section the author therefore wants to detail four major prerequisites which are necessary in order to put the recommendations proposed for the diet, the food chain, and the cuisine (chapter 6.1.1, 6.1.2, and 6.1.3) into practice. Otherwise any positive change is unlikely to happen.

6.2.1 Continuous innovation

Positive dietary change can only be reached when the processes of change show a more innovative and resilient nature. The current disruptive changes in the food system such as "banning shifting cultivation, banning hunting, banning fishing, banning gathering, banning building longhouses, banning polygamy, etc." should be stopped. Positive change can only be achieved by drawing upon the Katu's local potentials such as their knowledge, skills, and practices, and by adding new knowledge modules where and when necessary.

---

126 *This argument does not apply to foods considered as inedible due to taste, texture, etc.*

This judicious mix should be attained in terms of the diet, the food chain, and the cuisine where it has its greatest potential. This approach holds the potential to balance external and internal inputs. Continuous innovation needs to be facilitated. The GOL's ethnic minority policies will be crucial in guiding this process and could involve, for example, expanding the preservation curriculum from the retention of dress and dance for the sake of tourists to the retention of environmental and culinary knowledge. This should create fall-back strategies so that total production failures (to recall the case from the village Paxay), or loss of species or of culinary principles can be prevented. This idea of flexibility contrasts with the GOL's food security vision 2010, which up until now appears too rigid and to pose a threat to continuous innovation. Changing "food resource realities" require that the Katu food chain and cuisine are continually able to adapt in dynamic and complex ways.

6.2.2 Sustainable cuisine

Aiming at food security whilst turning a blind eye to environmental degradation undercuts the Katu's own ability for sustainable cuisines. The Katu have not yet been fully incorporated into commercial markets and still procure most of their food from their agroecosystems. Ergo, environmental protection is warranted. This calls for full recognition that food security issues are intrinsically linked to high forest quality, and vice versa. Theoretically, with its high donor dependency, foreign organisations in the Lao PDR should exercise more power to attempt to control such issues. Linking environmental issues and food security should be a prerequisite on the poverty agenda.

To prevent further decline in wildlife consumption, concerted efforts should be made to arrest the illegal wildlife trade in the Sekong Province (see also the recommendations for Sekong by Beer, Polsena et al. 1994) and to act against illegal logging and poaching within Katu villages and adjacent areas. As well as conserving intact forests, reforestation should also be incorporated into the idea of food security. Cuba seems on the road to recovering some of the biodiversity it lost due to the high input nature of the agriculture it has developed in the previous 30 years. The reviving polycultural production presents a scenario worthy of studying the extent to which negative trends could be reversed (Vandermeer 1997:124).

In order to arrest the decreasing wildlife populations, several management actions are recommended: a) the application of restricted and controlled species in relation to population trends[127], b) the identification hunting zones and hunting seasons, and c) habitat management. Together with the local communities the work of conservationists, nutritionists, and foresters could be collaborated in order to define consumption goals, e.g. 60% meat from wildlife, 40% from domestic sources (p.c. R. Eve, WWF 2003). Starting from the premise that local people are the best stewards for local environments (Trakarnsuphakorn 2003) the co-management approach has been proved to be effective in other countries in Southeast Asia having the potential to reverse unfavourable land and forest management systems (Nghi 2003). Bennett has shown in her various studies that with efficient enforcement against poaching, and with the participatory management of natural resources, subsistence hunting can be sustainable. Baird has shown that co-management of inland fisheries, can substantially increase depleted fish populations (Baird 1999a; 1999b). Referring to vanVandermeer, Noordwijk et al. (1998) in the face of change the Katu ecosystems must obtain the capacity to either resist the effects of large perturbations or be given the power to repel them, in order to reach system resilience. Conservation concerns should however not be put ahead of food security. Ideas for re-conceptualizing components in food security projects could be adapted from Margoluis and Salafsky (2001) in regard to proposal, design, implementation, and monitoring (change

---

[127] *Such as identifying animals which require urgent protection, and those which may be more suitable for subsistence use (p.c. A. Johnson, WCS 2004). See also Appendix 6.*

in indicators and means of verifications in particular). For the Lao PDR, Johnson has outlined a conceptual model and threat assessment for biodiversity conservation (Johnson 1999; Johnson and Vannalath 2002; Johnson, Singh et al. 2003).

6.2.3 Food sovereignty

Regardless of whether dietary change is stimulated from the outside - or is promoted by the Katu themselves - food sovereignty should be preserved. Food sovereignty in the Katu food system is a symbol of their independence. The Katu's cultural autarky has, until now, included local knowledge, practices, and skills. As long as there are no viable alternatives to the current means of food acquisition, the Katu's own solutions to change appear to be the most suitable in terms of achieving positive a dietary change. The Katu should be given the chance to resist coerced transformation if they consider elements of change unnecessary, wrong, or inappropriately timed. This would include objecting to the abandonment of shifting cultivation in order to adapt to wetland rice production, disapproving of the start of irrigated rice production, or to disallow the construction of a reservoir in the village area amongst other ideas. This argument derives from the fact that the Katu food system and the Katu diet have evolved over centuries and, until the 1990s, have always adapted well to local conditions. Mainstreaming the Katu - such as by coercing market affiliation - holds the risk of creating negative dietary change. Threats to the integrity of the Katu food system must be continuously identified, and incorporated into food intervention schemes. This also extends to the call from 6.2.2 which, in the sense of food sovereignty, would mean greater control by the Katu over local forest food resources.

6.2.4 Comparative advantages

The Katu's conceptualisation of regional integration should be accepted. Today, however, concerted efforts are needed to support the Katu in their identification of new comparative advantages within the income generation such as NTFP collection including marketing, price information, etc. As such, the Katu should be educated to be able to participate effectively in the regional markets, services, and development decisions according to the relative advantages of the Lao uplands (as were introduced in chapter 3.9). Until now regional integration has translated more as an exploitation of the Katu's natural resources, leaving behind few local, in particular monetary benefits. Additionally, the low income level has, until now, not permitted the Katu to participate in the services provided. The same is true for the increased levels of formal education. The mere vision of providing access to markets, services, and education, etc. should be replaced with practical opportunities which can be drawn upon.

6.3 Final Conclusions

From a nutritional point of view, this thesis started with the hypothesis that Laos is lacking a food security concept which sufficiently responds to the country's unique cultural and biological resources, and as such to provide local solutions for its nutritional problems. It was stipulated that the Lao food security concept is based on questionable assumptions, and does not have the potential to advocate positive dietary change amongst the various ethnic groups.

After analysis of the Katu food system there is evidence that proves that the current food security concept is not based on a comprehensive understanding of, and therefore not responding to, the dynamics of transitional food systems. Fact: GOL and other policy makers do not yet appear to recognise how uplands diets have evolved nor what the nutritional consequences will be. As a result, they do not use the inherent potential of the traditional food chains, the cuisine, and the diets of the various ethnic groups to ameliorate the emerging nutritional problems. The author identified four major fallacies in the current Lao food security concept.

Firstly, regarding the upland diets themselves, the concept of rice security makes minority groups food insecure by definition; rice deficiency is an old phenomenon in the Lao uplands (Cupet 1998, first 1891:154). With the high availability of forest food, rice insecurity in Laos does not readily fit with conventional definitions of food security. As such it has been wrongly suggested that the uplanders always eked out a miserable diet. The argument is that the former Katu diet in Upper Kaleum was marginal but was still within the limits of sufficiency. It therefore appears inappropriate to assume that most of the Lao uplanders have always been afflicted by food insecurity. Moreover, for ethnic groups, short food chains give reason to surmise that nutrient loss through transport and storage is less likely to occur than in market dominated societies

Besides rice, other food groups are not sufficiently addressed in the concept of food security (including the intake of fish and OAAs, wild and domestic meat, RTs, starchy filling foods, pulses, oilseeds, nuts, and also fats and oils). Given the current rice preparation techniques, from a nutritional point of view, an increased rice intake holds many risks, especially if the consumption of non-rice foods is not increased by a sufficient amount (see chapter 6.1.1) or the adverse preparation techniques are not changed.

Conversely, the reduction in wild meat consumption, which is a major issue in the changing diets, appears to be completely unrecognised. Up until now the call for something to substitute wildlife losses has not yet been quantified. It remains unclear what this would mean in terms of livestock numbers. In the case of the Katu village with the best forest condition, an annual per capita consumption of 53kg of mammal UMEP must theoretically be substituted by high numbers of livestock. It is unlikely that such a transformation can be achieved. At the same time, wildlife consumption starts to conflict with conservation issues. In Appendix 6, lists are provided showing the management regulations of consumed species according to the Lao Forestry Law (1996) and the Prime Minister's Decree No. 198 (1999). Most of the animals in the traditional Katu diet are under threat of extinction. This is a new issue which has to be tackled, but thus far has been excluded from orthodox nutritional research, food balance sheets, and national nutritional poverty lines. The same is true for wild plant species. This theory overlaps with the World Bank's recommendations to "*track nutrition changes as a sensitive indicator for poverty*" (Galloway 1999:4).

The current concept of food security is not responding to the ever decreasing intake of fat, protein, Fe, Ca, Zn, and B-vitamins. The trend towards a decreased intake of β-Carotene, and vit C, not to mention phytochemicals, has also not been anticipated. Up until now the concept of food security has not been rationally equated to nutritional security.

Secondly, to cope with changing diets the idea has emerged that an increased income would mean that more market foods could be bought (GOL 1999). Over the years however, in development research, a theoretical and empirical understanding has evolved showing that the generation of income alone does not automatically improve a household's food and nutrition security. In some cases, when little thought is given either to nutrition or health, increased income has actually proven detrimental to people's nutritional well-being (FAO 1996). The author's research proves that the goal of reaching food security via market integration (due to forest food losses) becomes even more illusive when considering that the village, with the best market access shows the lowest annual per capita income. In contrast to this, the villages in the forest with a higher per capita income have no access to the market (see also market study by ACF 2003). Translating annual incomes into purchasing power, however, shows that the average annual income would not even provide enough food for one month. The evaluation of the Cab-Cog Project of Concern in Northern Laos has shown that "*market changes appear to be benefiting the less poor families rather than the poorest* […]. *The quicker the decline in [the] traditional system, the harder it will be for them to cope*" (Folkard 2003: see Appendix B).

Thirdly, this work has shown that the Lao food security concept mainly targets the food chain, the materialistic dimension, revolving around rice, and is often ignoring the culinary dimension, the cuisine.

To begin with the food chain, the GOL aims at stopping shifting cultivation by 2010. In Sekong Province however, it became clear that harvests from shifting cultivation cannot even be partially substituted by wetland rice production or gardening. The same situation prevails in other provinces. Ending shifting cultivation, however, does not mean only changed modes of rice production, but in terms of spatial and timely expenses also lower RT production not to mention the effect on gathering firewood, wild foods, NTFPs as well as hunting. The Technical Advisory Committee to the Consultative Group on International Agricultural Research (2001) noted that the worldwide prospects for increasing the yields of roots and tubers appear to be much greater than the prospects for increasing rice yields. Thus far nobody has investigated the possibility of improved cassava, sweet potato, or taro production in Laos. In many upland areas sufficient support for increased livestock production is also missing, and ideas for traditional veterinary practices are very sketchily addressed. In Kaleum, an evaluation by ACF showed that contemporary livestock production is severely limited (ACF 2003). Nevertheless, even if food production was to be increased this would not necessarily translate into food security as globally high rates of mal- and undernutrition have proved.

In terms of the culinary dimension, the author has argued that in order to increase nutrient intake, the cuisine with its elements of food selection, manipulation, and flavouring, as well as eating patterns must stand as a fulcrum for action just as much as food acquisition, processing and distribution: within the action level of the food chain. This recommendation is supported by the argument that the major qualities of traditional food systems should be retained - and adverse culinary practices be redirected. The practice of incompatible foods being mixed together just because they are highly nutritive should be prevented – comparable to an unknown nutritionist recommending to the Germans that they fry breakfast cereal with mustard, olive oil and pineapple in order to gain good nutrition. It is therefore vital to address the villagers, especially the women, in their "universe", where the food problems manifest themselves. This is at the cooking pot. One advantage of the traditional Katu cuisine to work on, is that it harbours various taxa (see inventory in Appendix 1). With the exception of the *Hmong*[128] there is no database which could be compared in order to find a conclusive solution for other ethnic groups in the Lao PDR. Here the author asks how it would be possible to design a food security concept

---

128 *Records mainly derive from the Hmong living in Thailand, or exile Hmong groups living in the United States.*

without a comprehension of the many local species and varieties (and names) of the various ethnic groups. Imagine if a foreign nutritionist came to Germany and based his recommendations prejudicially on bread, potatoes, and beer without distinguishing between the various local brands, preparations, and flavours. In Laos, with the many ethnic groups, the need for more culture specific concepts is clearly warranted.

In the case of the Katu it has been shown that the traditional cuisine has many nutritionally favourable preparation techniques, some of which have resulted in nutrient dense foods such as the self-made salt, the meat mashes prepared in the *tcheruak*, the fermented vegetables, etc. The greatest challenge therefore is posed by the ingredients - and the novel combination and preparation of indigenous foods - which are locally available and already accepted. At the same time it is necessary to identify new foods and techniques which are genuinely worthy of being introduced. This requires the expansion of the very scant nutritional information on local foods and also the investigation of potential nutrient losses. Malaivongse for instance suggested the loss of iodine in salt in very spicy foods (Malaivongse 2000). The laboratory data from the Katu foods could be used as a starting point, and should be expanded by more chemical research. Kuhnlein (2001) reports for Southeast Asia that of 716 identified wild food species, many still require scientific identification. For 147 species there "[is] *not even the most basic nutrient data available*". Until now, nutritionists working in Laos have mainly had to draw upon Thai and other international databases. At the same time the various ethnic groups must be prevented from dismissing their own foods in favour of alien species because of the prerogative view on their cuisine held by outsiders. It is essential to properly inform them about the high nutritional value of some of their foods. There is a high potential to test nutritionally desirable innovations through the combination of new preparation techniques with locally available foods (e.g. vegetable dishes with added fat). FAO (2003:26) has noted that throughout Laos a very low intake of fats and oils combined with an inadequate intake of dark vegetables is the main reason for the prevalence of vitamin A deficiency. Notably, inventing new and accepted flavouring principles is a major challenge for transforming rejected foods into comestibles. The consumption of RTs for example has already increased in the cities with the method of frying, namely sweet potato and taro. In many parts of the world it has been shown that indigenous foods can find their way back into modern cuisine.

Comparing potential interventions at the food chain and the cuisine level, it seems that interventions at the cooking pot would be a novel option as they would empower the women, would be less costly, and would bridge the gap between production change and recommended consumption. Strategically, working at the cooking pot strongly supports the idea of help towards self-help which is essential in remote areas of rural Laos. The Lao Women's Union could be the one putting this idea into practice as it is operating in all districts and appears to have good ties to the local people. The many international NGOs could also pick up the "cooking pot approach", especially when they are struggling with low local capacity building and difficulties to reach out to the women as has e.g. been experienced by ACF or SEP DEV (ACF 2001; Navajas, Phomsoupha *et al.* 2001). At the same time cooking pot activities minimise the risks of unsuccessful large-scale experiments (in order to bring back the experiment of village Paxay) in a country which people act highly risk adverse (see Evans 1988:33; ADB/SPC/NSC 2001; Izikowitz 2001, first 1951).

Fourthly, any potential success in positively changing Laos' traditional food systems and diet is related to external determinants. For the Katu it has been shown that the four determinants which have an impact on the realisation of positive dietary change need to be re-balanced. In particular, forces for the national integration of ethnic minorities together with the interaction of regional systems and evolving market commodities should not suppress the potential for cultural innovation, nor occur at the expense of the local habitat. These underlying causes of dietary change are, however, not linked to the current food security concept. It is therefore likely, that the current Lao concept of food security will fail due to an insufficient response to the various determinants impinging on isolated food systems in the upland forests.

From this work there is substantial evidence to suggest that a positive dietary change for ethnic minorities in the Lao PDR requires more concerted efforts by all the stakeholders involved and not only by those who are directly dealing with food security issues. Strictly speaking, the concept for food security needs to be urgently restructured. Most importantly, the underlying causes of changing food systems resulting in coerced dietary change should be addressed. Ergo, the author has detailed four major prerequisites which are necessary in order to adequately respond to the underlying causes of emerging food insecurity.

The fading of biocultural adaptation should be redirected towards continuous innovation. Environmental degradation should be stopped and replaced by a new ecosystem balance which allows for sustainable cuisines. Disadvantages in regional integration should be reversed to comparative advantages. National control should come to a halt so as to enable local food sovereignty. What becomes obvious is that these four prerequisites extend far beyond the scope of localized food security strategies (for description of these strategies see chapter 2.6.2).

In terms of "continuous innovation", the author has called for past knowledge to be truly built upon. Understanding culture as innovation might help to identify the most flexible areas where, over centuries, Laos' ethnic groups have evolved dynamic production systems and cuisines, intricately interwoven with social relationships (applying figure 3). The author refers here to Elwert who calls for more research into the forms which express cultural flexibility and for the identification of areas where innovations have been generated in the past (Elwert 1997). As Kramer pointed out cultural diversity can be seen as a resource for development (Kramer 1998). As mentioned before, in terms of risk aversion and the difficulty with changing food habits, innovation and maintenance must be balanced (see e.g.Raintree 2000). However, in Laos there is scant information to be drawn upon on the knowledge of the various ethnic groups (see also Chamberlain and Phomsombath 2002:3; UNDP 2002). Until now the development imperative has not supported the optimisation of local bio-cultural adaptation. But even if cultural values are recognised in "*the preparatory stages* …[they are] *neglected in the final version of the approved project*" or in practice (GOL 2001:15). To work with the knowledge continuum (figure 3) will help to facilitate positive dietary change, either continued or newly achieved after arresting negative dietary change (figure 4). In this vein, the GOL should consider to urgently facilitate those food security projects which judiciously mix external and internal practices. Compared to other Southeast Asian countries, external input into projects in Laos is very high. What is desired is a more resilient concept of the food chain, and a cuisine which is continually adapting to changing realities.

The "afflicted-by-rice-insecurity" vision denigrates and devalues the ethnic minorities' traditional knowledge, skills, and practices. Attempts have not been made to record their local knowledge to the same extent as in other Southeast Asian countries such as Thailand, Malaysia, or Indonesia. However, the more native varieties go out of cultivation, the more future potential is lost (Gollin and Smale 1999). Additionally, up until now, the recording of local knowledge has always stopped at a mechanical listing of plant and animal taxa. Cultural practices and the culinary ones in particular, as elsewhere, have remained completely unrecorded. The potential for a positive change will probably remain untapped, if there is no more practical research on how to use this traditional knowledge before new species, new plant varieties, external equipment, external techniques, etc. are provided. More investigation is urgently needed on the various ethnic group's food selection, preparation techniques, flavouring, and storage.

Given the close connection between forest quality and food security for the ethnic groups in Laos, it becomes obvious that "sustainable cuisines" are crucial in achieving positive dietary change. The call to link food security with natural resource management for tropical countries (Falconer and Arnold 1991; FAO 1996; Ogden 1996; FAO 1999a; Mainka 2002; Rao and McGowan 2002) has however not yet been picked up in Laos. This is not only important in terms of the food production but also in regard to the understanding that biodiversity provides an essential buffer against uncontrolled proliferation of opportunistic pests (Epstein, Dobson et al. 1997) which are spreading rapidly in Laos.

In Laos, environmental degradation is likely to overshadow possible project activities. A hypothetical project, aiming at food security, intervening at the level of food acquisition and working exclusively on agricultural production, might result in increased rice production, some vegetable gardens, and some fish ponds, however, if the project were also to consider the concomitant losses of local forest plants and animals, the net food availability and nutritional density would not be shown to have increased. As such, issues of logging, wildlife trade, road access, unsustainable practices for harvesting NTFPs, and improper implementation of land allocation schemes may undermine the overall goal of food security. For other areas in Southeast Asia, various authors have demonstrated that environmental destruction is severely undermining the role of the forest in providing food in upland systems (Marris, Hedemark et al. 2002; Johnson, Singh et al. 2003; Krahn 2003b).

In the Lao PDR, villagers are reticent to voice their concerns regarding environmental degradation. At the same time the GOL is coming under pressure from natural resource depleted neighbours in the GMS region, especially China, to open Laos' natural resource base. However, besides WCS, WWF, and IUCN, foreign development organisations are exercising little pressure to stop the rampant destruction of natural resources. Current destruction rates are undercutting people's own ability for sustainable cuisines, especially in terms of hunting, fishing, and gathering edible forest products and other NTFPs. Clearly linking environmental issues and food security on the overall poverty agenda should be given high priority. As such, international organisations should exercise more influence on such issues in connection to their provision of foreign development aid to the GOL. In this context, the Tropical Rainforest Movement has continuously noted the low level of transparency in the usage of Laos' natural resources. (TRP 2000).

In contrast to this, there is the clear line taken by the GOL which says that shifting cultivation is outstripping logging activities. This argument is supported by most of the development organisations (GOL 2001). However, there is the urgent need to verify this argument and to determine the true carrying capacity for various ethnic groups and regions. For a sustainable cuisine it is also necessary to identify sustainable harvest rates of wildlife (compare e.g. Mena, Stallings *et al.* 2000; Peres 2000; Robinson and Bennett 2000). Yet, the GOL has argued that local hunting has been the main factor in dwindling animal populations. More research is however needed to assess the exact extent of the illegal wildlife trade on animal populations.

Hitherto, in Laos only wildlife biologists and conservationists have worked on plans to deal with the dwindling resources of wild flora and fauna. Cooperative efforts by the villagers, the GOL, development organisations and conservationists are however crucial. The "co-management approach" has thus far has been proved to be most beneficial (see chapter 6.2.2.). Until now however, it appears that environmental goals - such as habitat and species protection - have been put ahead of food security. This approach has been thoroughly investigated worldwide and has shown to have largely failed (Dove 1993; McNeely and Scherr 2003). Forest quality and food security cannot be dealt with separately.

With the view of mainstreaming ethnic minorities in order to truly develop, the GOL is jeopardising its own cultural diversity and thus "food sovereignty". For the Katu and other ethnic groups it can be assumed that only cultural autarky in terms of local knowledge, practices and skills has the potential to facilitate a positive dietary change. Coerced transformation of the food chain and the cuisine undermine the potential to find locally adapted and culturally accepted solutions. In this sense it should however be made clear that the current development process in the Lao PDR is not deadlocked as it is elsewhere.

For the GOL there is still a great potential to draw upon the knowledge of more than 200 ethnic groups on edible plant and animal species and varieties coupled with their usage for food and medicine. In order to facilitate the possibility that future generations will also be able to draw from this potential, the GOL should consider expanding the current concept of integrating ethnic minorities by preserving dress, music, and dance for the benefit of tourism, into the culinary dimension. The Lao Cultural Research Institute might be the best qualified organization to investigate the various local knowledge systems and should be financially supported in order to be able to establish a knowledge bank. This idea complies with Lemoine's idea of creating a Lao ethnographical data bank (Lemoine 2003). The Lao Front for National Construction and the Lao Women's Union could put concomitant recommendations into practice. This would be in compliance with the Front's ideas toward "*progress, equality and political awareness among* [Laos'] *ethnic minorities*" (Bannavong 2003).

In terms of facilitating comparative advantages, for the ethnic minorities, regional integration has, until now, constituted an exploitation of their natural resources without leaving behind any local benefits. For many regions in the Lao PDR it has already been shown that fraudulent implementation of the land allocation strategy is counter-productive rather than beneficial. In many areas, access to governmental services, education, markets, and roads have thus far not proved advantageous (ADB/SPC/NSC 2001; Marris, Hedemark et al. 2002; UNDP 2002).

More concerted efforts should therefore be undertaken to identify "local comparative advantages" e.g. in terms of income generation, local flora and fauna for potential ecotourism, etc. The overall idea of integrating ethnic minorities into lowland societies' markets and services calls for more culture-specific proposals which respond to local aspirations and capacities. Sustainable NTFP production and marketing should be given high priority as they have been shown to be beneficial but are still undervalued in various studies through Southeast Asia (Beer and McDermott 1989; FAO 1995c). In this context, with the current income levels of the remote ethnic community's access roads will give a carte blanche for logging and illegal wildlife hunting rather than supporting regional integration.

From this work there is substantial evidence to assume that also in other tropical forest areas rich in biodiversity, the concept of food security for ethnic minorities needs to be urgently restructured and to be mapped for specific cultures. The author tentatively concludes that the idea of a national food security strategy for culturally rich countries in Southeast Asia should be rejected. Generalising culinary principles is simply impossible. As long as various ethnic groups with distinct elements in their food systems remain, it will not be useful to develop one grand national strategy. The author strongly feels that there is a need for more polyvalent strategies (see pedigree in figure 9) to match the diversity of the individual cuisines and food chains. As long as there is still enough biodiversity and cultural knowledge to draw from, the need for high external input and costly interventions in these areas appears to be far less than was originally anticipated.

Theoretically, with regard to the future, when the four food security fallacies are taken together, it would be wrong to assume that "modern" villages in biodiverse and culturally rich areas in tropical Southeast Asia, or elsewhere will be more successful in achieving a sufficient nutrient intake than the "traditional" ones will be. However, as long as dominant ethnic groups continue to exercise their political, religious and socio-economic powers over ethnic minority groups positive dietary change is unlikely to take place. In order to arrest the trend for negative dietary change as well as reducing the high rates of mal- and undernutrition, a much more concerted effort far beyond the scope of orthodox food security strategies is required. Only with the political will to explore and to optimise the existing interrelations of traditional food systems with other development trends, can nutritionally necessary change be introduced. The current overlap of high levels of malnutrition and high cultural and biological diversity in tropical forest areas can, at least from a nutritional point of view, not be explained.

CHAPTER 7: SUMMARY

Rural Southeast Asia is confronted by high rates of malnutrition and maladjusted diets. Development research has attested to the fact that ethnic minorities are highly vulnerable to nutritional problems, especially the indigenous people of the uplands. The geographical dominance of malnutrition in these areas with cultural and biological diversity is an issue of particular concern.

Customary diets of ethnic minorities often met nutritional recommendations. At the same time, however, research revealed that in several instances the contemporary nutrient intake has fallen below the recommended level. With a lack of data, many therefore tended to share the pejorative attitude that ethnic people have always been eking out a miserable living, and have been suffering high rates of malnutrition mainly a result of a poor diet. But indeed, in many cases it can be suggested that an insufficient nutrient intake ("negative dietary change") is a recent phenomenon.

Despite the lack of consensus about the evolution of negative dietary change, the fact remains that many food security strategies for tropical forest areas have been proved fallacious, and often they run the risk of resulting in purely temporary benefits. Many argue that this is connected to an insufficient understanding of eating patterns, nutrient intake, especially nutrients provided through forest foods. Generally, researchers have been less vigilant to assert that food security strategies mainly act on the materialistic dimension. This means targeting the food chain with its focus on agricultural production. Anthropologists more than any other scientists, have continuously argued that the cultural dimension of food systems is not thoroughly addressed. Indeed, culinary principles are often completely ignored. Also, despite being called for, food security strategies still do not tackle the more underlying causes such as the political and environmental context.

The Lao People's Democratic Republic is an extraordinary country. Economists attest high levels of poverty. Nutritionists and doctors compare the high levels of malnutrition to the Sub-Saharan belt. At the same time however, anthropologists and biological scientists alike together praise the country's richness in cultural and biological diversity. However, the fact remains that Laos is one of the least-known countries in the world. Currently many of the upland minority groups are experiencing rapid dietary change. It is safe to surmise that some areas, especially the uplands, were once food abundant, but are now classified as being both food insecure and extremely poor. Following the cessation of the COMECON aid in the early 1990s, the Lao Government has been receiving tremendously high levels of foreign development aid. However, up until now the balance between aid and the alleviation of poverty has failed to reach an equitable level.

The Katu, an Austro-Asiatic group, indigenous to the Annamite Corderilla (along the Vietnam border), were selected as a research group for a two-year case study. These peoples, who inhabit the remote and mountainous Province of Sekong, presented an ideal group for cultural and biological investigation. The varied ethnic groups who live in the region still use a wide variety of flora and fauna that have recently become extinct in nearby provinces, and elsewhere in Southeast Asia. At the same time, the potential for a sustainable change in the economic and agricultural development, in particular wetland rice production, is very limited.

In order to investigate the dynamics of the Katu's dietary change, four villages in three districts were selected. Two villages are located in the remote Kaleum District, which is still highly forested and is the area of the Katu's origin. The other two villages are located in the Thateng and the Lammam District, where there have access to infrastructure, markets, and governmental services; however, severely degraded areas of forest are already extant there.

Out of the four villages for study, only the one deepest within the forest revealed strong dependence on the traditional forms of survival, namely: shifting cultivation, hunting gathering, and fishing. In the three other villages transformation is far more pervasive and wetland rice production has been introduced. It should be noted however that none of these villages are "modern" by any means. Transformation from a subsistence towards a market oriented food system is still lacking.

From a nutritional point of view, this thesis started with the hypothesis that Laos is lacking a food security concept which sufficiently responds to the country's unique cultural and biological resources, and as such to provide local solutions for its nutritional problems.

The author concentrated on the following five issues: (1) The traditional and contemporary food systems were portrayed through description of their main elements. (2) The traditional and contemporary diets were described in terms of the main food groups. The present nutrient intake was assessed. The health and nutrition situation was analysed. (3) Determinants for dietary change were identified. (4) Recommendations about harnessing positive dietary change were proposed. (5) Assumptions within the current Lao food security concept were discussed and tentatively corrected.

In the absence of any extant research framework suitable for analyzing the cultural and materialistic dimensions of traditional food systems, the author developed her own research framework. This comprises of seven elements. It complements aspects of the food chain (the materialistic dimension) with principles of cuisine (the cultural dimension). At the food chain level the author investigated into three aspects: food acquisition, processing, and distribution, referring to Pelto (1992). Following the model from Rozin (1982), at the level of cuisine, she analysed another three elements: basic food selection, manipulation techniques, and flavouring principles. Eating patterns were analysed separately as the seventh element. In addition to these elements the author analysed the nutrition and health status, and continuously monitored potential influencing factors. As such, this research framework necessitated complementing classical methods from natural sciences together with anthropological techniques. These were participatory observations, open and structured interviews, focus group interviews (e.g. oral history), transect walks, ethnozoological and ethnobotanical classifications, chemical analysis of food items, anthropometry, physical examination, stool and blood sampling, weighed and estimated food recalls among others. Where possible, the retrospective analysis involved timelines from the 1960s until today.

The challenge of conducting a multidisciplinary study under the conditions in the Lao PDR, and in the Sekong Province in particular, was formidable. Research was hooked up to the Cultural Research Institute (CRI), a line agency of the Lao Ministry of Information and Culture (MIC). Between 2001 and 2003, fieldwork was conducted exclusively with the CRI's seconded governmental staff. For the chemical analysis of food samples the author cooperated with the Institute of Nutrition, Mahidol University, Bangkok. For the health survey she received generous technical and financial support from the WHO. While running her own research project the author was not connected to any development organisation, but received most generous support from the staff of the Sekong Ethnic People Development Project (SEP DEV) of the United Nations Development Program (UNDP).

It is generally acknowledged that the nutritional status is a function of both the health status and nutrient intake (or dietary practices). To begin with the nutritional status, the anthropometric measurement showed that the children (under five years old) of all villages suffered from high levels of stunting, wasting, and underweight. The extent does not however vary significantly between the different villages and complies with other studies conducted in the Lao uplands. Through blood sampling and palpation low levels of anaemia and iodine deficiency disorders were identified. With the analysis of the coronae not a single case of vitamin A deficiency could be detected.

The analysis of the Katu's health status had only a tentative cast; many intricacies remain unknown. Epidemics are absent now, but the villagers are increasingly suffering from what might be malaria together with infectious diseases (conjunctivitis, upper respiratory infections such as tuberculosis, and diarrhoea, etc.). In all villages the Katu reported the advancing severity of helminithic infections. Stool sampling revealed high levels of parasitic infections (*Ascaris lumbricoides*, *Anclystoma duodenale*, and *Trichuris trichuria)*. Concurrently, it became clear that the traditional belief and medical systems (mainly based on animal medicine) is continuously eroding. As a result, coupled with inaccessible health services, the villagers are left in a vacuum for the diagnosis and treatment of new diseases.

The analysis of the diet revealed that the traditional dietary practices of the Katu before the onset of the war in the 1960s (Laos was involved the Viet Nam War) were found to be fundamentally different from those witnessed today. Contrary to the generally held view, that traditional diets of ethnic minorities were in most cases inadequate, it has been shown that the traditional Katu diet had been seasonally variable, diverse, and although never more than adequate, it was arguably still within the range of sufficiency. From weighed and estimated food recalls it was calculated that the contemporary diet is deteriorating towards inadequacy due to unbalanced ratios of food groups. One of the most striking differences found is the contemporarily higher consumption of rice, but lower consumption of various species of wild and cultivated roots and tubers, coarse grains, maize, and other starchy "filling foods". This was paralleled by the finding of lower wild meat consumption which could not be supplemented by domestic meat intake. On top of that, decreased meat consumption has coincided with the lower vegetable intake as forest vegetables were used not only as filling foods, but also as aromatic condiments for meats. The reduced consumption of forest fruits and vegetables was found to have been continuously substituted (but not sufficiently) by cultivated species. Finally, the author was able to infer that the identified changes in the Katu diet have indeed not been favourable. She concluded that dietary transformation has resulted mainly in a lower intake of B-vitamins, iron, zinc, calcium, fat, and protein, which is now for some nutrients below the recommended levels. She supported this assertion with the results of her chemical analysis of 40 Katu food items alongside her calculations from international, but mainly Thai food composition tables.

At this point, it was instructive that negative dietary change could be ascribed in particular to the two villages which are apparently more "modern" and which theoretically have access to infrastructure, markets, and governmental services. There, the lower nutrient intake might only be buffered by a better health system or by access to medicines. The two villages in the forest, away from the lowland societies, showed a more acceptable nutrient intake, but factors other than nutrient intake might have had an impact on their nutritional situation. These could be, for example, disease, excessive smoking and a continuous exposure to potential sources of dioxins (e.g. 2,3,7,8-TCDD in Agent Orange), furans or other congeners from the Viet Nam War.

Generally, the author concluded that it is becoming increasingly more difficult for the Katu to either improve or sustain their nutrient intake. This was shown to be mainly the result of two direct determinants: The disruption of the traditional food chain and the fading principles of the Katu cuisine.

The retrospective socio-economic analysis and participatory observations have shown that the increasing production loss in the agroecosystem constitute the major force in the disruption of the food chain. It was found that the reduced wildlife harvest rates (per capita/kg) could not be sufficiently substituted by domestic livestock production. Accordingly, an increasing and potentially unsustainable pressure on aquatic resources was observed. Moreover, it was suggested that traditionally the Katu hunting system was more elaborate than their agricultural production system (a system of shifting cultivation). The introduction of wetland rice production, which followed the land allocation, was found not to be able to buffer the increasing loss in dry rice production. Also, vegetable and fruit production appeared not to be a substitute for the reduced harvest yields of wild vegetables and fruits. At the same time, a higher individualisation of the Katu consumption units was observed, resulting in increasingly reduced kinship solidarity (including reduced levels of communal feasting) and opportunistic marketing of marginal surplus. It was inferred that this affects the poorer strata of the Katu society in particular. Concurrently, it was shown that with their consistently low income the Katu cannot even slightly increase the purchase of market foods. Taken together it can be attested that the changes in the traditional Katu's means of food acquisition have resulted into a shift away from a formerly stable food supply, towards an opportunistically unstable one.

In contrast to the disruption of the food chain, the fading principles of cuisine have until now been largely unnoticed. Through further interviews and participatory observations, the author observed that the disruption of the Katu's food chain is intrinsically linked to fading culinary principles and vice versa.

With ethnozoological and ethnobotanical classification the author found out that the originally broad food base, which consisted of a large variety of plant and animal taxa (she listed about 700 entries) has been tremendously reduced in recent times. Nowadays the Katu cuisine revolves exclusively around some core species. As such, the formerly "dual Katu cuisine", focusing on a varied combination of meat and staples, is currently shifting towards culinary monotony (rice humdrum). The adaptation of new food taboos was found to further diminish food variety, especially for pregnant women. While it was observed that fermentation and preserving techniques are fading rapidly, many manipulation and cooking techniques were identified to have been largely maintained. More generally however, it appears that the Katu women are lacking recipes to prepare tasty vegan dishes as they currently do not use pulses anymore, nor do they use any dairy products. Next, the taste ranking revealed that the Katu are increasingly coerced to consume foods with flavours they do not really appreciate (shrimps, crabs, snails, bamboo, dishes with low-fat content, etc.). As a corollary, the Katu's use of mono-sodium-glutamate is exceeding the use of salt. Finally, it became safe to assert that the disruption of the social organisation as well as the lack of available free time put additional pressure on the Katu's low level of gastronomy.

Moreover, the Katu food chain and cuisine was found to be strongly affected by underlying, less direct determinants. Using the framework from Huss-Ashmore and Thomas (1988) which describes potential determinants of upland food systems, the author has shown that the Katu food system is influenced by four salient forces. These were biocultural maladaptation, environmental degradation, national control, and disadvantages in regional integration. Increasingly these underlying causes are slipping out of the Katu's control.

As a backbone of "biocultural adaptation", the Katu's local knowledge of shifting cultivation, hunting, gathering edible forest products, food selection, manipulation, customary rules, etc., was observed as being lost at a rapid pace. At the same time, it is safe to argue that the Katu do not have sufficient access to or control over new knowledge elements. This situation leaves the Katu in profound unawareness of the opportunities that they have to change their diet in a beneficial way. The "environmental degradation" and the loss of ecosystem balance appeared to have reached a level whereby the Katu are now unable to intervene, such as with getting control over wild boar populations, over encroaching elephants or over new strains of livestock and crop diseases. In addition, the Katu's lack of political clout prevents them from having any influence over the decisions that effect their diet such as logging, poaching, and other causes of the destruction of their habitat. Next, it was tentatively suggested that attempts of national integration have shifted to "national control" (e.g. the inadequate implementation of the land allocation, the ban on shifting cultivation and on customary practices). With regard to the disadvantages of "regional integration" it was shown that the emerging affiliation with the cash economy is likely to act counterproductively on the Katu food chain, rather than providing monetary or other tangible benefits (e.g. exploitation and disadvantages in marketing).

As a next step, recommendations about harnessing positive dietary change were proposed. Indeed, it appeared that there is still a great potential to increase nutrient intake using the Katu's own biological and cultural resources. It was found the Katu's diet could be improved if current principles of the Katu cuisine were to be expanded (by new combinations of food, changing adverse preparation techniques, thus transforming the rejected food into "novel comestibles", etc.). As such, it was inferred that the potential to change the Katu cuisine compares favourably with the mere focus on the materialistic dimension of the food chain (e.g. increase production). Additionally, the author outlined four requisites which were considered necessary in order to put the food-based recommendations into practice, and without fulfilment positive dietary change is unlikely to be attained. The fading of biocultural adaptation should be redirected towards continuous innovation. Environmental degradation should be stopped and replaced by a new ecosystem balance which allows for sustainable cuisines. Disadvantages in regional integration should be reversed to comparative advantages. National control should come to a halt so as to enable local food sovereignty.

The author felt safe to postulate that the current Lao food security concept is neither based on a comprehensive understanding of the changing dynamics of upland food systems, nor does it attempt to draw on the full potential of traditional food chains, cuisines, and diets. As reflected in the research hypothesis, the underlying argument is that the current concept does not sufficiently respond to the suggested ever decreasing intake of fat, protein, Fe, Ca, Zn, and B-vitamins. In the same vein, insufficient attention is paid to the trend towards the decreased intake of β-Carotene and vitamin C. In the following, the author highlighted four major fallacies in the Lao food security concept. She proposed that its rationale is based on questionable assumptions.

Firstly, the current food security concept ill-defines many uplanders as food insecure when in reality they are not. Rice deficiency is an old phenomenon. Ergo: with the high availability of forest food, rice insecurity in Laos does not readily fit with conventional definitions of food security. Accordingly, the definition of food insecurity should be corrected. Indeed, a further increased rice intake has many risks attached to it, unless the adverse preparation techniques are not changed. Besides rice, alternative food groups have not, as yet, been sufficiently investigated. Conversely, the loss of wild meat - which is a major issue in changing diets - appears not to have been taken into account. From the argumentation surrounding the Katu nutrient intake, the idea surfaced to develop and quantify recommendations for a dynamic trilogy of staples, meat, and fruits/vegetables (based on nutritional principles). However, this requires more concerted efforts to analyse the nutrient content of local foods, especially wild foods, and to establish the first ever Lao food composition table.

Secondly, in the case of the Katu we have seen that the goal of reaching food security via market integration becomes illusive when considering that the village with the best market access shows the lowest annual per capita income. This was found to be related to forest destruction and resultant lower harvest and sale of Non-Timber-Forest-Products. In contrast to this, the villages in the forest with a higher per capita income have no access to the market. Given the high inaccessibility throughout the Lao uplands, at this stage, it seems therefore highly unrealistic to rely on market foods to cope with increasing production losses. It appears more advisable to strengthen the efforts to increase harvest rates in the local agroecosystems. Additionally, the literature abounds with empirical evidence questioning nutritional benefits from increased income generation.

Thirdly, until now, most of the food security activities are localized at the food chain level. It should be understood, however, that production cannot be equalled to consumption. Ergo: comparing potential interventions at the food chain with options for the cuisine, it seems that interventions at the cooking pot would yield tangible benefits in a very cost-efficient and effective way. Strategically, a more dual approach would also better support the idea of help towards self-help and thus allow to involve more women into proactive project activities.

Fourthly, the food security concept is completely detached from the underlying causes of nutritional problems. Similar to the case of the Katu food system, it can be argued that also in other areas of Laos the disruption of the food chain and the emergence of culinary monotony (as main determinants of negative dietary change) is directly linked to underlying factors. The author has detailed four major prerequisites to adequately respond to the indirect causes of emerging food insecurity. a) Regarding "continuous innovation", which means a more resilient nature of the processes of change, the author has called for truly building on traditional knowledge. In Laos, there is however scant information on the knowledge of the various ethnic groups. It is therefore recommended that the Government of the Lao PDR and development institutions should put more efforts into supporting local self-help strategies, rather than provide the technical and financial aid that inevitably results in dependence to the detriment of the communities to which that aid is donated. There is still a great potential to draw upon the knowledge, skills, and practices of more than 200 ethnic groups. b) It is the author's view that aiming at food security whilst turning a blind eye to environmental degradation in the uplands, undercuts the ethnic minorities own ability to provide for themselves a sustainable and satisfactory diet ("sustainable cuisines"). It is recommended that linking environmental issues on the food security agenda should be given higher priority, and that international organisations should exercise more influence on such issues in connection to their provision of foreign development aid. More research was found to be needed in the field of the carrying capacity of the Lao shifting cultivation systems and hunting systems, but also to assess the exact impact of the increased wildlife trade and logging on animal populations. c) Regarding "food sovereignty", it was recommended that threats to the integrity of the upland food system need to be continuously identified and incorporated into the food security concept. The author could not support the current view of mainstreaming cultural practices of ethnic minorities (in order to truly develop), as this process is likely to profoundly jeopardise the preservation and further elaboration of Laos' cultural and biological diversity resources. In this vein, it is suggested that in order to optimise local food sovereignty less political control over ethnic minorities should be exercised. d) In terms of facilitating "comparative advantages", regional integration in the uplands have not up until now resulted in any measurable benefits, not to mention those cases of economic and cultural exploitation. As such, it was advised that the mere vision of providing access to markets, services, and education should be replaced by real opportunities from which tangible, and in particular economic benefits, can be drawn.

Conclusively, the author infers that not only in Laos, but also in other tropical areas, such as in the Amazon region, the local self-help potentials are not sufficiently utilised to arrest the trend of negative dietary change. Up until now, food security concepts have mainly derived from ideas and experiences in areas penetrated by the cash economy and agricultural intensification. Despite success in these areas, inert assumptions appear not be applicable to regions with high biological and cultural diversity. On the contrary, intricate culinary principles of the diverse ethnic groups together with the unexplored nutritional values of wild foods constitute a high potential to improve the nutrient intake. These resources have until now remained untapped.

If however food security concepts were to draw more from these traditional biological and cultural diversity resources it would be necessary to address the communities in their own "universe". The author concludes therefore that governmental and development institutions should be challenged to work more closely in the kitchen, or literally at "the cooking pot". Hypothetically, more activities at the cooking pot could help to reduce project costs and would require less external input. Parallel to this additional action level, more concerted efforts are necessary to redirect the negative underlying factors in order to prevent further disruptions of traditional food chains and thus halt the irrevocable loss of culinary principles. Taken together, there is sufficient evidence to claim that the present scope of orthodox food security concepts needs to be carefully scrutinised, and urgently corrected.

REFERENCES

ACF (2001). "Securité alimentaire pour les minorites ethniques de Sud Laos, Province Sekong". Rapport Final - Phase 2. Sekong, Action contre la Faim.

ACF (2003). "Evaluation report on livestock production". Vientiane, ACF.

ACF (2003). "Kaleum market study (April/May 2003)". Sekong, Action contre la Faim

ADB/SPC/NSC (2001). "Participatory poverty assessment". Vientiane, Asian Development Bank.

Ali, M. and S. Tsou (1997). "Combating micronutrient deficiencies through vegetables. A neglected food frontier in Asia". Food Policy **22**: 17-38.

Allen, L. (1992). "The Mexican food system: Traditional and modern". Ecol Food Nutr **27**: 219-234.

Alstroem, P. and K. Mild (2003). "Pipits and wagtails of Europe, Asia, and North America". London, Christopher Helm (Publ.) Ltd.

Anderson, E. (1993). "Plants and people of the Golden Triangle". Bangkok, Silkworm Books.

Antweiler, C. (1995). "Zur Relevanz kulturspezifischen Wissens für Entwicklungsprozesse". Entwicklungsethnologie (Sonderband): 19-52.

Aubertin, C. (2001). "Institutionalizing duality - lowlands and uplands in the Lao PDR". IIAS Newsletter **24**: 10-11.

Auzel, P. and D. Wilkie (2000). "Wildlife use in Northern Congo: Hunting in a commercial logging concession". In: *Hunting for sustainability in tropical forests*. New York, Colombia University Press.

Baird, I. (1993). "Wildlife trade between the Southern Lao PDR provinces of Champasak, Sekong, and Attapeu, and Thailand, and Cambodia, and Viet Nam - Field report No. 3". Kuala Lumpur, TRAFFIC Southeast Asia.

Baird, I. (1995). "Lao PDR: An overview of traditional medicines derived from wild plants and animals". Vientiane, TRAFFIC Southeast Asia

Baird, I. (1999a). "The fishes of Southern Laos". Vientiane, Ministry of Agriculture and Forestry.

Baird, I. (1999b). "Towards sustainable co-management of Mekong River inland aquatic resources, including fisheries, in Southern Lao PDR". Vientiane, CESVI, MAFO.

Baird, I. (2001). "A catchment approach to small-scale irrigation schemes". Watershed **6**: 36-41.

Baird, I. and P. Dearden (2003). "Biodiversity conservation and resource tenure regimes: A case study from Northeast Cambodia". Environmental Management **32**: 541-550.

Bannavong, S. (2003). "The Lao Front for National Construction and minority cultural heritage". In: *Laos and ethnic minority cultures: promoting heritage*. Y. Goudineau. Paris, UNESCO Publishing**:** 255-281.

Barloesius, E. (1999). "Soziologie des Essens. Eine sozial- und kulturwissenschafliche Einfuehrung in die Ernaehrungsforschung". Weinheim und Muenchen, Juventa Verlag.

Bass, S. and E. Morrison (1994). "Shifting cultivation in Thailand, Laos and Vietnam. Regional overview and policy recommendations". Forestry and landuse series No. 2. London, International Institute for Environment and Development.

Baudon, A. (1968). "Catalogue commenté des Buprestidae récoltés au Laos." Vientiane, Lao Ministry for Information/Asia Foundation.

Beckerleg, S. (1995). "Food bowl division and social change". Ecol Food Nutr **34**: 89-104.

Beer, J. and M. McDermott (1989). "The economic value of Non-Timber Forest Products in Southeast Asia with emphasis on Indonesia, Malaysia and Thailand." Amsterdam, World Wildlife Fund/Netherlands Committee for the International Union for Nature Conservation.

Beer, J., K. Polsena, W. Bergmans, P. Chinh, S. Ketphanh and B. Ottens (1994). "Our life depends on nature. NTFPs in conservation and community development in Lao PDR: A preparatory study". Vientiane, Oxfam Netherlands, ProFound

Belitz, H.-D. and W. Grosch (1992). "Lehrbuch der Lebensmittelchemie". Berlin, Springer Verlag.

Bennett, E., A. Nyaoi and J. Sompud (2000a). "Saving Borneo's bacon. The sustainability of hunting in Sarawak and Sabah." In: *Hunting for sustainability in tropical forests*. G. Robinson. New York, Colombia University Press**:** 305-324.

Bennett, E. and J. Robinson (2000b). "Hunting of wildlife in tropical forests. Implications for biodiversity and forest peoples". Biodiversity Series - Impact Studies. Environment Department. Paper No. 76. Washington D.C., The World Bank.

Berlin, B. and E. Berlin (1983). "Adaptation and ethnozoological classification: Theoretical implications of animals resources and diet of the Aguaruna and Huambisa". In: *Adaptive responses of native Amazonians*. W. Taylor Vickers. New York, Academic Press**:** 301-30_.

Bezzel, E. and K. Bauer (1995a). "Handbuch der Vögel Mitteleuropas." Band 13/II. Passeriformes (4. Teil). Sittidae - Laniidae. Wiesbaden, Aula Verlag.

Bezzel, E. and K. Bauer (1995b). "Handbuch der Vögel Mitteleuropas. Band 10/II Passeriformes (1. Teil). Motacillidae - Prunellidae". Wiesbaden, Aula Verlag.

Bhicharana, P. (1932). "Notes on the Schomburgk Deer". <u>Nat. Hist. Bull. Siam Soc.</u> **8**(4): 311-313.

Biesalski, H., P. Fürst, H. Kasper, R. Kluthe, W. Pölert, C. Puchstein and H. Stähelin (1995). "Ernährungsmedizin". Stuttgart, Thieme Verlag.

Bindon, J. R. (1984). "An evaluation of the diet of three groups of Samoan adults: Modernization and dietary adequacy". <u>Ecol Food Nutr</u> **14**: 105-115.

BMZ (1982). "Soziokulturelle Fragen in der Entwicklungspolitik". Materialien 83. Bonn, Bundesministerium für wirtschaftliche Zusammenarbeit.

BMZ (1996). "Förderung von Waldvölkern im Rahmen des Tropenwaldprogramms - Entwicklungspolitische Bewertung und Perspektiven." BMZ Aktuell 062. Bonn, Bundesministerium für Wirtschaftliche Zusammenarbeit.

Bognar, A. (2002). "Tables on weight yield of food and retention factors of food constituents for the calculation of nutrient composition of cooked foods." Karlsruhe, Bundesforschungsanstalt für Ernährung.

Brand-Miller, J. and S. Holt (1998). "Australian Aboriginal plant foods: a consideration of their nutritional composition and health implications". <u>Nutr Res Rev</u> **11**: 5-23.

Braun, v. J. (1999). "Food security. A conceptual basis". In: *Food security and nutrition. The global challenge*. M. Schulz. New York, St. Martin's Press**:** 41-53.

Chamberlain, J. and P. Phomsombath (2002). "Poverty alleviation for all. Potentials and options for people in the uplands". Vientiane, Embassy of Sweden, Sida.

Chan, W., J. Brown, S. Lee and B. D (1995). "Meat, poultry and game. Supplement to McCance & Widdowson's 'The composition of food'". London, The Royal Society of Chemistry and Ministry of Agriculture, Fisheries and Food.

Chape, S. (1996). "Biodiversity conservation, protected areas and the development imperative in the Lao PDR: Forging the links". Vientiane, International Union for Nature Conservation.

Chapman, C. and L. Chapman (2002). "Comparative Biochemistry and Physiology". **133**: 861-875.

Cheke, R., C. Mann and R. Allen (2001). "Sunbirds, flowerpeckers, spiderhunters, and sugarbirds of the world". London, Christopher Helm (Publ.) Ltd.

Choowaew, S., W. Chandrachai and R. Peterson (1994). "The socio-economic conditions in the vicinity of Huai Nam Un Wetland, Songkhram River, Lower Mekong Basin, Thailand". <u>Mitt Internat Verein Limnol</u> **24**: 41-46.

Chujo, M., Ed. (1964). <u>Coleoptera from Southeast Asia</u>. Nature and life in Southeast Aisa. Kyoto, Fauna and Flora Research Society.

Clement, P., A. Harris and J. Davis (1993). "Finches and sparrows. An identification guide". London, Christoph Helm (Publ.) Ltd.

Clendon, K. (1998). "The role of forest food resources in village livelihood systems. A study of three villages in Salavan Province. Phase 1 field report". Vientiane, IUCN, Department of Forestry

Clum, N., M. Fitzpatrick and E. Dierenfeld (1996). "Effects of diet on nutritional content of whole vertebrate prey". Zool Biol **15**: 525-537.

Condominas, G. (1977). "We have eaten the forest. The story of a montagnard village in the central highlands of Vietnam (first: 1957 in French)". New York, Hill and Wang (Publ.).

Condominas, G. (2001). "Introduction". In: *Viet Nam's cultural diversity: Approaches to preservation.* O. Salemink. Paris, United Nations Educational, Scientific and Cultural Organization**:** 15-29.

Condominas, G. (2003). "Safeguarding and promoting the intangable cultural heritage of Lao minority groups". In: *Laos and ethnic minority cultures: Promoting heritage.* Y. Goudineau. Paris, United Nations**:** 19-16.

Cordain, L., J. Brand-Miller, S. Boyd Eaton, N. Mann, S. Holt and J. Speeth (2000). "Plant-animals subsistence ratios and macronutrient energy estimations in worldwide hunter-gatherer diets". Am J Clin Nutr **71**: 682-692.

Cordain, L., B. Watkins, G. Florant, M. Kelher, L. Logers and Y. Li (2002). "Fatty acid analysis of wild ruminant tissues: evolutionary implications for reducing diet-related chronic disease". Eur J Clin Nutr **56**: 181-191.

Counihan, C. (2000). "The social and cultural uses of food". In: *The Cambridge world history of food (Vol 2).* K. Kiple. Cambridge, Cambridge University Press**:** 1513-1523.

Counihan, C. and P. Van Esterik (1997). "Food and culture". New York and London, Routledge.

Cox, M., P. Dijk van, J. Nabhitabhata and K. Thirakhupt (1998). "A photographic guide to snakes and other reptiles of Thailand and Southeast Asia". Bangkok, Asia Books.

Cunningham, C. (1970). "Thai 'injection doctors'". Social Science and Medicine **9**: 171-180.

Cupet, P. (1998, first 1891). "Among the tribes of Southern Vietnam and Laos. Wild tribes and French politics on the Siamese border." Translated by Walter Tips. Bangkok, White Lotus Press.

Dadd, R. (1968). "Essential fatty acids: Insects and vertebrates compared". In: *Metabolic aspects of lipid nutrition in insects.* Colorado, Westview Press**:** 107-142.

Davies, G. (2000). "Bushmeat and International Development". Conservation Biology **16**(3): 587-589.

DeFoliart, G. (1991). "Insect fatty acids: Similar to those of poultry and fish in their degree of unsaturation, but higher in the polyunsaturates". The Food Insects Newsletter **4**(1): 1-4.

DeFoliart, G. (1997). "An overview of the role of edible insects in preserving biodiversity". Ecol Food Nutr **36**: 109-132.

Delforge, I. (2001). "Laos at the crossroads". Seedling **18**(2).

Denes, A. (1998). "Exploring the links between foraging and household food security. A gender-based study of foraging activities in Salavan Province". Vientiane, World Education.

Dewey, K. (1979). "Agricultural Development, Diet and Nutrition". Ecol Food Nutr **8**: 265-273.

Dewey, K. (1981). "Nutritional consequences of the transformation from subsistance to commercial agriculture in Tabasco, Mexiko". Human Ecology **9**: 151-187.

DFA (1991). "Der kleine Souci-Fachmann-Kraut. Lebensmitteltabelle für die Praxis". Garching bei München, Wissenschaftliche Verlagsgesellschaft.

Dierenfeld, E., H. Alcorn and K. Jacobsen (2002). "Nutrient composition of whole vertebrate prey (excluding fish) fed in zoos". at http://www.nal.usda.gov/awic/zoo/WholePreyFinal02May29pdf.

Dove, M. (1993). "A revionist view of tropical deforestation and development". Environmental Conservation **20**.

Draper, H. (2000). "Human nutritional adaptation: Biological cultural aspects". In: *The Cambridge World History of Food, Vol 2*. K. Kiple. Cambridge, Cambridge University Press: 1466-1475.

Duckworth, J., R. Salter and K. Khounboline (1999). "Wildlife in the Lao PDR. 1999 Status report". Vientiane, International Union for Nature Conservation, Centre for Protected Areas and Watershed Management, Wildlife Conservation Society.

Dufour, D. (1983). "Nutrition in the Northwest Amazon: Household dietary intake and time-energy expenditure". In: *Adaptive responses of native Amazonians*. W. Taylor Vickers: 329-389.

Dunn, J. and F. Van der Haar (1990). "A practical guide to the correction of iodine deficiency". Technical Manual No. 3. Wageningen, World Health Organization/United Nations Children Fund/International Council for Control of Iodine Deficiency Disorders.

Dwyer, P. (1985). "The contribution of non-domesticated animals to the diet of the Etolo, Southern Highlands Province, Papua New Guinea". Ecol Food Nutr **17**: 101-115.

Eames, J., F. Steinheimer and R. Bansok (2002). "A collection of birds from the Cardamom mountains, Cambodia, including a new subspecies of Arborophila cambodiana". Forktail **18**: 67-86.

Easterly, W. (2002). "The elusive quest for growth. Economists' adventures and misadventures in the tropics". Cambridge (Massachusetts), London, MIT Press.

Eggertz, D. (1996). "Tenure and the sustainable use of forest land in Lao PDR" (*Master Thesis*). Uppsala, Faculty of Law, University Uppsala (Sweden)

EIU (2003). "Country Profile 2003. Cambodia, Laos". London, The Economist Intelligence Unit.

EIU (2004a). "Country Profile 2004. Laos". London, The Economist Intelligence Unit.

EIU (2004b). "Country Report May 2004. Laos". London, The Economist Intelligence Unit.

Elwert, G. (1997). "Schmückendes Gerede und reale Entwicklungsbedingungen. Ueber sozio-kulturelle Bedingungen der Entwicklung". In: *Entwicklung*. M. Schulz, Westdeutscher Verlag: 261-290.

Epstein, P., A. Dobson and J. Vandermeer (1997). "Biodiversity and emerging infectious diseases: integrating health and ecosystem monitoring". In: *Biodiversity and human health*. J. Rosenthal. Washington D.C., Island Press: 60-77.

Estes, J. (2000). "Food as medicine". In: *The Cambridge world history of food (Vol 2)*. K. Kiple. Cambridge, Cambridge University Press: 1534-1553.

Evans, G. (1988). "Agrarian change in communist Laos". Occasional Paper 85 ISAS. Singapore, Institute of Southeast Asian Studies.

Evans, G. (1998). "The politics of ritual and remembrance. Laos since 1975". Bangkok, Silkworm Books.

Evenson, J. (1994). "Compendium of Lao food plants". Working Paper. Vientiane, Dong Dok University, Nabong Agricultural College.

Evers, H.-D. (1990). "Trading minorities in Southeast Asia. A critical summary of research findings". Southeast Asia Programme. Working Paper 139. Bielefeld, University of Bielefeld, Faculty of Sociology.

Falconer, J. and J. Arnold (1991). "Household food security and forestry. An analysis of socio-economic issues". Community Forestry Note 1. Rome, Food and Agricultural Organization of the United Nations/Forest, Tree and People Network.

Falk, P. (1994). "The consuming body". London, Sage Publications.

FAO (1968). "Food composition table for use in Africa". Rome, Food and Agriculture Organization of the United Nations/ US Department of Health, Education, and Welfare.

FAO (1984). "Improved production systems as an alternative to shifting cultivation". FAO Soils Bulletin. Rome, Food and Agriculture Organization of the United Nations, Land and Water Development Division.

FAO (1988). "Traditional food plants". FAO Food and Nutrition Paper 42. Rome, Food and Agricultural Organization of the United Nations.

FAO (1989). "Why natural forests are linked with nutrition, health and self-reliance of villagers in northeast Thailand". Field document 6. FO:DP/THA/84/002. Khon Kaen, Food and Agricultural Organization of the United Nations.

FAO (1989a). "Forestry and food security". FAO Forestry Paper 90. Rome, Food and Agriculture Organization of the United Nations.

FAO (1991). "Non-wood forest products: The way ahead". Rome, Food and Agriculture Organization of the United Nations.

FAO (1991b). "Shifting cultivators. Local knowledge and natural resource management in the humid tropics". Rome, Food and Agriculture Organization of the United Nations.

FAO (1992). "Forest, trees and food". Rome, Food and Agricultural Organization of the United Nations/Forest, People, Trees Network.

FAO (1995a). "Improving nutrition through home gardening - A training package for preparing field workers in Southeast Asia". Rome, Food and Agriculture Organization of the United Nations.

FAO (1995b). "What about the wild animals. Wild animal species in community forestry in the tropics". Rome, Food Agriculture Organization of United Nations.

FAO (1995c). "Beyond timber: Social, economic and cultural dimensions of Non-Wood Forest Products in Asia and the Pacific". RAP Publication 1995/13. Bangkok, Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific.

FAO (1996). "Considering nutrition in national forestry programmes". Formulation, Implementation and Revision of National Forestry Programmes. Rome, Food and Agriculture Organization of the United Nations.

FAO (1996a). "Asia -Pacific Agroforestry Profiles". APAN Field Doc. No. 4/RAP. Bangkok, Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific.

FAO (1999). "Code of practice for forest harvesting in Asia-Pacific". Bangkok, Food and Agricultural Organization of the United Nations, Regional Office for Asia and the Pacific

FAO (1999a). "Poverty alleviation and food security in Asia". Bangkok, Food and Agriculture Organization of the United Nations. Regional Office for Asia and the Pacific.

FAO (2002). "General status of the system of food and agricultural statistics in the Lao PDR. Improvement of agricultural statistics in Asia and Pacific countries". GCP/RAS/171/JPN. Bangkok, Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific.

FAO (2003a). "Nutrition Country Profile of Laos". Bangkok, Food and Agricultural Organization of the United Nations. Regional Office for Asia and the Pacific.

FAO (2003b). "State of the world forests". www.fao.org/forestry

FAO/IRRI (1993). "Rice in human nutrition". Rome, Food and Agricultural Organization/International Rice Research Institute.

Feare, C. and A. Craig (1998). "Starling and mynas". London, Christoph Helm (Publ.), Ltd.

Fimbel, R. (2001). "The cutting edge. Conserving wildlife in logged tropical forests". New York, Columbia University Press.

Fleuret, A. (1979). "The role of wild foliage plants in the diet. A case study from Lushoto, Tanzania". Ecol Food Nutr **8**: 87-93.

Folkard, A. (2003). "Impact evaluation. Rice has a price now". Report of the Cab Cog Project. Vientiane, Concern.

Foppes, J., T. Saypaseuth, K. Sengkeom and S. Chantilat (1997). "The use of NTFPs on the Nakai Plateau". Mission report prepared for NTEC, Thakek. Vientiane, International Union for Nature Conservation.

Forsyth, T. (1999). "Questioning the impacts of shifting cultivation". Watershed **5**: 23-29.

Francis, C. (2001). "A photographic guide to mammals of Thailand and Southeast Asia". Bangkok, Asia Books.

Freeman, J. (1955). "Iban agriculture. A report on the shifting cultivation of hill rice by the Iban of Sarawak". Colonial Research Studies No. 18. London, Her Majesty's Stationary Office.

Galloway, R. (1999). "Report on the nutrition in the Lao PDR (Appendix VI)". Washington D.C., World Bank.

Gansberghe, D. (1994). "The diversity of shifting cultivation systems in Laos. Preliminary findings from the Nabong area". In: *Shifting cultivation systems and rural development in the Lao PDR. Report of the Nabong Technical Meeting July 14-16,1993*. Vientiane, United Nations Development Programme, Lao Ministry of Agriculture and Forestry**:** 98-109.

Garnier, F. (1996, first 1866). "Travels in Cambodia and part of Laos: The Mekong exploration commission report (Vol 1)". Translated by W. Tips. Bangkok, White Lotus Press.

Gebert, R. (2004). "Gender, poverty and malaria: Results of a rapid, qualitative assessment in Mon-Khmer villages in Sekong Province. Unpublished." Berlin.

Gibson, R. S. (1990). "Principles of nutritional assessment". New York and Oxford, Oxford University Press.

Gillespie, S. and L. Haddad (2001). "Attacking the double burden of malnutrition in Asia and the Pacific". ADB Nutrition and Development Series 4. Manila, Asian Development Bank.

GOL (1999). "The Government's strategic vision for the agricultural sector". Vientiane, Lao Ministry of Agriculture and Forestry.

GOL (2000a). "Action programme for the development of the Lao PDR 2001-2010". Third United Nations conference on the least developed countries. Brussels, 13-20 May 2001, Government of the Lao PDR.

GOL (2000b). "Agricultural statistics 1975-2000". Vientiane, Lao Central Planning Committee.

GOL (2001). "Sekong Indigenous Peoples Development Programme. Final Evaluation Report. June 2001". Vientiane, Sekong Provincial Government, United Nations Development Programme.

GOL (2001a). "Health status of the people in the Lao PDR. Report on the national health survey". Vientiane, Lao Ministry of Public Health/Lao State Planning Committee.

GOL (2002). "Foreign aid report". Vientiane, Lao Central Planning Committee.

GOL (2003a). "The Lao PDR's National Poverty Eradication Programme (NPE P)". Vientiane, Lao Central Planning Committee.

Gollin, D. and M. Smale (1999). "Valuing genetic diversity: Crop plants and agroecosystems". In: *Biodiversity in agroecosystems*. C. Qualset. Boca Raton, Florida, CRC Press**:** 237-265.

Goudineau, Y. (1997). "Resettlement and social characteristics of new villages - Basic needs for resettled communities in the Lao PDR". Vientiane, United Nations Development Programme/UNESCO.

Goudineau, Y. (2003). "Managing the intangible cultural heritage". In: *Laos and ethnic minority cultures: promoting heritage*. Y. Goudineau. Paris, UNESCO Publishing**:** 33-37.

GOV (2000). "Nutrition composition table of Vietnamese foods (in Vietnamese language)". Thanh phan dinh du'o'ng thu'c an Viet Nam. Hanoi, Government of Vietnam, National Institute of Nutrition, Ministry of Health.

Gressitt, J. (1970). "Biogeography of Laos". Pacific Insects Monograph **24**: 573-626.

Grifo, F. and J. Rosenthal (1997). "Biodiversity and human health". Washington D.C., Island Press.

GTZ/GOL (2002). "Schwerpunktstrategiepapier 'Ländliche Entwicklung in nördlichen Bergregionen' (unpublished)". Vientiane, Gesellschaft für Technische Zusammenarbeit/Government of the Lao PDR.

Gupta, P. N. S. (1980). "Food consumption and nutrition of regional tribes in India". Ecol Food Nutr **9**: 93-108.

Håkangård, A. (1990). "Women in shifting cultivation. Luang Prabang Province". Stockholm, Department of Social Anthropology, Development Studies Unit, Stockholm University.

Halle von, B. (2002). "Preliminary assessment of the environmental and socio-economic impacts of wild meat harvesting in South America". In: *Links between biodiversity, conservation, livelihoods and food security. The sustainable use of wild species for meat*. M. Trivedi. Gland and Cambridge, International Union for Nature Conservation**:** 61-69.

HANDICAP (1997). "Living with UXO. National survey on the socio-economic impact of UXO in the Lao PRD". Vientiane, HANDICAP International.

Hartog den, A. and Vos de (1971). "The use of rodents as food in tropical Africa". Nutritional Newsletter **11**: 1-14.

Hassan, N., N. Huda and K. Ahmad (1995). "Seasonal patterns of food intake in rural Bangladesh: Its impact on nutritional status". Ecol Food Nutr **17**: 175-186.

Hatfield (1998). "Preliminary assessment of environmental impacts related to spraying of agent orange herbicide during the Viet Nam war". Volume 1: Report; Volume 2: Appendices. Vancouver and Hanoi, Hatfield Consultants Ltd, 10-80 Committee.

Hawkes, K., K. Hill and J. O'Connell (1982). "Why hunters gather: Optimal foraging and the Ache of Eastern Paraguay". Am Ethnol **9**: 379-398.

Hickey, G. C. (1993). "Scattered world - Survival among Vietnam's highland peoples during the Vietnam War". Philadelphia, Pennsylvania Press.

Hladik, C., O. Linares, A. Hladik, H. Pagezy and A. Semple (1993). "Tropical forests, people and food: an overview". In: *Biocultural interaction and applications to development*. O. F. L. C M Hladik. Paris, UNESCO/The Parthenon Publishing Group**:** 3-14.

Holmes, R. and K. Clark (1992). "Diet, acculturation and nutritional status in Venezuela's Amazon Territory". Ecol Food Nutr **27**: 163-187.

Holyo del, J., A. Elliot and J. Sargatal (1992). "Handbook of the birds of the world". (Vol 1-8). Barcelona, Lynx Edicions.

Huss-Ashmore, R. and S. Johnston (1994). "Wild plants as cultural adaptations to food stress". In: *Eating on the wild side. The pharmacologic, ecologic and social implications of using non-cultigens*. N. Etkin. Tuscon and London, The University of Arizona Press**:** 62-_.

Huss-Ashmore, R. and R. Thomas (1988). "A frame for analyzing uncertainty in highland areas". In: *Coping with uncertainty in food supply*. G. Harrison. Oxford, Clarendon Press**:** 452-468.

IFAD (2002). "Interim evaluation of IFAD's Bokeo Food Security Project, Laos." Evaluation profile - No. 4. April 2002. Available at http://www.ifad.org/evaluation/public.html/eksyst/doc/profile/pi/la.htm.

IIRR, IDRC, FAO, NACA and ICLARM (2001). "Utilizing different aquatic resources for livelihoods in Asia. A resource book". Manila, International Institute of Rural Reconstruction, International Development Research Centre, Food and Agricultural Organization of the United Nations, Network of Aquaculture Centres in Asia-Pacific and International Centre for Living Aquatic Resources Management.

Ingram, C., S. Lewis, G. Stott and K. Wynn (2000). "Clinical use of WHO haemoglobin colour scale: Validation and critique." Journal of Clinical Pathology **53**: 933-937.

INMU (2002). "Food composition database for INMUCAL Program (in Thai and English)". Bangkok, Institute for Nutrition, Mahidol University.

Ireson, C. (1996). "Field, forest, and family: Women's work and power in rural Laos". Colorado, Westview Press.

Ireson, C. and R. Ireson (1991). "Ethnicity and Development in Laos". Asian Survey **31**(10): 929-937.

IRRI (2003). "Annual Technical Report 2001-2002". Vientiane, International Rice Research Institute, National Agriculture and Forestry Research Institute.

IUCN (2002). "Sustainable management of NTFPs for the Forestry Strategy to the year 2020 Lao PDR". Bangkok, SIDA.

Izikowitz, K. (2001, first 1951). "Lamet - Hill peasants in French Indochina". Bangkok, White Lotus.

Jerndal, R. (1998). "Making space in Laos: constructing a national identity in a "forgotten" country". Political Geography **17**: 809-831.

Johns, T., H. Chan, O. Receveur and H. v. Kuhnlein (1994). "Nutrition and the environment of indigenous peoples". Ecol Food Nutr **32**: 81-87.

Johnson, A. (1999). "Use of a conceptual model and threat assessment to design and monitor effectiveness in Nam Ha National Biodiversity Conservation Area, Lao PDR". The World Commission on Protected Areas 2nd Southeast Asian Regional Forum (Conference proceeding). Pakse, 1999.

Johnson, A., S. Singh, M. Dongdala and O. Vongsa (2003). "Wildlife hunting and use in the Nam Ha National Protected Area: Implications for rural livelihoods and biodiversity conservation". Vientiane, Wildlife Conservation Society

Johnson, A. and S. Vannalath (2002). "Measuring success: Ecotourism and wildlife conservation in the Lao PDR. Monitoring biodiversity and natural resource use along Nam Han national protected area ecotourism routs". Vientiane, WCS.

Jones, D. (1977). "Medical practice and tribal communities". In: *Health and disease in tribal societies. Ciba Foundation Symposium 49*. C. Foundation. Amsterdam, Oxford, New York, Elsevier, Excerpta Medica, North-Holland**:** 243-255.

Judprasong, K. (1996). "Nutritive value of commonly used fish: proximate composition, fatty acids and cholesterol" (*Master Thesis*). Bangkok, Faculty of Graduate Studies, Mahidol University

Kaufmann, S. (1998). "IFSP Nutrition survey Muang Sing and Nalae, Luang Namtha Province 1997". Project Report. Muang Sing, GTZ Integrated Food Security Programme Muang Sing.

Kaufmann, S., A. Phanlavong, G. Kohl and M. Krawinkel (2001). "Nutrition and poverty in Northern Laos: Achievements after 4 years of intensive interventions". Lao German Integrated Food Security Programme Muang Sing and Nalae (GTZ). Antwerpen (Nov 2001), Poster for the International Seminar on Child Growth and Development.

Kemp, A. (1995). "The hornbills. Bucerotiformes". New York, Oxford University Press.

Keyes, C. (1997). "Indigenous minorities in Northern mainland Southeast Asia". In: *Selected papers of the workshop on ethnic communities in a changing environment.* Chiang Mai, Social Research Institute Chiang Mai University.

Kirsch, T. (1973). "Feasting and social organization. Religion and society in upland Southeast Asia". Data Paper Number 92, Southeast Asian Program, Department of Asian Studies. Ithaca, New York, Cornell University.

Knowles, J. (2002). "Comparative review of 1997-1998 Lao PDR poverty profile". Vientiane, ADB, CPC

Kracht, U. (1999). "Hunger, malnutrition and poverty: Trends and prospects towards the 21st century". In: *Food security and nutrition. The global challenge.* M. Schulz. New York, St. Martin's Press**:** 54-74.

Krahn, J. (2000). "Food and nutrition security: Concepts, calories, and clumsiness. Coconuts and pigs are good to think but not to eat". Entwicklungsethnologie **9**: 40-59.

Krahn, J. (2003b). "Cooking up: Dietary change in Lao upland kitchens". Juth Pakai (Perspectives on Lao Development) **1**: 1-13.

Kramer, D. (1998). "Kulturelle Vielfalt als Ressource. Die Bedeutung von Kultur in der Globalisierungsdebatte". E+Z **39**: 256-258.

Krings, T. (1999). "Agrarwirtschaftliche Entwicklung, Verfügungsrechte an natürlichen Resourcen und Umwelt in Laos". Zeitschrift für Wirtschaftsgeographie **43**: 213-228.

Krings, T. (1999). "Hydropower, rice farmers and the state. The case of deforestation in Laos". In: *Coping with changing environments. Social dimensions of endangered ecosystems in the developing world.* H. Geist. Ashgate, Aldershot**:** 75-96.

Kuhnlein, H. v. (1992). "Change in the use of traditional foods by the Nuxalk native people of British Columbia". Ecol Food Nutr **27**: 259-282.

Kuhnlein, H. v. (2003). "Micronutrient nutrition and traditional food systems of indigenous peoples". Food and Nutrition.

Kuhnlein, H. v. and O. Receveur (1996). "Dietary change and traditional food systems of indigenous peoples". Ann. Rev. Nutr. **16**(417-442).

Kuhnlein, H. v., O. Recevuer, N. Morrison, D. Appavpp, R. Soueida and P. Pierrot (1995). "Dietary nutrients of Sahtu Dene/Metis vary by food source, season and age". Ecol Food Nutr **34**: 183-195.

Kunarattanapruk, K., J. Chokkanapitak, P. Uttamavatin, B. Muktabhant, S. Lowirakorn and S. Saowakontha (1998). "Yearly household record of food from the forest for home consumption by rural villagers in north-east Thailand". Food and Nutrition Bulletin **19**: 13-19.

Kunstadter, P. (1965). "The Lua' (Lawa) and Karen hill peoples of North-Western Thailand (Confidential draft for private circulation)". Conference on Southeast Asian tribes, minorities and central governments. Princeton University, New Jersey, 1965.

Kunstadter, P. (1978). "Alternatives for the development of upland areas". In: *Farmers in the forest. Economic development and marginal agriculture in Northern Thailand*. Honolulu, University Press of Hawaii**:** 289-308.

Lacher, T., R. Douglas Slack, L. Coburn and M. Goldstein (1999). "The role of agroecosystems in wildlife biodiversity". In: *Biodiversity in agroecosystems*. C. Qualset. Boca Raton, Florida, CRC Press**:** 147-161.

Lambert and M. Woodcock (1996). "Pitta, broadbills and asities". Sussex, Picca Press.

Larsen, C. (2003). "Animal source foods and human health during evolution". J Nutr **11**: 3893S-3897S.

Laughlin, C. and A. Fairfield (1997). "Natural products for the treatment of infectious diseases". In: *Biodiversity and human health*. J. Rosenthal. Washington D.C., Island Press**:** 164-179.

Le Pichon, J. (1938). "Les chasseurs de sang". Bulletin des Amis Vieux Hue **25**: 359-364.

Leakey, R. (1999). "Agroforestry for biodiversity in farming systems". In: *Biodiversity in agroecosystems*. C. Qualset. Boca Raton, Florida, CRC Press**:** 127-145.

Leitzmann, C. (2003). "Nutrition ecology: the contribution of vegetarian diets". Am J Clin Nutr **78**(3 Suppl): 657S-659S.

Leitzmann, C. and I. Elmadfa (1990). "Ernährung des Menschen". Stuttgart, Eugen Ulmer Verlag.

Lekagul, B. and J. McNeely (1977). "Mammals of Thailand".

Lekagul, B. and P. Round (1991). "A guide to the birds of Thailand". Bangkok, Sahra Karn Bhaet.

Lemoine, J. (2003). "Creating an ethnographical data bank in the Lao PDR". In: *Laos and ethnic minority cultures: promoting heritage*. Y. Goudineau. Paris, UNESCO Publishing**:** 275-282.

Leonard, W. and B. Thomas (1988). "Changing dietary patterns in the Peruvian Andes". Ecol Food Nutr **21**: 245-263.

Lepowsky, M. (1985). "Food taboos, malaria and dietary change: Infant feeding and cultural adaptation on a Papua New Guinea Island". Ecol Food Nutr **16**: 105-126.

Lewis, S., G. Stott and K. Wynn (1998). "An inexpensive and reliable new haemoglobin colour scale for assessing anaemia". Journal of Clinical Pathology **51**: 21-24.

Lian, L. (1996). "Biodiversity database and assessment of logging impacts". Conservation, management and development of forest resources. Kuala Lumpur, 1996, Forest Research Institute Malaysia.

Madge, S. and H. Burn (1999). "Crows and jays: A guide to the crows, jays, and magpies of the world". London, Christopher Helms (Publ.) Ltd.

Mainka, S. (2002). "Biodiversity, poverty and hunger - where do they meet?" In: *Links between biodiversity conservation, livelihoods and food security. The sustainable use of wild species for meat*. M. Trivedi. Gland and Cambridge, International Union for Nature Conservation**:** 11-17.

Malaivongse, P. (2000). "Study on the stability of iodine in iodated salt by using of different cooking model conditions" (*Master Thesis*). Bangkok, Faculty of Graduate Studies, Mahidol University

Manthey, U. and W. Grossmann (1997). "Amphibien und Reptilien Südostasiens". München, Natur und Tier Verlag.

Margoluis, R. and N. Salafsky (2001). "Measures of success. Designing, managing and monitoring conservation and development projects". Washington, D.C., Covelo Californien, Island Press.

Marris, G., M. Hedemark, A. Johnson and C. Vongkhamheng (2002). "Environmental baseline study of the Route 3 upgrade through the Nam Ha National Protected Area". Vientiane, Wildlife Conservation Society

Marshall, D. (1995). "Introduction: Food choice, the food consumer and food provisioning". In: *Food Choice and the Consumer*. D. Marshall. Glasgow, Blackie Academic and Professional.

Marten, G. and O. Abdoellah (1988). "Crop diversity and nutrient in West Java". Ecol Food Nutr **21**: 17-43.

McGavin, G. (2000). "Insects, spiders and other terrestrial arthropods". London, Dorling Kindersley.

McNeely, J. and S. Scherr (2003). "Ecoagriculture. Strategies to feed the world and save biodiversity". Washington, Island Press.

Mena, P., J. Stallings, J. Regalado and R. Cueva (2000). "The Sustainability of current hunting practices by the Huaorani". Hunting for Sustainability in Tropical Forests.

Messer, E., E. Haber, J. Toomre and B. Wheaton (2000). "Culinary history". In: *The Cambridge world history of food (Vol 2).* K. Kiple. Cambridge, Cambridge University Press**:** 1367-1378.

Metz, M., D. Hart and H. Harpending (1972). "Iron, folate and vitamin B12 nutrition in a hunter-gatherer people: a study of the !Kung Bushmen". Am J Clin Nutr **24**: 229-242.

Meusch, E., J. Yhoung-Aree, R. Friend and S. Funge-Smith (2003). "The role and nutritional value of aquatic resources in the livelihoods of rural people. A participatory assessment in Attapeu Province, Lao PDR." Bangkok, Food and Agriculture Organization of the United Nations/Internation Union for Nature Conservation/Living Aquatic Resource Research Centre

Meyer-Rochow, V. (1973). "Edible insects in the different ethnic groups of Papua and New Guinea". Am J Clin Nutr **26**: 673-677.

Missano, H., H. Njebele, L. Kayombo and B. Ogle (1994). "Dependency on forests and trees for food security. A pilot study: Nanguruwe and Mbambakofi villages, Mtwara region, Tanzania". Working Paper 261. Uppsala, Swedish University of Agricultural Sciences. International Rural Development Centre.

Mitchell (1998). "The political economy of Mekong Basin development". In: *The politics of environment in Southeast Asia*. C. Warren. London, Routledge**:** 71-79.

MOH (2001). "Health status of the people in the Lao PDR. Report on the national health survey". Vientiane, Lao Ministry of Public Health, State Planning Committee.

MOH, WHO and UNICEF (1995). "National vitamin A survey - Lao PDR 1995". Final Report. Vientiane, Ministry of Health/World Health Organization/ United Nations Children's Fund.

Montresor, A. (2000). "Field trial of a haemoglobin colour scale: An effective tool to detect anaemia in preschool children". Tropical Medicine and International Health **5**: 129-133.

Moreno-Black, G. and P. Somnasang (2000). "In times of plenty and times of scarcity: Non domesticated food in Northeastern Thailand". Ecol Food Nutr **38**: 563-586.

Morrison, H. (1966). "Life in a long house". Hongkong, Borneo Literature Bureau.

Mungkorndin, S. (1981). "Forests as a source of food to rural communities". RAPA 52. Bangkok, Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific.

Napompeth, B. (1965). "Entomology in Thailand up to 1964". Bankgok, Department of Entomology, College of Agriculture, Kasetsart University.

Narbonne, J.-F. (2000). "Dioxin contaminants in foodstuffs. Report for the Committee of Experts on nutrition, food safety and consumer health". Brussels, Council of Europe

Nash, S. (1997). "Fin, feather, scale and skin: Observations on the wildlife trade in the Lao PDR and Vietnam". Kuala Lumpur (Selangor), TRAFFIC Southeast Asia.

Navajas, H., B. Phomsoupha and M. Kakegawa (2001). "Sekong Indigenous Peoples Development Programme - Final Evaluation Report". Vientiane, Government of Laos/United Nations Development Programm/United Nations Volunteers/Capacity 21

Ng, P. and P. Naiyanetr (1995). "Pudaengon: a new genus of terrestrial crabs (Crustacea: Decapoda: Brachyura: Potamidae) from Thailand and Laos with description of seven new species". The Raffles Bulletin of Zoology **43**(2): 355-376.

Ngaosyvathn, M. (1993). "Tribal politics in Laos". In: *Fifth International Conference on Thai Studies, School of Oriental and African Studies, University of London, 5-10 July 1993*. London.

Nghi, H. (2003). "Community forest management in Dak Lak Province, Vietnam". Watershed **8**: 33-37.

Norman, J., C. Pearson and P. Searle (1995). "The ecology of tropical food crops". Cambridge, Cambridge University Press.

Nowak, R. (1999). "Walker's mammals of the world". Baltimore, John Hopkins Press.

Nurse, M. and V. Soydara (2001). "Conservation and development: Finding the linkages. Lessons learned in collaborative management for the sustainable use of NTFPs in the Lao PDR (Draft)". Vientiane, International Union for Nature Conservation.

ODI (1998). "Shifting cultivation as agents of deforestation: Assessing the evidence". Natural Resource Perspectives **29**: at http://www.odi.org.uk/nrp/29.html.

ODI (2003). "Food policy old and new". ODI Briefing Paper November 2003.

Ogden, C. (1996). "Considering nutrition in national forestry programmes". Rome, Food and Agricultural Organization of the United Nations.

Ogle, B., H. Tuyet, H. Duyet and N. Dung (2003). "Food, feed or medicine: The multiple functions of edible wild plants in Vietnam". Economic Botany **57**: 103-117.

Omori, K. and L. Greska (1996). "Dietary patterns and dietary adequacy of highland Pwo and Sgaw Karen of Northwest Thailand". Ecol Food Nutr **36**: 219-235.

Oomen, H. (1971). "Ecology of human nutrition in New Guinea". Ecol Food Nutr **1**: 1-16.

Oritz, O. (1999). "Understanding interactions between indigenous knowledge and scientific information". Indigenous Knowledge and Development Monitor **7**: 7-10.

Pelto, G. and L. Vargas (1992). "Introduction: dietary change and nutrition". Ecol Food Nutr **27**: 159-161.

Pelzer, K. (1978). "Swidden cultivation in Southeast Asia: Historical, ecological, and economic perspectives". In: *Farmers in the forest. Economic development and marginal agriculture in Northern Thailand*. Honolulu, University Press of Hawaii: 271-286.

Pennington, M. (2001). "Laos' hill tribes resist dropping old habits". Associated Press, 9 January.

Peres, C. (2000). "Evaluating the impact of sustainability of subsistence hunting at multiple Amazonian forest sites". Hunting for Sustainability in Tropical Forests.

Polunin, I. (1977). "Some characteristics of tribal people". In: *Health and disease in tribal societies. Ciba Foundation Symposium 49 (London 1976)*. C. Foundation. Amsterdam, Oxford, New York, Elsevier, Excerpta Medica, North Holland: 5-20.

Pongcharoen, T. (1998). "Household food acquisition and nutritional status of children 0-5 years old in forest and non-forest communities: a case study of Pha Taem National Park, Ubon Ratchathani" (*Master thesis*). Bangkok, Faculty of Graduate Studies, Mahidol University

Popkin, B. (1994). "The nutrition transition in low-income countries: An emerging crisis". Nutrition Reviews **52**(9): 285-298.

Popkin, B. (2001). "The nutrition transition and its relationship to demographic change". In: *Nutrition and health in developing countries*. M. Bloem. Totowa, New Jersey, Human Press: 427-445.

Pottier, J. (1999). "Anthropology of food. The social dynamics of food security". Cambridge, Polity Press.

Puwastien, P., B. Burlingame, M. Raroengwichit and P. Sungpuag (2000). "ASEAN Food Composition Tables". Bangkok, Institute for Nutrition, Mahidol University (for the ASEAN Network of Food Data System).

Raintree, J. (2000). "Innovation in culturally conservative communities". ILEIA Newsletter: 19.

Rao, M. and P. McGowan (2002). "Wild-Meat use, food security, livelihoods, and conservation". Conservation Biology **16**: 580-583.

Rappaport, R. (1968). "Pigs for the ancestors. Ritual in the ecology of a New Guinea people". New Haven, Yale University Press.

Redford, K., R. Godshalk and K. Asher (1995). "What about the wild animals? Wild animal species in community forestry in the tropics". Community Forestry Noten 13. Rome, Food and Agriculture Organization of the United Nations.

Rehbein, B. (2004). "Globalisierung in Laos. Transformation des ökonomischen Feldes". Münster, LIT Verlag.

Reid, J., A. Bensadoun, L. Bull, J. Burton, P. Gleeson, I. Han, Y. Joo, D. Johnson, W. McManus, O. Paladines, J. Stroud, H. Tyrrell, B. Van Niekerk and G. Wellington (1967). "Some peculiarities in the body composition of animals". Body composition in animals and man (Conference proceedings). University of Missouri, Columbia, 1967, National Academy of Sciences, Washington D.C.

Reitz, E. and E. Wing (1999). "Zooarchaeology". Cambridge, Cambridge University Press.

Rerkasem, K. and B. Rerkasem (1995). "Montane mainland South-East Asia: agroecosystems in transition". Global Environmental Change **5**(4): 313-322.

Rhoades, R. and V. Nazarea (1991). "Local management of biodiversity in traditional agroecosystems". In: *Biodiversity in agroecosystems*. C. Qualset. Boca Raton, Florida, CRC Press: 215-236.

Rigg, J. (2003). "Food security and rural livelihoods: Identifying (possible) trajectories". Workshop on food security and sustainable livelihoods. Vientiane, 2003.

Rigg, J. and R. Jerndal (1996). "Plenty in the context of scarcity". In: *Environmental change in Southeast Asia*. R. Bryant. London, Routledge: 145-162.

Robinson, J. and E. Bennett (2000). "Carrying capacity limits to sustainable hunting in tropical forests". In: *Hunting for sustainability in tropical forests*. G. Robinson. New York: 13-30.

Roder, W. (1997). "Slash- and burn rice systems in transition: Challenges for agricultural development in the hills of northern Laos". Mountain Research and Development **17**: 1-10.

Roder, W. (2001). "Slash- and burn rice systems in the hills of Northern Lao PDR: Description, challenges, and opportunities". Vientiane, International Rice Research Institute.

Romagny, L. and S. Daviau (2003). "Synthesis on resettlement in Long District, Luang Namtha Province, Lao PDR". Vientiane, Action Contre de la Faim (Laos)

Ronnås, P. (2001). "Introduction". In: *Institutions, livelihoods, and the environment.* A. Straub. Copenhagen, Nordic Institute of Asian Studies.

Rozin, E. (1982). "The structure of cuisine". In: *The psychobiology of human food selection*. L. Barker. Conneticut, A.V.I. Publishing: 189-203.

Russell, S. (1989). "Introduction: Transformations in ritual and economy in upland and lowland Southeast Asia". Ritual power and economy. Upland-lowland contrast in mainland SEA. Occasional Paper 14. Centre for SEA Studies, Northern Illinois University.

Saraya, A., B. Tandon and K. Ramachandran (1971). "Study of vitamin B12 and folic acid deficiency in hookworm disease". Am J Clin Nutr **24**: 3-6.

Schaller, G. (1995). "A wildlife survey in the Annamite mountains of Laos. Unpublished". Vientiane, WCS.

Schecter, A. (1994). "Dioxin and health". New York, Plenum Press.

Schecter, A. (2001). "Recent dioxin contamination from Agent Orange in residents of a Southern Vietnam city". J Occup Environ Med **43**: 435-43.

Schecter, A., H. Quynh, M. Pavuk, O. Paepke, R. Malisch and J. Constable (2003). "Food as a source of dioxin exposure in the residents of Bien Hoa City, Vietnam". J Occup Environ Med **45**: 781-788.

Schlegel, S. and A. Guthrie (1973). "Diet and the Tiruray shift from swidden to plow farming". Ecol Food Nutr **2**: 181-191.

Schliesinger, J. (2003). "Ethnic groups of Laos (Vol 2). Profile of Austro-Asiatic speaking peoples". Bangkok, White Lotus Press.

Schuftan, C. (2000). "The different challenges in combating micronutrient deficiencies and combating protein energy malnutrition". Ecol Food Nutr **38**: 505-513.

Schultze, M. (1994). "Die Geschichte von Laos. Von den Anfängen bis zum Beginn der neunziger Jahre". Hamburg, Institutes für Asienkunde.

Schulz, M. (1999). "Introduction". In: *Food security and nutrition: the global challenge.* M. Schulz. New York, St. Martin's Press: 11-38.

Schwerin, K. (1985). "Food energy in tropical ecosystems". New York, Gordon and Breach.

Scott, G., M. Rosegrant and C. Ringler (2000). "Roots and tubers for the 21st century - trends, projections, and policy options". Washington and Lima, International Food Policy Research Institute, Centro International de la Papa.

Scrimshaw, N. (2000). "Infection and nutrition: Synergistic interactions". In: *The Cambridge world history of food (Vol 2).* K. Kiple. Cambridge, Cambridge University Press: 1397-1411.

Sen, A. (1981). "Poverty and famines". Oxford, Clarendon Press.

Shoemaker, B., I. Baird and M. Baird (2002). "The people and their river: The Xe Bang Fai River Basin, Lao PDR". Watershed **7**: 33-44.

Showler, D., P. Davidson, C. Vongkhamheng and K. Salivong (1998). "A wildlife and habitat survey of the Southern border of the Xe Sap National Biodiversity Conservation Area and the Dakchung Plateau, Xe Kong Province, Lao PDR". Vientiane, Wildlife Conservation Society

Silitoe, P. (1998a). "Defining indigenous knowledge: The knowledge continuum". Indigenous Knowledge and Development Monitor **3**: 1-5.

Silitoe, P. (1998b). "What, know natives? Local knowledge in development". Social Anthropology **6**: 203-220.

Simana, S. (1997). "Kmhmu' livelihood. Farming the forest". Vientiane, Ministry of Information and Culture. Institute for Cultural Research.

Smith, N., J. Williams, D. Plucknett and J. Talbot (1992). "Tropical forests and their crops". Ithaca, Comstock Publishing Associates.

Smith, R., R. Muir, M. Walpole, A. Balmford and N. Leader-Williams (2003). "Governance and the loss of biodiversity". Nature **426**: 67-70.

SNV (2002). "Participatory institutional analysis of NTFP Sector". Vientiane, Netherlands Development Organization, Laos.

Steinmetz, R., T. Stones and T. Chan-Ard (1999). "An ecological survey of habitats, wildlife and people in Xe Sap National Biodiversity Area, Salavan Province, Lao PDR". Patumthani (Thailand), World Wildlife Fund

Stellmann, J., S. Stellmann, R. Christian, T. Weber and C. Tomasallo (2003). "The extent and patterns of usage of Agent Orange and other herbicides in Vietnam". Nature **422**: 681-687.

Stott, G. and S. Lewis (1995). "A simple and reliable method for estimating haemoglobin." Bulletin of the World Health Organization **73**(3): 369-373.

Stuart, B., P. Djik van and D. Hendrie (2001). "Photographic guide to the turtles of Thailand, Laos, Vietnam and Cambodia". Vientiane (????), Wildlife Conservation Society.

Sulavan, K., T. Kingsada and N. Costello (1993). "Katu folktails and society". Vientiane, Lao Ministry of Information and Culture.

Sulavan, K., T. Kingsada and N. Costello (1994). "Belief and practice in Katu agriculture". Vientiane, Lao Ministry of Information and Culture.

Sulavan, K., T. Kingsada and N. Costello (1995). "Aspects of Katu traditional medicine." Vientiane, Lao Ministry of Information and Culture.

Sungpuag, P. and P. Puwastien (1983). "Nutritive values of unconventional protein source: Insects (in Thai language)". J. Nutr. Assoc. Thailand **17**: 5-12.

Surin Pookajorn, S. (1992). "The Phi Tong Luang (Mlabri). A hunter-gatherer group in Thailand". Bangkok, Odeon Store.

Tayanin, D. and K. Lindell (1991). "Hunting and fishing in a Kammu villlage". Studies on Asian Topics No. 14. Copenhagen, Curzon Press.

Thamam, R. (1982). "Deterioration of traditional food systems, increasing malnutrition and food dependency in the Pacific Islands". Journal of Food and Nutrition **39**: 109-119.

Timmins, R. and C. Vongkhamheng (1996). "Final report to the Centre for Protected Areas and Watershed Management, Department of Forestry, Ministry of Agriculture and Forestry, Lao Peoples' Democratic Republic". Vientiane, Wildlife Conservation Society

Toft Mogensen, M. (2001). "The importance of fish and other aquatic animals for food and nutrition security in the Lower Mekong Basin." (*Master Thesis*). Copenhagen, The Royal Veterinary and Agricultural University, Denmark

Townsend, P., S. Liao and J. Konlande (1973). "Nutritive contributions of sago ash used as a native salt in Papua New Guinea". Ecol Food Nutr **2**: 91-97.

Trakarnsuphakorn, P. (2003). "Local wisdom in the management of biodiversity". Watershed **8**: 26-32.

TRP (2000). "Aspects of forest management in the Lao PDR". Amsterdam, Tropical Rainforest Movement.

Truswell, A. (1977). "Diet and nutrition of hunter-gatherers". In: *Health and disease in tribal societies. Ciba Foundation Symposium 49*. C. Foundation. Amsterdam, Oxford, New York, Elsevier, Excerpta Medica, North-Holland**:** 213-226.

Tungittiplakorn, W. and P. Dearden (2002). "Hunting and wildlife use in some Hmong communities in Northern Thailand". Nat. Hist. Bull. Siam Soc. **50**: 57-73.

Turner, A. and C. Rose (1989). "A handbook to the swallows and martins of the world". London, Christopher Helm (Publ.) Ltd.

UNDP (1997a). "Socio-economic profile of Sekong Province". Vientiane, United Nations Development Program.

UNDP (2002). "National Human Development Report Lao PDR 2001". Vientiane, United Nations Development Programme (Laos).

UNDP/UNV (1997). "Country comparisons on highland peoples development issues - Lao PDR". HPP Regional Workshop. Phnom Penh, 1997, Highland Peoples Programme/ United Development Programme.

Uphoff, N. (2002). "The agricultural development challenges we face". In: *Agroecological innovations. Increasing food production with participatory development*. N. Uphoff. London, Earthscan Publications**:** 4-20.

UXO (1999). "Annual Report". Vientiane, Lao National UXO Programme.

UXO (2000). "Work Plan 2000". Vientiane, Lao National UXO Programme.

Vandermeer, J. (1997). "Biodiversity loss in and around agroecosystems". In: *Biodiversity and human health*. J. Rosenthal. Washington D.C., Island Press**:** 111-123.

Vandermeer, J., M. Noordwijk van, J. Anderson, C. Ong and I. Perfecto (1998). "Global change and multi-species agroecosystems: concepts and issues (Review article)". Agriculture, Ecosystems and Environment **67**: 1-22.

Vidal, J. (1959). "Noms vernaculaires de plantes en usage au Laos". Paris, Ecole Francaise D'Extreme-Orient.

Vos de, A. (1977). "Game as food: A report on its significance in Africa and Latin America". Unasylva **29**: 2-12.

Wangpattana, A. (2002). "From science to common sense". Watershed **8**: 22-26.

Warner, K. (1991). "Shifting cultivator's local knowledge and natural resource management in the humid tropics". Rome, Food and Agriculture Organization of the United Nations.

Warren, T. (2000). "Indigenous Mekong fish species with potential for aquaculture, stocking or translocation. Management of reservoir fisheries in the Mekong Basin II. Component Report No. 1". Vientiane, Mekong River Commission

Watabe, T. (1968). "Glutinous rice in Northern Thailand". Reports on research in SEA - Natural Science Series. Osaka, Kyoto University.

Wester, L. (1996). "Conservation of traditional food plants and economic development in Thailand". In: *Contemporary perspectives in Thai foodways*. G. Yasmeen. Vancouver, Center for Southeast Asian Research, University of British Columbia.

White, T. (1953). "Statistical techniques for the discovery of artifact types". American Antiquity **XVIII**(4): 396-398.

WHO and IARC (1997). "Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzofurans". IARC monographs on the evaluation of carcinogenic risks to humans, Vol 69. Lyon, World Health Organization of the United Nations, International Agency for Research on Cancer.

Williams, T. (1965). "The Dusun. A North Borneo society". Case Studies in Cultural Anthropology. San Francisco, Holt, Rinehart and Winston (Publ.).

Williams-Hunt, P. (1952). "Malayan Aborigines". Kuala Lumpur, Government Press, Department of the Adviser on Aborigines.

Wilson, C. (1985). "Staples and calories in Southeast Asia: The bulk of consumption". In: *Food energy in tropical ecosystems*. K. Schwerin. New York, Gordon and Breach**:** 65-81.

Wilson, C. (1994). "Traditional diets; their value and preservation". Ecol Food Nutr **32**: 89-90.

Winterhalder, B. (1981). "Optimal foraging strategies and hunter-gatherer research in anthropology: theories and models." In: *Hunter-gatherer foraging strategies*. E. Smith. Chicago, University of Chicago**:** 13-35.

Wolfe, W., C. Weber and K. Dahozy Arviso (1985). "Use and nutrient composition of traditional Navajo foods". Ecol Food Nutr **17**: 323-344.

Worldbank (2001). "Lao PDR production forest policy. Status and issues for dialogue. Vol 1. Main report". Vientiane, World Bank/Sida/Ministry of Foreign Affairs/Government of Finland

WWF (1999). "A wildlife and habitat survey of Hin Namno NBCA and adjacent areas, Khammouane Province, Lao PDR (prepared by Walston and Vinton)". Vientiane, World Wildlife Fund

WWF (2003a). "Country strategy action plan". Vientiane, World Wildlife Fund.

Yen Ho, A. (1985). "At the Southeast Asian table". Singapore, Oxford University Press.

Yen, N., N. Duc, V. Thien, D. Phuong and B. Ogle (1994). "Dependency on forest and tree products for food security. A pilot study in Yen Huong Commune, Ham Yen District, Tuyen Quang Province, North Vietnam". Working Paper 250. Uppsala, Swedish University of Agricultural Sciences, International Rural Development Centre.

Yhoung-Aree, J., P. Puwastien and G. Attig (1997). "Edible insects in Thailand: An unconventional protein source?" Ecol Food Nutr **36**: 133-149.

Young, O. (1961). "The hilltribes of Northern Thailand. A socio-ethnological report". Bangkok, United States Operations Missions to Thailand

Plate 1: Inaccessible terrain in the dissected Lao mountains

Plate 2: Kaleum village (District Capital) is still surrounded by undisturbed forest. In the rainy season the district is only accessible over the Sekong river.

Plate 3: Various rapids hampering the local transport by boat in Upper Kaleum (ACF boat)

Plate 4: Forest fringing TD village

Plate 5: Plomm (TD)

Plate 6: His wife Sum (TD)

Plate 7: <u>*Bua joll*</u> festival (KDM)

Plate 8: Sawmill in vicinity to NB-TM

Plate 9: Logging truck on the road between Sekong town and the Kaleum District

Plate 10: Rampant logging along the Kaleum road for erecting electricity poles

Plate 11: Cuts of wild boar which will be distributed among all villagers

Plate 12: Inundation in KDM for the construction of an irrigation reservoir

Plate 13: Remnant of the war- Highly explosive projectile (about 30cm, TD)

Plate 14: The traditional field selection by the Katu included careful study of the environment and long fallows (>15 yrs) to minimize soil erosion (TD)

Plate 15 (left): Slashing of the fields by the villagers (TD). In the background: The mountains bordering the Xe Xap National Biodiversity Conservation Area (Salavan)

Plate 16: Wetland rice fields (NB-TM)

Plate 17: New “mini-gardens” (TK)

Plate 18: Traditional large cassava fields in between the upland rice fields. Selection of sugarcane cuttings for planting. During work Sum is smoking the traditional pipe (TD)

Plate 19 (left): Traditional fishing gear (*aruang*) (TD)

Plate 20 (right): Traditional fence with intermittent dead falls, formerly constructed by collective production units. The fence can be as long as 200m and the logs up to 4m (TD).

Plate 21 (below): Various sections of the fields are planted with different rice varieties. Plomm places 3-5 kernels in the holes he has made with the dibbling stick

Plate 22: TD’s children harvesting termites

Plate 23: Drying frogs and toads as meat for the dry season (NB-TM). Traditionally, large amounts of mammal meat were preserved as “hunger food”

Plate 24: Harvest of wild vegetables for one evening meal (TK). Preparation however is mainly without fat if no meat is available. Bioavailability of Beta-Carotene is low

Plate 25: Portionizing meat at a communal festival. 88 lumps, one for each family (KDM)

Plate 26: The traditional hearth area. A tripod is placed between logs (TD)

Plate 27: Grating cassava and simmering food in the *tcheruak* (here self-made from bomb scrap). With the stick the food is later transformed into a palatable mash (TD)

Plate 28: Pounding the steamed rice and mixing it with roasted sesame seeds (*malme*l). These calcium rich “rice cakes” can be stored up to 3-4 days. Traditionally, however, this is a festival food (TD)

Plate 29 (right): Traditional rice pounding with foot-driven rice mill (TK)

Plate 30 (below): Successful harvest of only one day: One civet cat, one bamboo rat, two rats, one lizard, and one frog (TD)

Plate 31 (below): Sufficient rice, meat, and *cheo* are considered a complete meal. Fresh vegetables are eaten as condiment only (TD)


Plate 32


Plate 33


Plate 34


Plate 35


Plate 36


Plate 37


Plate 38


Plate 39


Plate 40


Plate 41


Plate 42


Plate 43

Plate 32: Finely minced snake *laab*

Plate 33: Crispy grilled paws are a favored snack food among children

Plate 34: Grilled pigeon (rich in iron and vit B_2)

Plate 35: With less and less wildlife snails, shrimps, and crabs are increasingly important protein sources

Plate 36: Cuts of braised civet cat

Plate 37: Rat prepared in the *tcheruak* containing the smashed bones (highly rich in calcium)

Plate 38: Traditional thick rice soup (*trrong*)

Plate 39: *Soup phak* with various wild vegetables

Plate 40: Unbalanced ratio of rice to vegetables and meat

Plate 41: Banana flower prepared in the *tcheruak*

Plate 42: *Cheo seu seu* containing only chilli, salt, and MSG

Plate 43: Small indigenous fish species are eaten with all bones providing good sources of calcium, zinc, and iron

APPENDICES

NOTES ON THE APPENDIX 1

Names in Lao and Katu, as in many other Southeast Asian languages, present something of a problem in English translation. The spelling of Lao in English has not been standardised and there are a French and an English system in use. The Katu language is an oral language and has no written language.

The author has adopted an eclectic approach designed for the general reader rather than for the linguist, the Lao specialist or the Mon-Khmer specialist. While the Lao phonetic alphabet has been orientated to the English alphabet, the Katu phonetic alphabet has been orientated to the German alphabet (using the German "rr, z, i, e, and a"). "Eu" has however been used as in the Lao phonetic alphabet. In the Katu language "r's" appear to equate the Spanish rolling "r's". The suffix "!" stresses the last syllable. "Dth" highlightes a hissing guttural sound (low tone).

The renditions are likely to be acceptable to the eye and ear of the average reader, regardless of whether the rules of German or English system are applied consistently. The result will undoubtedly not please some linguistics, but seems to be less of a distraction to others attempting to appreciate this work.

Next, as already mentioned in chapter 1, the reader should refrain from seeing this Appendix as confirmation of the animal's habitat. The data here is an ethnozoological classification which provides only preliminary data on species taxonomy. It should be recalled that most of the taxa is still scientifically unidentified in the Sekong region.

It should also be noted that the Katu-Lao translation is not an official one, but is the version provided by the villagers. The underlining and writing in italics of the Katu names (e.g. *achem*) and the writing only in italics of the Lao terms (e.g. *nok*) are applied only to the footnotes, but not in the tables themselves. Adding [!] to the Katu names means that these are no compound names. The suffix […] indicates that the full name (specie level) could not be recorded.

Detailing cells with [1] indicates that identification was unsuccessful and with [9] that no Lao species names appear to exist. N.d. indicates that the data was either inconclusive, or was lost, or was accidentally not recorded.

Appendix 1

1.1 Traditional Katu flora species

*Indicating preparation techniques

[1]=confirmed, [0]=not confirmed

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
akol	[1]	[1]	[9]	[1]	Wild	n.d., stem	1	1
ala ampriang	*[1]*	[1]	[9]	[1]	Wild	Leaves	1	1
ala kaki	*[1]*	[1]	[9]	[1]	Wild	Leaves	0	1
lom terrhau	*[1]*	[1]	[9]	[1]	Wild	Stem	1	1
lom paharr	*[1]*	[1]	[9]	[1]	Wild	Leaf bud	0	1
rong tuak	*[1]*	[1]	[9]	[1]	Wild	Leaf bud	-	-
tcherrtokk	*[1]*, equates hung deng	[1]	[9]	[1]	Wild	Stem, Leaf bud	1	1
tua away pahay	*[1]*	[1]	[9]	[1]	Wild	Stem	1	1
lam kabob	*[1]*	[1]	[9]	[1]	Wild	Stem	n.d.	n.d.
mul, ateung mul	*[1]*	[1]	[9]	[1]	Wild	Leaves	0	1
ala katiang	*[1]*	[1]	[9]	[1]	Wild	Leaves	1	1
arong	*[1]*	[1]	bay mak hlowt	[1]	Wild	Leaves	1	0
xoka borr	*Algues filamenteuses*	[1]	thao	Alga	Water	Leaves	0	1
ating leui den	*Algues filamenteuses*	[1]	thao	Alga	Water	Leaves	0	1
ala katiam	*Allium cepa*	Alliaceae	phak boua	Springonion	Cultivated	Leaves	1	1
ala ajurr	*Amaranthus gangeticus*	Amaranthaceae	gnot hom peo	[1]	Cultivated, wild	Leaves	1	1
ala adah	*Amaranthus tricolor*	Amaranthaceae	[9]	Joseph's coat	Cultivated	Leaves	0	1
ala apae	*Mangifera indica*	Anacardaceae	bay mak muang	Leaves from mango	Wild	Leaves	1	0
ala krrpuh	*Mangifera indica*	Anacardaceae	bay mak muang kaso	Leaves from mango	Wild	Leaves	1	0
ala kadud	*Mangifera indica*	Anacardaceae	bay mak muang	Leaves from mango	Wild	Leaves	1	0
tua assur	*Rhus sinensis*	Anacardaceae	som phot, [mak mat]	[1]	Wild	Leaves	1	0
tua kapu	*Mangiferaindica*	Anacardaceae	gnot mak muang	Leaves from mango	Cultivated	Leaves	1	0
agnoy	*[1]*	Anacardaceae	[phak heua ho]	[1]	Wild	Leaves	1	1
ala kui	*Melodinus quiquadii*	Apocynaceae	bay mak yang	[1]	Wild	Leaves	1	1
arok	*Lasia spinosa*	Araceae	phak nam	[1]	Wild	Leaves	0	1
abaeh	*Amorthophyllus spp.*	Araceae	lam eephuk	[1]	Wild	Leaves	-	-
n.d.	*Alocasia longiloba*	Araceae	bon pa kang	[1]	Wild	Leaves	0	1
n.d.	*Colocasia gigantia*	Araceae	thun	[1]	Cultivated	Leaves	0	1

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
n.d.	*Remusatia vivipara*	Araceae	bon tao	[1]	Wild	Leaves	0	1
lom pakay	*Alocasia sp.*	Araceae	bon	[1]	Cultivated	Leaves	0	1
ala chirkatt	*Trevesia palmata*	Araliaceae	[9]	[1]	Wild	Leaves	0	1
alegn, alang	*Diplazium esculentum*	Athyreaceae	phak kut khok noy	[1]	Wild	Fern leaves	0	1
katogn, atogn	*Diplazium esculentum*	Athyreaceae	phak kut	[1]	Wild	Fern leaves	1	1
tua pong chakuy	*Diplazium esculentum*	Athyriaceae	[9]	[1]	Wild	Leaves	0	1
n.d.	*Careya sphaerica*	Baringtoniaceae	phak ka don	[1]	Wild	Leaves	1	0
n.d.	*[1]*	Bignoniaceae	[9]	[1]	Wild	Leaves	1	1
tua apin	*Oroxylun indicum*	Bignoniaceae	gnot mak lin may	[1]	Wild	Leaf bud	0	1
n.d.	*Creteva magma*	Capparidaceae	bay bon van	[1]	Wild	Leaves	0	1
ala apugn	*Creteva magma*	Capparidaceae	phak kum	[1]	Wild	Leaves	0	1
tua hung	*Carica papaya*	Caracaceae	gnot mak hung	[1]	Cultivated	Stem	0	1
n.d.	*Inula sp.*	Compositae	[9]	[1]	n.d.	n.d.	n.d.	n.d.
n.d.	*[1]*	Compositae	gna khee mu	[1]	n.d.	Leaves	n.d.	1
apih	*Raphanus sativus*	Cruseferae	phak kat	[1]	Cultivated	Leaves	1	1
n.d.	*Ipomoea aquatica*	Cucurbitaceae	phak bong	[1]	Cultivated	Leaves	0	1
apang [!]	*Momordica subangulata*	Cucurbitaceae	[1]	Leaves from bitter gourd	Cultivated, wild	Leaves	1	0
apang peng	*Momordica charantia*	Cucurbitaceae	say	[1]	Wild	Leaves	0	1
apang rah	*Momordica chaantia*	Cucurbitaceae	phak iha	[1]	Wild	Leaves	1	0
tua akill	*Cucumis melon*	Cucurbitaceae	gnot mak teng	[1]	Cultivated	Leaves	0	1
tua (a)duk	*Cucurbita mascata*	Cucurbitaceae	gnot mak eu	[1]	Cultivated	Leaves	0	1
tua kerrhoh	*Luffa cylindriaca*	Cucurbitaceae	gnot mak bouap	[1]	Cultivated, wild	Leaves	0	1
tua pong dok	*Ipomoe barbata*	Cucurbitaceae	gnot man dang	Leaves from sweet potatoe	Cultivated	Leaves	0	1
ala aruy reng	*Dioscorea alata*	Dioscoriaceae	[…] liam	[1]	Wild	Leaves	0	1
ala armodth	*Aporusa filifolia*	Euphorbiaceae	mouad khon	[1]	Wild	Leaves	1	0
ala aruy	*Homonoria riparia*	Euphorbiaceae	khay nam	[1]	Wild	Leaves	1	0
tua pong dong	*Manihot utilissima*	Euphorbiaceae	gnot man ton	Leaves from cassava	Cultivated	Leaves	0	1
ala kilek	*Senna siamea*	Fabaceae	bay kilek	[1]	Wild	Leaves	1	0
ala krrong	*Millitia sp.*	Fabaceae	[9]	[1]	Wild	Leaves	1	1
n.d.	*Albizia lucida*	Fabaceae	khe	[1]	Wild	Leaves	0	1
tua away	*Pachyrhizus angulatus*	Fabaceae	gnot man pao khao	[1]	Cultivated	Leaves	0	1
ala entarr	*Cratoxylum formosum (many varieties)*	Gutteferae	phak tiou dong	[1]	Cultivated	Leaves	1	0
ala agniang	*Cratoxylum formosum (many*	Gutteferae	phak tiou	[1]	Wild	Leaves	1	0

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
	varieties)							
ala cherraeng	*Garcinia thorelii*	Guttiferae	n.d.	[1]	Wild	Leaves	1	0
ala kawah	*Garcinia thorelii*	Guttiferae	som mong	[1]	Wild	Leaves	1	1
n.d.	*Hydrolea zeylanica*	Hydrophylaceae	phak bee ian (ien)	[1]	Wild	Leaves	0	1
lom atah	*Hydrolea zeylanica*	Hydrophylaceae	phak bee ian (ien)	[1]	Wild	Leaves	0	1
tua ramot	*Irvingia malayana*	Irvingiaceae	gnot mak kabot	[1]	Wild	Leaves	1	0
n.d.	*Ocimum gratissimum*	Lamiaceae	boua la pa	[1]	Cultivated	Leaves	1	0
ideu, sakieu	*Ocimum canum*	Lamiaceae	phak ikhu	[1]	Cultivated	Leaves	1	1
aloz blang (big), aloz mat (small)	*Ocimum camum*	Lamiaceae	phak itu falang (big), p. itu ngua (small)	Basil	Wild Cultivated	Leaves	1	1
ala kar xae	*Cinnamomum scortechinii*	Lauraceae	bay kok khe	[1]	Wild	Leaves	1	1
lan long	*Leea sp.*	Leeaceae	tang	[1]	Wild	Leaves	0	1
ala ayiz	*microcos tomentosa*	Liliaceae	phak kom	[1]	Wild	Leaves	1	0
lan kriong, tchang tcheuap	*Decaschistia harmandii*	Malvaceae	phak ka douk, khiet noy	[1]	Cultivated	Leaves	0	1
kir-juah	*Marsilea crenata*	Marsileaceae	phak vaen	Water clover	Wild	Leaves	1	1
ala atoy	*Melastoma sp.*	Melastomaceae	en ah	[1]	Wild	Leaves	0	1
ala alari	*Ficus rumphii*	Moraceae	bay kok hay	[1]	Wild	Leaves	1	1
tua arung	*Ficus auriculata*	Moraceae	gnot mak deua	Leaves from fig	Wild	Leaves	0	1
ariad a-oy	*Musa sp.*	Musaceae	tong juak	[1]	Wild	Stem	1	1
ariad aluak	*Musa sp.*	Musaceae	tong juak	[1]	Wild	Stem	1	1
ariad [!]	*Musa sp.*	Musaceae	tong tuak	[1]	Wild	Stem	1	1
ala lalui takoh, a. malui takoh	*Myrica esculenta*	Myricaceae	bay mak nam tao	[1]	Wild	Leaves	0	1
aloz choh	*Syzygium gratum*	Myrtaceae	phak sa mek	[1]	Wild	Leaves	1	0
ala krrtoy	*Syzygium cuminii*	Myrtaceae	va	[1]	Wild	Leaves	1	1
ala apiak	*Syzygium gratum*	Myrtaceae	bay samek sang (red)	[1]	Wild	Leaves	1	1
aruy (different from aruy reng)	*Syzygium gratum*	Myrtaceae	phak samek	[1]	Cultivated	Leaves	1	0
ala sriang	*Psidium guyava*	Myrtaceae	bay kok sida	[1]	Cultivated, wild	Leaf bud	1	0
aneng	*Nymphera lotus*	Nymphaeaceae	boua	[1]	Wild	Leaves	0	1
ala pelang, plang	*Miliantha suavis*	Oppiliaceae	phak van	[1]	Wild	Leaves	0	1
ala alouy chakah	*Palmae sp.*	Palmae	phak tao nam	[1]	Cultivated	Leaves	0	1
ala poh	*Calamus harmandii*	Palmae	bay seuy	[1]	Wild	Leaf bud	1	1
karaeh	*Calamus poilanii*	Palmae	gnot way thun	[1]	Wild	Stem	1	1
ajerr	*Rhapis micrantha*	Palmae	sane	[1]	Wild	Stem	1	1
tamay	*Calamus sp.*	Palmae	lam soy	[1]	Wild	Stem	1	1

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
ajorr	*Rhapis micrantha*	Palmae	sane	[1]	Wild	Stem	1	0
atud	*Caryota urens*	Palmae	tao hang	[1]	Wild	Stem	n.d.	n.d.
axay xeng	*Phoenix loureiri*	Palmae	[9]	[1]	Wild, Cultivated	Stem	0	1
saluat	*Piper lolot*	Piperaceae	phak ileut	[1]	Wild	Leaves	1	1
prlawng	*Plantago major*	Plantaginaceae	gnot phay	[1]	Wild	Leaves	n.d.	n.d.
arong	*[1]*	Poaceae	gnot kok kolau (palau)	[1]	Wild	Leaves	1	1
atau	*Saccharum officinarum*	Poaceae	oy	[1]	Cultivated	Stem	1	0
ateng	*Thysanolaena maxima*	Poaceae	khaem	[1]	Wild	Stem	1	0
bang, abang	*Many species of Bamboo*	Poaceae	gnot may	Bamboo	Wild	Stem	0	1
ajurr	*Polygonum odoratum*	Polygonaceae	phak hom peo	[1]	Cultivated	Stem	1	0
prseum	*Polygonum odoratum*	Polygonaceae	phak pheo	[1]	Cultivated	Leaves	0	1
roneng	*Monochoria hastaefolia*	Pontederaceae	phak tob	[1]	Wild	Leaves	0	1
ala apoz podge (apiz)	*Citrus hystrix*	Rutaceae	bay khee hout	[1]	Cultivated	Leaves	1	1
ala poz lung	*Cuitrus aurantifolia*	Rutaceae	bay mak nao	[1]	Cultivated	Leaves	1	1
ala poz pung	*Citrus hytrix*	Rutaceae	bay khee hout	[1]	Cultivated	Leaves	1	1
aworr	*Lycopodium sp.*	Schizaeceae	phak kut kheua, phak kut ngong	[1]	Wild	Fern Leaves	0	1
n.d.	*Limnophila geoffrayi*	Scrophulariaceae	phak ka nheng	[1]	Cultivated	Leaves	0	1
ala poz kong	*Tetramixis pelligrinii*	Simaroubaceae	bay mak som oh	[1]	Cultivated	Leaves	1	1
apui pay	*Algues filamenteuses*	Spirogyra sp.	thao	Alga	Water	Leaves	0	1
tarrkaen	*Eryngium foetidum*	Umbelliferae	phak hom ho	Mint	Cultivated	Leaves	1	1
arob	*Centella asiatica*	Umbelliferae	phak hnowk	[1]	Wild	Leaves	1	0
baat	*Eryngium foetidum*	Umbelliferae	phak hom tchin	[1]	Cultivated	Leaves	1	1
n.d.	*Anethum graveolens*	Umbelliferae	phak xee, bay mak lam	[1]	Wild	Leaves	1	1
palar	*Alpinia bracteata*	Zingiberaceae	kha pa	Wild galangal	Wild	Stem	1	1
n.d.	*Alpinia sp.*	Zingiberaceae	[9]	Equates galangal	Wild	Stem	1	0
tua empiang	*Amomum ovoideum*	Zingiberaceae	gnot mak neng	[1]	Wild	Stem	0	1
axay	*Alpinia galganga*	Zingiberaceae	gnot kha ta deng	[1]	Forest	Stem	0	1
patong, paruh	*Alpinia sp.*	Zingiberaceae	[kha pa]	[1]	Wild	Stem	0	1
pong achang	*[1]*	[1]	[9]	[1]	Wild	RT (liana)	0	1
pong aham	*[1]*	[1]	[9]	[1]	Wild	RT (liana)	0	1
pong apuak	*[1]*	[1]	[9]	[1]	Wild	RT (liana)	0	1
pong duell	*[1]*	[1]	[9]	[1]	Wild	RT	0	1
pong kaliang (white)	*[1]*	[1]	[9]	[1]	Wild	RT (liana)	0	1
pong puay	*[1]*	[1]	[9]	[1]	Wild	RT	0	1
pong takad	*[1]*	[1]	[9]	[1]	Wild	RT	0	1

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
pong aroh, p. alak	*Colocasia esculenta*	Araceae	man peuak bay	Taro	Cultivated	RT	0	1
pong aroy	*Colocasia esculenta*	Araceae	man pheuak	[1]	Cultivated	RT	0	1
pong chakeuy	*Diplazium esculentum*	Athyriaceae	man phak kout	[1]	n.d.	RT	0	1
pong dok	*Ipomoea batatas*	Cucurbitaceae	man dang	Sweet potatoe	Cultivated	RT	0	1
n.d.	*Dioscoria esculenta*	Dioscoraceae	man pheum	[1]	Wild	RT	0	1
n.d.	*Dioscorea sp.*	Dioscoraceae	man kidok	[1]	n.d.	RT	0	1
pong atao	*Dioscorea sp.*	Dioscoraceae	man pheuak oy	[1]	Cultivated	RT	0	1
pong achid	*Dioscorea sp.*	Dioscoreaceae	man leuat	[1]	Cultivated, wild	RT	0	1
pong adong, p. ajorr, p. hil	*Dioscorea sp.*	Dioscoreaceae	man khay	[1]	Cultivated	RT	0	1
pong ajorr	*Diocorea sp.*	Dioscoreaceae	man pheuak	[1]	Cultivated	RT	0	1
pong alak	*Dioscorea esculenta*	Dioscoreaceae	man pheuak	[1]	Cultivated	RT	0	1
pong aloh, p. asoh	*Dioscorea hispida*	Dioscoreaceae	man koy	Yam	Wild	RT (liana)	0	1
pong angeul	*Dioscorea alata*	Dioscoreaceae	man heup, m. iam	[1]	Wild	RT (liana)	0	1
pong apodth [!]	*Dioscorea esculenta*	Dioscoreaceae	man peum	[1]	Cultivated	RT	0	1
pong apodth […]	*Dioscorea sp.*	Dioscoreaceae	man leuang	[1]	Cultivated	RT	0	1
pong atus	*Dioscorea pentaphylla*	Dioscoreaceae	man tian , m. imu	[1]	Wild	RT (liana)	0	1
pong kleuz	*Dioscorea alata*	Dioscoreaceae	man heup, m. liam	[1]	Wild	RT (liana)	0	1
pong peu ang	*Dioscorea sp.*	Dioscoreaceae	man peu ang	[1]	Cultivated	RT	0	1
pong takoy	*Dioscorea sp.*	Dioscoreaceae	man kakuay	[1]	Cultivated	RT	0	1
pong zazill	*Dioscoprea sp.*	Dioscoreaceae	man khay	[1]	Cultivated	RT	0	1
pong dong	*Manihot utilissima*	Euphorbiaceae	man ton	Cassava	Cultivated	RT	1	1
pong dong atuak	*Manihot utilissima*	Euphorbiaceae	man ton	Casssava	Cultivated	RT	1	1
pong dong hob	*Manihot utilissima*	Euphorbiaceae	man ton	Casssava	Cultivated	RT	1	1
pong dong keo	*Manihot utilissima*	Euphorbiaceae	man ton	Casssava	Cultivated	RT	1	1
pong dong mee	*Manihot utilissima*	Euphorbiaceae	man ton	Casssava	Cultivated	RT	1	1
pong dong	*Manihot utilissima*	Euphorbiaceae	man ton (sam deuan)	Casssava	Cultivated	RT	1	1
pong away	*Pachyrhizus angulatus*	Fabaceae	man phao	Yam bean	Cultivated	RT	1	1
pong lao, p. aham	*Maranta arundinacea*	Marantaceae	man sangkhu	Arrowroot	Cultivated	RT	0	1
awial	*Andropogon citratus*	Poaceae	hua sing khay	Lemongrass	Cultivated	RT	1	1
axay	*Alpinia nigra*	Zingiberaceae	kha	Galangal	Cultivated	RT	1	1
axay pariz	*Alpinia sp.*	Zingiberaceae	kha pa	Ginger	Wild	RT	1	1
axay kruell	*Zingiber officinalis*	Zingiberaceae	khing	Ginger	Wild, cultivated	RT	1	1
trrir akong	*[1]*	[1]	[9]	[1]	Wild	Mushroom	0	1
trrir ti buan	*[1]*	[1]	[9]	[1]	Wild	Mushroom	0	1
trrir kajuanuak	*[1]*	[1]	[9]	[1]	Wild	Mushroom	0	1

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
trrir piez	*[1]*	[1]	[9]	[1]	Wild	Mushroom	0	1
trrir tarlong	*[1]*	[1]	[9]	[1]	Wild	Mushroom	0	1
trrir chakalon	*[1]*	[1]	het leo	[1]	Wild	Mushroom	0	1
trrir kuat	*[1]*	[1]	[9]	[1]	Wild	Mushroom	0	1
trrir chalong	*[1]*	[1]	[9]	[1]	Wild	Mushroom	0	1
trrir pateuy	*Termitomyces spp.*	Amanilaceae	het puak	[1]	Wild	Mushroom	0	1
trrir tawaeh	*Astraeus hygrometrius*	Astracaceae	het pho, h. kee tao	[1]	Wild	Mushroom	0	1
trrir torr	*Auricularia polytricha*	Auriculariaceae	het hou nou, h. nou ling	[1]	Wild	Mushroom	0	1
trrir peturr	*Geastrum stipitatus*	Lygoperdaceae	het dao	[1]	Wild	Mushroom	0	1
trrir pelaerr	*Volvariella valvacea*	Pluteaceae	het pheuang	[1]	Wild	Mushroom	0	1
trrir xa (or xa xa)	*Volvariella valvacea*	Pluteaceae	het feuang	[1]	Wild	Mushroom	0	1
trrir kitong, t. bot	*Lentinus polychrous*	Polyporaceae	het bot	[1]	Wild	Mushroom	0	1
trrir ploh in the forest, or t. chuidth in the hai	*Lentinus squarrosulus*	Polyporaceae	het khao	[1]	Wild	Mushroom	0	1
trrir kah	*Lentinus sguarrosulus*	Polyporaceae	het khao	[1]	Wild	Mushroom	0	1
trrir keung (at the tree)	*Daedaleopsis confragosa*	Polyporaceae	het toh	[1]	Wild	Mushroom	0	1
trrir emprong, t. perong ahoh	*Lentinus sajor-caju*	Polyporaceae	het misod	[1]	Wild	Mushroom	0	1
trrir peuy	*Lentinus sguarrosulus*	Polyporaceae	het khao	[1]	Wild	Mushroom	0	1
trrir tat	*Lentinus sguarrosulus*	Polyporaceae	het khao	[1]	Wild	Mushroom	0	1
trrir tohng	*Microporus xanthopus*	Polyporaceae	het ka deng	[1]	Wild	Mushroom	0	1
trrir tuidth	*Pyenoporus sanguinius*	Polyporaceae	het deng	[1]	Wild	Mushroom	0	1
trrir tuk	*Lentinus sguarrosulus*	Polyporaceae	het khao	[1]	Wild	Mushroom	0	1
trrir katiak	*Lectarius spp.*	Russulaceae	het din	[1]	Wild	Mushroom	0	1
trrir achak	*Russula foeteus*	Russulaceae	het pheuak	[1]	Wild	Mushroom	0	1
trrir aen	*Russula foeteus*	Russulaceae	het pheuak	[1]	Wild	Mushroom	0	1
trrir kalang, t. alang	*Russula foeteus*	Russulaceae	het pheuak (light green)	[1]	Wild	Mushroom	0	1
trrir ting	*Russula foeteus*	Russulaceae	het pheuak	[1]	Wild	Mushroom	0	1
trrir joll	*Russula foeteus*	Russulaceae	het pheuak	[1]	Wild	Mushroom	0	1
trrir aham	*Russura sp.*	Russulaceae	het luat, h. pheuak	[1]	Wild	Mushroom	0	1
trrir peuz	*Schizophyllum commune*	Schizophyllaceae	het kap ke	[1]	Wild	Mushroom	0	1
trrir set (or zet)	*Schizophyllum commune*	Schizophyllaceae	het kap ke	[1]	Wild	Mushroom	0	1
trrir tozed	*Schizophyllum commune*	Schizophyllaceae	het kap ke	[1]	Wild	Mushroom	0	1
trrir tariah	*Psilocybe cubensis*	Stropharaceae	kee khuay, poat	[1]	Wild	Mushroom	0	1
palaeh siel ploh	*[1]*	[1]	[9]	[1]	Wild	Fruit	1	0
palaeh krrpok	*[1]*	[1]	[9]	[1]	n.d.	Fruit	1	0

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
palaeh emplaeng	*[1]*	[1]	[9]	[1]	Wild	Fruit	1	0
palaeh empaeh	*[1]*	[1]	[9]	[1]	Wild	Lianafruit	1	0
palaeh prrdung	*[1]*	[1]	[9]	[1]	Wild	Lianafruit	1	0
palaeh pruall	*[1]*	[1]	[9] (kok du)	[1]	Wild	Fruit	1	0
palaeh amoh	*[1]*	[1]	mak hin	[1]	[Wild]	Fruit	1	0
palaeh tabam	*[1]*	[1]	[9]	[1]	Wild	Fruit	1	0
palaeh ayul yuak	*[1]*	[1]	[9]	[1]	Wild	Fruit	1	0
n.d.	*[1]*	[1]	mak baem	[1]	Cultivated	Fruit	[1]	[0]
palaeh ampiang	*[1]*	[1]	mak ngen	Cardamon	Wild	Fruit	1	0
palaeh apang rah	*[1]*	[1]	mak phak iha	[1]	Wild	Fruit	0	1
palaeh karrpok	*[1]*	[1]	[9]	[1]	Cultivated	Fruit	1	0
palaeh tchernia	*[1]*	[1]	[9]	[1]	Wild	Lianafruit	1	0
palaeh nok	*[1]*	[1]	[1]	[1]	Wild	Fruit	n.d.	n.d.
palaeh longalong	*[1]*	[1]	[1]	[1]	Wild	Fruit	0	0
palaeh apang	*[1]*	[1]	[1]	Bitter gourd	[1]	Fruit	1	0
palaeh kayeu	*Rhus sinensis*	Anacardaceae	mak fot	[1]	Wild	Fruit	1	0
palaeh akok	*Spondias pinnata*	Anacardaceae	mak kok	Hogplum	Cultivated, wild	Fruit	1	1
palaeh assur	*Rhus sinensis*	Anacardaceae	mak som phot, mak mat	Prickly ash	Wild	Fruit	1	1
palaeh kadud	*Mangifera indica*	Anacardaceae	mak muang […]	Mango	Wild	Fruit	1	0
palaeh krrpuh	*Mangifera (unspecified)*	Anacardaceae	mak muang kaso	Mango	Wild	Fruit	1	0
palaeh kasian	*Mangifera indica*	Anacardaceae	mak muang keo	Mango	Cultivated	Fruit	1	0
palaeh prill	*Mangifera (unspecified)*	Anacardaceae	mak muang khay	Mango	Cultivated	Fruit	1	0
palaeh sodth	*Mangifera indica*	Anacardaceae	mak muang khan	Mango	Wild	Fruit	1	0
palaeh axii	*Melodinus guiguadii*	Apocynaceae	mak gnang (yang)	[1]	Wild	Fruit	1	0
palaeh arrnaeh	*Melodinus guiguadii*	Apocynaceae	mak gnang (yang)	[1]	Wild	Fruit	1	0
palaeh kui	*Melodinus guiguadii*	Apocynaceae	mak gnang (yang)	[1]	Wild	Fruit	1	0
n.d.	*Melodinus guignardii*	Apocynaceae	mak yang	n.d.	Wild	Fruit	1	0
palaeh abe	*Amorphophallus campanulatus*	Araceae	phak ka bouk	[1]	Wild	Fruit	0	1
palaeh tcherrtokk	*Trevesia palmata*	Araliaceae	mak houng deng	[1]	Wild	Fruit	1	0
palaeh sapeu	*Averrhoa carambola*	Averrhonaceae	mak feuang	Wild carambola (starfruit)	Wild	Fruit	1	0
palaeh apin	*Oroxylum indicum*	Bignoniaceae	mak lin may (tongue wood)	[1]	Wild	Fruit	0	1
palaeh tcheau	*Ananas sativus*	Bromeliaceae	mak nat	Pineapple	Cultivated	Fruit	1	0
pele pahung	*Carica papaya*	Caricaceae	mak hung	Papaya	Cultivated	Fruit	1	0
palaeh kerrhoh	*Luffa cylindrica*	Cucurbitaceae	mak bouap	[1]	Cultivated	Fruit	0	1

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
palaeh a-don	*Cucumis spp.*	Cucurbitaceae	mak teng pa	Wild cucumber	Wild	Fruit	0	1
palaeh a-deuk paleung	*Banincosa hispida*	Cucurbitaceae	mak fak	Equates melon	Cultivated	Fruit	0	1
palaeh alouy takoh	*lagenaria sp.*	Cucurbitaceae	mak nam tao	Type of pumpkin	Cultivated	Fruit	0	1
n.d.	*lagenaria siceraria*	Cucurbitaceae	mak nam	[1]	Wild	Fruit	n.d.	n.d.
palaeh (a)kial pakay	*Citrullus vulgaris*	Cucurbitaceae	mak moo	Melon	Cultivated	Fruit	1	0
palaeh noy	*Trichosanthes anguina*	Cucurbitaceae	mak noy	Gourd	Cultivated	Fruit	1	1
palaeh kiel rek	*Cucumis sativus*	Cucurbitaceae	mak teng chin	Cucumber	Cultivated	Fruit	1	1
palaeh kiel mat	*Cucumis sativus*	Cucurbitaceae	mak teng kha	Cucumber	Cultivated	Fruit	1	1
palaeh kiel neull	*Citrullus vulgaris*	Cucurbitaceae	mak teng mo	Cucumber	Cultivated	Fruit	1	1
palaeh kiel mat	*Cucumis sativus*	Cucurbitaceae	mak teng […]	Cucumber	Cultivated	Fruit	1	1
palaeh kiel magnang	*Cucumis sativus*	Cucurbitaceae	mak teng […]	Cucumber	Cultivated	Fruit	1	1
palaeh paloh	*Dellinia sp.*	Dilleniaceae	San	[1]	Wild	Fruit	1	0
palaeh sadth (reddish)	*Bacaurea ramiflora*	Euphorbiaceae	mak phay	[1], longan	Wild	Fruit	1	0
palaeh sadth (greenish)	*Bacaurea ramiflora*	Euphorbiaceae	mak phay	[1], longan	Wild	Fruit	1	0
palaeh prrlong	*Bacaurea ramiflora*	Euphorbiaceae	mak phay	Sour berry	Wild	Fruit	1	0
palaeh li ao	*Phyllanthus emblica*	Euphorbiaceae	mak kham pom	[1]	Wild	Fruit	1	1
palaeh xay oh perrlong	*Baccaurea ramiflora*	Euphorbiaceae	mak pay, fay	[1]	Cultivated, wild	Fruit	1	0
palaeh atong [!]	*Phyllanthus emblica*	Euphorbiaceae	mak kham pom	[1]	Wild	Fruit	1	1
n.d.	*Parkia speciosa*	Fabaceae	mak houa lon	[1]	Wild	Fruit	1	1
palaeh atong katiat, p. atiak	*Arachis hypogea*	Fabaceae	mak thoua din	Peanut	Cultivated	Fruit	1	1
palaeh atong yrr bok	*Phaseolus spp.*	Fabaceae	mak thoua keua	Green Bean	Cultivated	Fruit	1	0
palaeh atong yrr moung	*Phaseolus spp.*	Fabaceae	mak thoua keua	Green Bean	Cultivated	Fruit	1	0
palaeh atong yrr xeran	*Phaseolus spp.*	Fabaceae	mak thoua keua	Green Bean	Cultivated	Fruit	1	0
n.d.	*Tamarindus indicus*	Fabaceae	mak kham	Tamarind	Wild	Fruit	1	1
palaeh kawah	*Garcinia thorelii*	Guttiferae	mak som mong	[1]	Wild	Fruit	1	0
palaeh krrteng	*Garcinia oliveri*	Guttiferae	mak mong	Mangosteen	Wild	Fruit	1	0
palaeh cherraeng	*Garcinia thorelii*	Guttiferae	[1]	Mangosteen	Wild	Fruit	1	0
n.d.	*Garcinia sp.*	Guttiferae	mak muang nang	Mango	Cultivated	Fruit	1	0
palaeh kacheraen, p. kam chareng	*Garcinia gracilis*	Guttiferae	mak pem (bem)	Mangosteen	Wild	Fruit	1	0
palaeh plein kay	*Irvingia harmandiana*	Irvingiaceae	mak bok	Almond	Wild	Fruit	0	1
palaeh atong	*Parkia Speciosa*	Leguminosa-Mimosoideae	mak hualon	Nitta tree	Wild	Fruit	1	1
palaeh krrpay	*Hyacinth dolichos*	Leguminosa-Papilionoideae	mak baep	[1]	Cultivated	Fruit	1	0
palaeh angnoaz	*Lagertroemia sp.*	Lythraceae	[mak peuay]	[1]	Wild	Fruit	1	0
palaeh arung, p. alhan	*Ficus auriculata*	Moraceae	mak deua gnoy	Fig	Wild	Fruit	1	0
palaeh apaeh	*Ficus auriculata*	Moraceae	mak deua kang	Fig	Wild	Fruit	1	0

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
palaeh alari	*Ficus rumphii*	Moraceae	mak hay	[1]	Wild	Fruit	1	0
palaeh panaz su	*Artocarpus integrifolia*	Moraceae	mak mee	Jackfruit	Cultivated	Fruit	1	1
palaeh panaz ruaz	*Artocarpus integrifolia*	Moraceae	mak mee	Jackfruit	Cultivated	Fruit	1	1
palaeh panaz ariu	*Artocarpus integrifolia*	Moraceae	mak mee	Jackfruit	Cultivated	Fruit	1	1
palaeh pe suk	*Musa sapientum*	Musaceae	mak kouay […]	Banana	Wild	Fruit	1	0
palaeh pe don	*Musa sapientum*	Musaceae	mak kouay […]	Banana	Wild	Fruit	1	0
palaeh pe akrol	*Musa sapientum*	Musaceae	mak kouay […]	Banana	Cultivated	Fruit	1	0
palaeh pe lun (big)	*Musa sapientum*	Musaceae	mak kouay ngao (k. dap)	Banana	Cultivated	Fruit	1	0
palaeh pe koh (small)	*Musa sapientum*	Musaceae	mak kouay noy	Banana	Cultivated	Fruit	1	0
palaeh pe arjung	*Musa sapientum*	Musaceae	mak kouay som	Banana	Cultivated	Fruit	1	0
palaeh kaning ohn	*Musa balbisiana*	Musaceae	mak kouay thani	Banana	Cultivated	Fruit	1	0
palaeh pe ariel	*Musa sapientum*	Musaceae	mak kouay to	Banana	Cultivated	Fruit	1	0
palaeh pe atod	*Musa sapientum*	Musaceae	mak kouay […]	Banana	Cultivated	Fruit	1	0
palaeh pe chang	*Musa sapientum*	Musaceae	mak kouay […]	Banana	Cultivated	Fruit	1	0
palaeh pe angoy	*Musa acuminata*	Musaceae	mak kuay pa	Banana	Wild	Fruit	1	0
palaeh pe a-oy, p. pe kal a-oy	*Musa acuminata*	Musaceae	mak kuay pa	Banana	Wild	Fruit	1	0
palaeh ayul, p. ariad[1]	*Musa spp.*	Musaceae	mak kuay pa	Banana	Wild	Fruit	1	0
palaeh kariang dia	*Syzygiun(m?) cuminii*	Myrtaceae	mak hwa	[1]	Wild	Fruit	1	0
palaeh kariang kriz	*Syzygiun cuminii*	Myrtaceae	mak hwa	[1]	Wild	Fruit	1	0
palaeh srieng leuang	*Psidium guyava*	Myrtaceae	mak sida	Gouva	Wild, cultivated	Fruit	1	0
palaeh srieng bok	*Psidium guyava*	Myrtaceae	mak sida	Gouva	Wild, cultivated	Fruit	1	0
palaeh srieng tiz	*Psidium guyava*	Myrtaceae	mak sida	Gouva	Wild, cultivated	Fruit	1	0
palaeh buang	*Cocos nucifera*	Palmae	mak phao	Coconut	Cultivated	Fruit	1	0
palaeh ihak	*Passiflora foetida*	Passifloraceae	mak hhammoy	[1]	Wild	Fruit	1	0
palaeh el wang	*Sesamum indicum*	Pedaliaceae	mak nga dam	Sesame	Cultivated	Fruit	0	1
palaeh el wang	*Sesamum indicum*	Pedaliaceae	mak nga khao	Sesame	Cultivated	Fruit	0	1
palaeh el wang	*Sesamum indicum*	Pedaliaceae	mak nga deng	Sesame	Cultivated	Fruit	0	1
palaeh ohm perrjaeh	*Coix lacryma-Jobi*	Poaceae	mak duay	Job's tear	Cultivated	Fruit	0	1
palaeh empil	*Thysanolaena maxima*	Poaceae	mak khem	[1]	Wild	Fruit	1	1

[1] *Stem is not edible.*

Katu name	**Scientific name**	**Family name**	**Lao name**	**English name**	**Origin**	**Type**	**Raw***	**Cooked***
pahle kalang	*Zyzyphus oenoplia*	Rhamnaceae	lep mio	[1]	Wild	Fruit	1	0
pahle kapob	*Wendlandia glabrata*	Rubiaceae	mak kaw	[1]	Wild	Fruit	1	0
palaeh poz podge	*Citrus hystrix*	Rutaceae	mak khee hout	Kaffir lemon	Cultivated, wild	Fruit	1	1
palaeh poz poet	*Citrus maxima*	Rutaceae	mak kiang	Orange	Cultivated, wild	Fruit	1	0
palaeh apoz kong	*Citrus maxima*	Rutaceae	mak som oh	Grapefruit	Cultivated, wild	Fruit	1	0
palaeh poz jeng	*Citurs sp.*	Rutaceae	n.d.	Orange	Cultivated, wild	Fruit	1	0
palaeh poz lung	*Citurs sp.*	Rutaceae	n.d.	n.d.	Cultivated, wild	Fruit	1	0
palaeh poz kong	*Citurs sp.*	Rutaceae	n.d.	n.d.	Cultivated, wild	Fruit	1	0
n.d.	*Lepisanthes oliginosa*	Sapindaceae	mak hnuat	[1]	Cultivated	Fruit	n.d.	n.d.
palaeh kriel	*Nephelum hypoleucum*	Sapindaceae	mak kho len	n.d.	Wild	Fruit	1	0
palaeh krul	*Nephelum hypoleucum*	Sapindaceae	mak ngeo	Sour lichi	Wild	Fruit	1	0
palaeh ploh	*Sandoricum indicum*	Sapindaceae	mak tong	Mangosteen	Wild	Fruit	1	0
palaeh prrsuh	*Smilax spp.*	Smilacaceae	kheuang nam toum	[1]	Wild	Fruit	1	0
n.d.	*Physalis minima*	Solanaceae	mak tek top	[1]	Wild	Fruit	1	1
palaeh a-deuk	*Solanum ferox*	Solanaceae	mak euk	Pumpkin	Cultivated	Fruit	1	0
palaeh [puk] aduk	*Physalis minima*	Solanaceae	mak tek top	[1]	Wild	Fruit	1	0
palaeh pleun [!]	*Solanum torvum*	Solanaceae	mak khaeng	Small eggplant	Wild	Fruit	1	1
palaeh pleun aduk	*Solanum torvum*	Solanaceae	mak khaeng	Small eggplant	Cultivated	Fruit	1	1
palaeh pleun kaju	*Solanum torvum*	Solanaceae	mak kheua or kheng ngao	Eggplant	Cultivated	Fruit	1	1
palaeh pleun tcherkod	*Solanum sp.*	Solanaceae	mak kheua or khen kay	Eggplant	[2[	Fruit	1	1
palaeh akeung	*Solanum sp.*	Solanaceae	mak kheua (3 sp.)	Eggplant	Cultivated	Fruit	1	1
palaeh tiu	*Capsicum frutescens*	Solanaceae	mak phet	Cherry Capsicum	Cultivated	Fruit	1	1
palaeh chong	*Sterculia lynchophora*	Sterculiaceae	mak chong	Malva nut	Wild	Fruit	1	0
palaeh armodth	*symplocos sp.*	Symplocaceae	mak hmeuad	[1]	Wild	Fruit	1	0
pirr apugn	*Creteva magma*	Capparidaceae	dok phak kum	[1]	Wild	Flower	1	1
pirr jirrpurr	*[1]*	[1]	[9]	[1]	Wild	Flower	n.d.	n.d.
pirr ajurrr	*[1]*	[1]	dok hom peo	[1]	Wild	Flower	1	1
pirr hong hid	*[1]*	[1]	[9]	[1]	Wild	Flower	n.d.	n.d.
pirr katiam	*[1]*	[1]	dok phak katiam	Flower of onion	Cultivated	Flower	1	1
pirr keua	*[1]*	[1]	[9]	Flower of eggplant	Cultivated	Flower		1
pirr longalong	*[1]*	[1]	[9]	[1]	n.d.	Flower		
pirr pakay	*[1]*	[1]	dok kay	[1]	Wild	Flower	0	1

Katu name	Scientific name	Family name	Lao name	English name	Origin	Type	Raw*	Cooked*
pirr paruh	*[1]*	[1]	[9]	[1]	[1]	Flower	1	0
pirr tchamang	*[1]*	[1]	[9]	[1]		Flower		
pirr pleun	*[1]*	[1]	[9]	Flower of eggplant	Wild	Flower	0	1
pirr taharr	*[1]*	[1]	[9]	[1]	Wild	Flower	0	1
pirr tcherttok	*[1]*	[1]	dok mak houng deng	[1]	Wild	Flower	0	1
pirr tenharr (entarr)	*[1]*	[1]	[9]	[1]	Wild	Flower	0	1
pitt tutru	*[1]*	[1]	[9]	[1]	Wild	Flower	1	0
pirr apin	*Oroxylum indicum*	Bignoniaceae	dok mak lin may	[1]	Wild	Flower	1	1
pirr ngiou	*Bombax spp.*	Bombaceae	dok mak ngiou	Kapok tree (2sp.)	Cultivated	Flower	1	0
pirr ampoy, p. ampii	*Brassica spp.*	Cruseferae	dok phak kat hay (kat heun)	Flower of mustard greens	Cultivated	Flower	0	1
pirr adeuk	*Cucurbita moschata*	Cucurbitaceae	dok mak eu	Flower of pumplin	Cultivated	Flower	0	1
pirr akiel	*Cucumis melon*	Cucurbitaceae	dok mak teng	Flower of cucumber	Cultivated	Flower	0	1
pirr alui (malui)	*Lagenaria sp.*	Cucurbitaceae	dok mak nam tao	[1]	Cultivated	Flower	0	1
pirr alui tako	*Lagenaria siceraria*	Cucurbitaceae	dok mak nam	[1]	Cultivated	Flower	1	1
pirr krrhoh	*Luffa cylindrica*	Cucurbitaceae	dok mak bouap	[1]	Cultivated	Flower	0	1
pirr noy	*Trichosanthes anguina*	Cucurbitaceae	dok mak noy	[1]	Cultivated	Flower	0	1
pirr ton	*Trichosanthes anguina*	Cucurbitaceae	dok mak noy	[1]	Cultivated	Flower	0	1
pirr aruy	*Homonoria riparia*	Euphorbiaceae	dok khay nam	[1]	Wild	Flower	1	0
pirr pong dong	*Manihot utilissima*	Euphorbiaceae	dok mak ton	Flower of cassava	Cultivated	Flower	0	1
pirr pong dok	*Manihot utilissima*	Euphorbiaceae	dok man ton	Flower of potatoe	Cultivated	Flower	0	1
pirr chapua	*Sesbania grandiflora*	Fabaceae	dok khe	Sesbania flower	Wild	Flower	1	1
pirr kaerrpeuy	*Dolichos lablads*	Fabaceae	dok mak baep	[1]	Cultivated	Flower	0	1
pirr aloz blang, p. a. mat	*Ocimum basilicum, O. sp.*	Lamiaceae	dok phak itu falang, d.p.i. ngua	Flowers of basil	Wild, cultivated	Flower	1	1
pirr atong	*Parkia Speciosa*	Leguminosa-Mimosoideae	dok mak hualon	Flower of the Nitta tree	Wild	Flower	1	1
pirr ayul, p. ariad	*Musa sapientum*	Musaceae	dok yuak	Flower of banana	Wild	Flower	1	1
pirr pe […]	*Musa spp.*	Musaceae	dok mak khuay	Flower of banana	Wild, cultivated	Flower	1	1
pirr bangho	*Oxythenanthera parvonina*	Poaceae	dok hno may soat	[1]	Wild	Flower	1	1
pirr rong ateng	*Thysanolaema maxima*	Poaceae	dok bay khaem	[1]	Wild	Flower	0	1
pirr arob	*Centella asiatica*	Umbelliferae	dok phak hnowk	Asiatic Pennywort	Wild	Flower	1	1
pirr empiang	*Amomum ovoideum*	Zingiberaceae	mak neng	Flower of the Cardamom tree	Wild	Flower	1	n.d.
pirr palarr (or pelarr)	*Curcuma spp.*	Zingiberaceae	dok katchiau	[1]	Wild	Flower	0	1
pirr patong	*Alpinia sp.*	Zingiberaceae	kha pa	Flower of galangal	Wild	Flower	1	1

1.2 The Katu traditional fauna species

Mammals

*Method of identification: 1=Katu-Lao translation; 2=identification with photo, drawing or description; 3=collection of species (or bones), foot print or marks encountered

**References: 1=Nowak (1999); 2=WWF (1999); 3=Legakul (1988); 4=Steinmetz (1999); 5=Francis (2001); 6=Gressitt (1970); 7=Payne (1985)

Katu name	English name	Scientific name	Order/Family	Lao name	Reference*	Method**
	RATS					
abuat ajay, a. songdong	[1]	*[1]*	Muridae	nuu fan		1
abuat ajoy	[1]	*[1]*	Muridae	[9]		
abuat ansomm (ensomm)	[1]	*[1]*[2]	Muridae	nuu thong khao	1	1, p.c.
abuat aplok, a. aklok	[1]	*[1]*	Muridae	[9]		
abuat bok	Moonrat	*Echinosorex gymnurus*	Muridae	[9]	1,5	2, 3
abuat cha ateng	[1]	*[1]*	Muriddae	[9]		
abuat chong arid	[1]	*Rattus spp.*[3]	Muridae	[9]	1	2
abuat dep	Red Spiny Rat	*Maxomys spp.*[4]	Muridae	[9]	1,5	2
abuat kandaeh!	[1]	*[1]*	Muridae	nuu hhang san	1	1, p.c.
abuat kayung soy, a. tamaruk	Long-tailed Giant Rat	*Leopoldamys sabanus*	Muridae	nuu way, hang ngao	1	1, p.c.
abuat kokong	[1]	*[1]*	Muridae	[9]		
abuat laluat	Long-tailed Giant Rat	*Leopoldamys sabanus*	Muridae	[9]	1	2
abuat paruz	[1]	*[1]*	Muridae	[9]		
abuat pong	[1]	*[1]*[5]	Muridae	nuu phuk		1, p.c.
abuat raromm	Long-tailed Mountain Rat	*Niviventer spp.*	Muridae	nuu khon khay, kheng	1	1, p.c.
abuat tong achi (chi), a. kiri	Norway Rat	*Rattus norvegicus*[6]	Muridae	[9]	1	2
abuat wawarr, a. warwarr	[1]	*[1]*	Muridae	[9]		
ameu aped, a. on	Lesser Bamboo Rat	*Cannomys badius*	Muridae	ohn	1,3,5	2,3

---

[2] *E.g. Rattus argentiventer or White Bellied Forest Rats such as Berylmys, Maxomys, or Niviventer spp.*

[3] *E.g. Rattus Rattus, Rattus hoxaensis, Rattus osgoodi, Rattus tiomanicus, Rattus argentiventer.*

[4] *Probably, Maxomys surifer.*

[5] *Translation from the Lao name equates approximately to* Rattus annandalei, or Bandicota indica, or B. savilei, or B. bengalensis.

[6] *Consumption frequency revealed that the Katu refer to two Katu kind of abuat tong achi.*

Katu name	English name	Scientific name	Order/Family	Lao name	Reference*	Method**
ameu ateng, a. kutgung	Large Bamboo Rat	*Rhizomys spp.*[7]	Muridae	toun	1,3,5	2, p.c.
ameu kui gung[8]	Bamboo Rat	*Rhizomys spp.*	Muridae	[9]	1,3,5,6	2, p.c.
ameu pu arong	Bamboo Rat	*Rhizomys spp.*	Muridae	ohn	1,3,5	2, p.c.
	SQUIRRELS[9,10]					
cheliang, chatang	Flying Squirrel	*Petaurista sp.*[11]	Sciuridae	bang kate	1,3	2
trrjon (tirrjon), tajeurr	Flying Squirrel	*Petaurista sp.*[11]	Sciuridae	bang lua	1,3	2
ajob	Red Giant Flying Squirrel	*Petaurista petaurista*	Sciuridae	n.d.	1,3	2
abez	Squirrel	*Callosciurus sp.*	Sciuridae	kahowk	1,3	2, 3
semock	Squirrel	*Callosciurus spp.*[12]	Sciuridae	kahowk	1,3	2, 3
enuadth, bajit, bajiz	Red-cheeked Squirrel	*Dremomys sp.*	Sciuridae	kalen	1,3	2
teu an	[1]	*[1]*[13]	Sciuridae	kalen		2
sorr, kachon	Squirrel	*Callosciurus spp.*[14]	Sciuridae	katae	1,3	2
deuap	Squirrel	*[1]*[15]	Sciuridae	katae	1,3	2
somporr	Squirrel	*Callosciurus spp.*	Sciuridae	katae	1,3	2
katchon	Indochinese Ground Squirrel	*Menetes sp.*	Sciuridae	gnuat	1,3	2
	PORCUPINES					
atcheng, vong chental	Brush-tailed Porcupine	*Atherus macrourus*	Hystericidae	hhon	1,3,4,5	2,3
atchong, vong chon	Malayan Porcupine	*Hystrix brachyuran*	Hystericidae	hmen	1,3,4,5	2,3

7 *Probably Rhizomys sumatrenisis (Large Bamboo Rat), Rhizomys pruinosus (Hoary Bamboo Rat).*

8 *The Katu refer to four types with ameu kui gung reported to be the biggest one.*

9 *There are also squirrels with tufted ears in their appearance similar to Exilisciurus sp., but which could not be identified. Tufted ears are also attributed to some treeshrews.*

10 *Unidentified "squirrel-like animal" in Ban TD called kakaz, but not endemic in TK.*

11 *E.g. Petaurista elegans or Petaurista alborufus, trrjon should have dark fur.*

12 *E.g. Callosciurus finlaysoni spp. such as C.f. annellatus.*

13 *Similar enuadth.*

14 *E.g. Callosciurus flavimanus spp, such as C. fl. zimmensis or C.fl.thai.*

15 *Appearance like Sundasciurus hippurus, brownish-grey fur and its tail darker than the body.*

Katu name	English name	Scientific name	Order/Family	Lao name	Reference*	Method**
	SHREWS					
[2]	Pygmy Shrew	*Suncus spp.*[16]	Soricidae	[9]	1	2
[2]	Pygmy Shrew	*Suncus spp.*	Soricidae	[9]	1	2
	TREESHREWS					
chaluy, laluy, aluy	Common Treeshrew	*Tupaia glis*	Tupaiidae	kalen	3	2
teu an	Treeshrew	*Tupaia spp.*[17]	Tupaiidae	kalen	1	2
	GIBBONS[18]					
ayuadth [!]	Black-cheeked Crested Gibbon	*Hylobates concolor*	Hylobatidae	thani dam	1,3,4	2,3[19]
ayuadth [!]	White cheeked Crested Gibbon	*Hylobates khem deng*	Hylobatidae	thani khem khao	1,3,4	2,3
	LANGURS (LEAF MONKEYS)					
adok kho	Silvered Langur	*Semnopithecus cristatus*	Cercopithecidae	khang gnok, talung	3,4	2
adok kho	Francois Langur	*Semnopithecus francoisi*	Cercopithecidae	khang dam	3,4	2
pirr bok (par bok, prr bok)[20]	Red-shanked Douc Langur	*Pygathrix nemaeus*	Cercopithecidae	kha deng	3,4	2,3
	MACAQUES					
adok de xoi	Bear Macaque (or Stump-tailed M.)	*Macaca arctoide*	Cercopithecidae	ling khang	1,3,4	2
adok a-ang	Macaque	*Macaca sp.*[21]	Cercopithecidae	ling […]	1,3,4	2
adok deu	Macaque	*Macaca sp.*[21]	Cercopithecidae	ling […]	1,3,4	2,3

16 *E.g. S. murinus, S. etruscus.*

17 *E.g.T. belangeri.*

18 *Villagers reported to have three types of Gibbons. Besides the listed ones, apparently there is another with appearance equal to Hylobates pileatus, called ayuey.*

19 *Identified by song.*

20 *Villagers in KDM reported of a primate called tarrpeua parai, but which could not be identified.*

21 *E.g. Crab Eating Macaque (M. fascicularis), Pigtail Macaque (M. nemestrina), Rhesus Monkey (M. mulatta).*

Katu name	English name	Scientific name	Order/Family	Lao name	Reference*	Method**
	LORIS					
ning muat	Pygmy Loris	*Nycticebus pygmacus*	Lorisidae (Loridae)	ling lom	1,4	2
xanok, kupoz, song kludth	Black Giant Squirrel	*Ratufa bicolor*	Lorisidae (Loridae)	kahowk mo	1,3,4,	2,3
	ROUNDLEAF BATS					
axieb, xiab trua	Bat	*[1]*	Hipposideridae	tchia	7	2,3,
axieb kub	Bat	*[1]*	Hipposideridae	tchia	7	2,3
	PIGS					
armoll	Wild boar	*Sus scrofa*	Suidae	mu pa	1,3,4	2,3
	MOUSE DEER					
cha koy, poz klod	Lesser Mouse Deer	*Tragulus javanicus*	Tragulidae	kay	1,3,4,	2,3
	DEER					
pernoch, chechui, panoh, pagnop, tchatchiu	Sambar Deer	*Cervus unicolor*	Cervidae	kuang	1,3,4	2,3
arming	Deer[22]	*[1]*	Cervidae	kuang	3,4	2
ajeun klod, bob	Large-antlered Muntjac	*Muntiacus vuquangensis*	Cervidae	fan	1,4	2,3
ajeun teroh, a. erang, songdee	Common (Red) Muntjac	*Muntiacus muntjac*[23]	Cervidae	fan	1,4	2,3
	CATTLE, BUFFALOS, GOATS	*Bovidae*				
kaeh!	Serow	*Naemorhedus sumatraensis*	Bovidae	gneuang	1,4	2,3
tchemurr, semurr	Gaur[24]	*Bos garaus*	Bovidae	meuy, kating	1,4	2
tariah krung	Wild Water Buffalo	*Bubalus arnee*	Bovidae	khuay paa	1,4	2
	CIVETS					
kasong	[1]	*[1]*	Viverridae	n.d.	1,3	2
a-king	Large Indian Civet	*Viverra zibetha*	Viverridae	n.d.	1,3	2,3

22 *Probably Hog Deer (Cervus porcinus).*

23 *Probably also Muntiacus truongsonensis. Distribution reported for Southern border of Xe Sap by (WCS 1999).*

24 *Villagers's estimation of five animals in Ban TD.*

Katu name	English name	Scientific name	Order/Family	Lao name	Reference*	Method**
karoch[25]	Large Indian Civet	*Viverra zibetha*	Viverridae	n.d.	1,3	
aemping arrnok	Banded Palm Civet	*Hemigalus derbyanus*	Viverridae	n.d.	1,3,4,5	2
atok taek	Large Spotted Civet	*Viverra megaspila*	Viverridae	ngen faeng hang kan	1,3	2
atok tarun	Small Indian Civet, Spotted Linsang	*Viverra malaccensis*	Viverridae	n.d.	1,3	2
tchelhuh	Otter Civet	*Cynogale sp.*[26]	Viverridae	n.d.	1,3,4	2
samok	[1]	*[1]*	Viverridae	n.d.		2
tchekoll trrsuk, tchekoll lia	Common Palm Civet	*Paradoxurus hermaphroditus*	Viverridae	hen ngai	1,3	2,3
tchekoll trrdi	Small-toothed Palm Civet or Masked Palm Civet	*Arctogalidia trivirgata or Paguma larvata*	Viverridae	hen kan		2,3
tchekoll [!]	Banded Palm Civet or Owston's Palm Civet	*Hemigalus derbyanus or Hemigalus owstoni*	Viverridae	n.d.		2,3
tchekoll tcheran	Spotted Linsang	*Prionodon pardicolor*	Viverridae	n.d.		2
	Mongoose					
ka-och	Crab-eating Mongoose and Javan Mongoose	*Herpestes urva and Herpestes javanicus*	Viverridae	tchonponh	3, 4, 5	2
	MARTENS, WEASELS, BADGERS, OTTERS					
karoch	Yellow Throated Marten	*Martes flavigula*	Mustelidae	ngen	1,3,4,5	2
prrxiang	Weasel	*Mustela spp.*	Mustelidae	chon pon	1,3,4,5	2
pahi dia	Otter	*Lutra sp.*	Mustelidae	nak	1,3,4,5	2
pahi kriz	Otter	*Lutra sp.*	Mustelidae	nak	1,3,4,5	2
pahi ateum, pahi axiu	Smooth-coated Otter	*Lutrogale perspicillata*	Mustelidae	nak	1,3,4,5	2
pahi axiu, pahi ateum	Oriental Small Clawed Otter	*Aonyx cinera*	Mustelidae	nak	1,3,4,5	2
tiju, song jeuk	Bintorung	*Arctictis binturong*	Mustelidae	mee hang khot, mee kahowk, mo kanee	1,3,4,5	2,3
adokoh (dthuin)	[1]	*[1]*	Mustelidae	talung		
aroll [!], apo arrong	Hog Badger	*Arctonyx collaris*	Mustelidae	mu leung	3,4	2,3
aroll amu, a. enkodth, a. awon	Ferret Badger	*Melogale personata*	Mustelidae	mu leung	3,4	2,3

25 *For the Yellow-Throatened Marten the name karoch was also recorded. One possible explanation is that all three species share some distinctive characteristics which are not congruent with the Western taxa system.*

26 *Appearance equates to otter civet. Up until now however, distribution of C. lowei is known with low certainty (Nowak 1999).*

Katu name	English name	Scientific name	Order/Family	Lao name	Reference*	Method**
	CATS					
waz, ra ay koch	Leopard	*Panthera pardus*	Felidae	xeua dao	3,4	2
ra ay satamai	Black Panther	*Panthera pardus*	Felidae	xeua dam, xeua way	3,4	2
ra ay ahem	Clouded Leopard	*Neofelis nebulosa*	Felidae	xeua nok	3,4	2
ameo kruang	Leopard Cat	*Prionailurus bengalensis*	Felidae	xeua meo	3,4	2
tcherr	Marbled Cat	*Pardofelis marmorata*	Felidae	xeua lay	3,4	2
ra ay koch, ra ay kao	Indochinese Tiger	*Panthera tigris corbetti*	Felidae	xeua khong	3,4	2,3
ra ay […][27]	Asian Golden Cat	*Filis temmincki*	Felidae	xeua fai	3,4	2
ra ay […]	Fishing Cat	*Prionaillurus viverrinus*	Felidae	xeua pa	3,4	2
kla chedang	Jungle Cat	*Felis chaus*	Felidae	xeua dong	3,4	2
	Bears					
ikau redth, ikau dia	Sun Bear	*Ursus malayanus*	Ursidae	mee euy	1,3,4,5	
ikau a-o, ikau a-eu, ikau kriz	Asiatic Black Bear	*Ursus thibetanus*	Ursidae	mee khuay	1,3,4,5	
	DOGS					
chakong	Asiatic Jackal	*Canis aureus*	Canidae	maa noy	1,3	2,3
chakong a-ja	Asian Wild Dog, Dhole	*Cuon alpinus*	Canidae	maa ngai	1,3	2
nguat, karoh[28]	[1]	*Similar to civet with red chest*	[1]	katchon		
	ELEPHANTS					
atchiap, atchiang	Asian Elephant	*Elephas maximus*	Elephantidae	xang	1	2
	PANGOLINS					
praxiel	Chinese Pangolin	*Manis pentadactyla*[29]	Manidae	lin ngua	1,3,4,5	2,3
praxiel	Sunda Pangolin	*Manis javanica*	Manidae	lin kuay	1,3,4,5	2,3

---

27 *TP not TD.*

28 *Very rare animal, harvest: only one every two or three years. Meat is not tasty. Feeds on sugarcane and has the size of a human foot.*

29 *Villagers reported to have 2 types. WWF (2001) indicates however that the Chinese Pangolin is only distributed in Northern Laos. The Katu however distinguish between two different types according to colour and weight.*

Birds

Katu name	English name	Family	Scientific name	Lao name	Reference	Method
	DARTERS					
kaltok koh!, katong kasaeh	Great Darter, Indian Darter	Anhingidae	*Anhinga melanogaster*	kho ngu	1,2	2
	PHEASANTS					
arak, [tera]	[Green Peafowl][30]	Phasianidae	*Pavo muticus*	ngung	1,2	2
tarul	Kalij Pheasant	Phasianidae	*Lophura leucomelanos*	nok kua	1,2	2
tarul	Silver Pheasant	Phasianidae	*Lophura nycthemera*	nok kua	1,2	2,3
tarul	Siamese Fireback	Phasianidae	*Lophura diardi*	nok kua	1,2	2,3
taleung	Crested Fireback	Phasianidae	*Lophura ignita*	[1]	1,2	2,3
au-y krul, entroy kruang, kurung	Red Jungle Fowl	Phasianidae	*Gallus gallus*	khai paa	1,2	2,3
	OWLS					
kalang kasau	Similar Spotted Wood Owl	Strigidae	*Strix sp.*	nok khao	1,2	2
kalang amem	Similar Brown Wood Owl	Strigidae	*Strix sp.*	nok khao	1,2	2
kalang abok	Similar Brown Wood Owl	Strigidae	*Strix sp.*	nok khao	1,2	2
kalang alim	Similar Brown Wood Owl	Strigidae	*Strix sp.*	nok khao	1,2	2
kalang akodth	Similar Brown Wood Owl	Strigidae	*Strix sp.*	nok khao	1,2	2
kalang ka arok	Spot-bellied Eagle Owl	Strigidae	*Bubo nipalensis*	nok khao	1,2	2
kalang tak	Similar Spot-bellied Eagle Owl	Strigidae	*[Ketupa sp.]*	nok khao	1,2	2
kalang treup	Similar Dusky Eagle Owl	Strigidae	*[1]*	nok khao	1,2	2
kalang teut en teu	Barn Owl	Tytonidae	*Tyto alba*	nok khao	1,2	2,3
kalang bur, k. akoh	Oriental Bay Owl	Tytonidae	*Phodilus badius*	[1]	1,2	2
kalang akoh	[1]	[1]	*[1]*	[9]		
	EAGLES, KITES, ETC.					
kalang noh	Crested Serpent Eagle	Accipitridae	*Spilornis cheela*	nok leo	1,2	2,3
kalang […]	Kites	Accipitridae	*Aviceda sp.*[31]	nok leo	1,2	2

30 *Now extinct, but common resident in the past.*

31 *E.g. Aviceda jerdoni, (Jerdon's Baza), Aviceda leuphotes (Black Baza), Elanus cacruleus (Common Black-shouldered Kite).*

Katu name	English name	Family	Scientific name	Lao name	Reference	Method
kalang […]	Buzzards	Accipitridae	*Pernis spp and Butastatur spp.*	nok leo	1,2	2
kalang […]	Hawks	Accipitridae	*Accipiter spp.*	nok leo	1,2	2
trok aluy	HERONS	Ardeidae	*[1]*[32]	nok chao (grey)	1,3	2
kala abok	EGRETS	Ardeidae	*Egretta sp.*	nok yang (white)	1,2	2
	STORKS					
trok aluy	Stork	Ciconiidae	*[1]*[33]	[nok unla]	1	2
aleng tet	Stork	Ciconiidae	*[1]*		1	2
pentaeh, pataeh	NIGHTJARS	Caprimulgidae	*Eurostopodus macrotis, Caprimulgus spp.*	nok kaba	1,2	2,3
adah aruz	DUCKS	Anatidae	*Dendrocygna sp.*	nok ped pa	1,2	2
kalang […]	FALCONS	Falconidae	*Falco sp.*	nok leo	1,2	2
kakroidth, apeud, wong paraell	PARTRIDGES AND QUAILS	Turnicidae	*Cortunix spp.*	[nok kho]	1,2	2,3
kakroidth, apeud, wong paraell	BUTTONQUAILS	Turnicidae	*Turnix spp.*	nok khum	1,2	2,3
	PLOVERS					
jae joll	Grey headed Lapwing	Charadriidae	*Vanellus cinereus*	nok kataeh	1	2
	PIGEONS, DOVES					
pleuk, kompleuk, kabual	Mountain Imperial Pigeon	Colombidae	*Ducula badia*	nok mum	1,2	2,3
chaprill	Emerald Dove	Colombidae	*Chalcophaps indica*	nok pao	1,2	2,3
katru totek	Ashy Wood Pigeon	Colombidae	*Columba pulchricollis*	nok mum, nok pao	1,2	2
katru kukirr	Spotted Dove	Colombidae	*Streptopelia chinensis*	nok mum, nok pao	1,2	2
awiak, akliah, akliak, atiat	Parrots	Psittacidae	*Psittacula eupatria*	nok keo	1,2	2,3

32 *Could possibly be Butorides striatus (Green-backed Heron).*

33 *Villagers of TD reported to have three different types of storks.*

Katu name	English name	Family	Scientific name	Lao name	Reference	Method
	CUCKOOS					
a-ut trung	Moustached Hawk-Cuckoo	Cuculidae	*Cuculus vagans*	nok kot	1,2	2
a-ut chock	Common Koel	Cuculidae	*Eudynamys scolopacea*	nok kot	1,2	2
	COUCALS					
a-ut […]	Greater Coucal	Cuculidae	*Centropus sinensis*	nok kot	1,2	2,3
	MALKOHAS					
tarok	Green bellied Malkoha	Cuculidae	*Phaenicophaeus tristis*	nok hang ngao	1	2,3
achok	TROGONS	Trogonidae	*Harpactes spp.*	[9]	1	2,3
	KINGFISHERS					
taboz koch, t. tawoz	Crested Kingfisher	Alcedinidae	*Megaceryle lugubris*	nok xai	1	2,3
krah	Banded Kingfisher	Alcedinidae	*Lacedo pulchella*	nok xai	1	2,3
ajat[34]	WHIMBREL	Scolopacidae	*Numenius phaeopus*	[9]	1	2
traeh	HOOPOE	Upopidae	*Upupa epops*	[9]	1	2
katreo, charlaidth	BEEEATERS	Meropidae	*Merops spp., Nyctyornis sp.*	aen	1	2
	HORNBILLS					
triang[35]	[…] Hornbill[36]	Bucerotidae	*[1]*	nok kok	1,5	2,3
plaeh[35]	Greater Hornbill	Bucerotidae	*Buceros bicornis*	nok keng	1,5	2,3
porboms	BARBETS	Megalaimidae	*Megalaima spp.*	nok kandok	1	2
	WOODPECKERS					
traeh, koko,	Greater Flameback	Picidae	*Chrysocolaptes lucidus*	nok xai	1,2	2
traeh, koko	Laced Woodpecker	Picidae	*Picus vittatus*	nok xai	1,2	2,3

---

34 *Contrasting, in TK achem ajat is described as black bird with black beak.*

35 *In Katu the term triang names all small hornbills, plaeh big hornbills. There is no further classification for the various subgroups.*

36 *Hornbill species in Hin Namno NBCA and adjacent areas (Khammouane Province) include Anthracoceros albirostris, Anorrhinus tickelli, Aceros nipalensis and Aceros leucocephalus (WWF 1999).*

Katu name	English name	Family	Scientific name	Lao name	Reference	Method
	PITTAS					
awaedth	Long-tailed Broadbill	Pittidae	*Psarisomus dalhousiae*	[9]	1,6	2
awaedth, aping	Pitta spp., e.g. Blue-rumped Pitta	Pittidae	*Pitta soror*	[9]	1,6	2
cherladth	SWIFTS	Apodidae	*[1]*	nok ean	1	2
cherladth	SWALLOWS	Hirundinidae	*Hirundo spp.*	nok ean	1,7	2
cherladth	SPARROWS	Passeridae	*Passer montanus*	nok achip/katchok fa	1,12	2
chiar	WAGTAILS	Motacillidae	*Motacilla spp.*		1,8	2
porr, puarr	LEAFBIRDS					
cheu-y	Common Iora	Irenidae	*Aegithina viridissima*	n.d.	1	2
porr chenong	Greater Green Leafbird	Irenidae	*Chloropsis sonnerati*	n.d.	1	2
porr chenong	Blue-winged Leafbird	Irenidae	*Chloropsis cochinchinensis*	n.d.	1	2,3
ariau, ario	BULBULS	Pycnonotidae	*Pycnonotus spp.*	nok kalieo	1	2,3
awiz	ORIOLES	Oriolidae	*Oriolus spp.*	nok keemin	1	2
	CROWS					
a-ak	Large Billed Crow	Corvidae	*Corvus macrorhynchos*	nok ka	1, 4	2,3
apuak	Grey Treepie	Corvidae	*Dendrocitta formosae*	n.d.	1	2
(en)traeh	SULTAN TITS	Paridae	*Melanochlora spp.*	nok katha	1,10	2
parieh, katiak	BABBLERS	Timaliidae	*Pellorneum spp, Stachyris spp, Pteruthius spp.*	nok chip	1	2
awing	Long-tailed Sibia		*Heterophasia picaoides*	n.d.	1	2,3
akao	LAUGHINGTRUSHES	Garrulax	*Garrulax spp.*[37]	nok hua lang	1	2,3
parieh, chacholl	WARBLERS	Accipitridae	*Phylloscopus spp.*[38]	nok tchib	1	

[37] *E.g. G. leucolophus, G. monileger, G. vassali.*

[38] *E.g. P. schwarzi, P. inornatus.*

Katu name	English name	Family	Scientific name	Lao name	Reference	Method
korr keu-y	ROBINS		*Luscinia spp.*		1	2,3
	FANTAILS					
datarr, kabil	Slaty-backed Fantail	Rhipiduridae	*Enicurus schistaceus*	n.d.	1	2
datarr, kabil	White crowned Fantail	Rhipiduridae	*Enicurus leschenaulti*	n.d.	1	2
jerjai, ajirr	Blue Whistling Thrush	Rhipiduridae	*Myiophoneus caeruleus*	n.d.	1	2
tu taed, titat	Yellow-bellied Fantail	Rhipiduridae	*Rhipidura hypoxantha*	n.d.	1	2
tu taed, titat	White throated Fantail	Rhipiduridae	*Rhipidura albicollis*	n.d.	1	2
	FLYCATCHERS			[9]		
awiak	Asian Paradise Flycatcher	Muscicapidae	*Terpsiphone paradisi*	n.d.	1	2
juam	Flycatchers	Muscicapidae	*Ficedula spp.*	n.d.	1	2
aderr	Flycatchers	Muscicapidae	*Niltava spp.*	n.d.	1	2
akedth, jichorr, [zazedth]	STARLINGS	Sturnidae	*Sturnus spp.*	nok chi peuan	1,11	2
	MYNAS					
jong [!]	Hill Myna	Sturnidae	*Gracula religiosa*	nok xing ka	1,11	2,3
jong jid	Golden-crested Myna	Sturnidae	*Ampeliceps coronatus*	[9]	1,11	2
ajat	SUNBIRDS	Nectariniidae	*Aethpyga spp.*	[9]	1,9	2
azedth	SPIDERHUNTERS	Nectariniidae	*Arachnothera spp.*	[9]	1,9	2,3
a-jeo, a-jio	WHITE-EYES	Zosteropidae	*Zosterops spp.*	[9]	1	2,3
apidth	FINCHES[39]	Fringillidae	*[1]*	nok apid	1,12	2,3
aroz	BUNTINGS	Emberizidae	*[1]*	[9]	1	2
awiz	MINIVETS	Campephagidae	*Pericrocrotus spp.*	[9]	1	2,3

39 *Since finches are no common residents in the area, achem apidth might equate to finch-like birds.*

Katu name	English name	Family	Scientific name	Lao name	Reference	Method
ay	[1]	[1]	*similar Pericrocrotus spp.*[40]	[9]	-	-
	MALKOHAS					
tarok	Green bellied Malkoha	Cuculidae	*Phaenicophaeus tristis*	nok hang ngao	1	2,3

The following birds could not be identified: *achem ajerr or ajarr, achem akek, achem tcheuy, achem ajieu, achem atchrao, achem kan(n)bual, achem jeck, achem apik, achem atiet.*

References: 1=Legakul (1995); 2=Holyo del et al (1992); 3= WCS (1998); 4=Madge *et al* (1999); 5=Kemp (1995); 6=Lambert *et al* (1996); 7=Turner (1989); 8=Alström (2003); 9=Cheke et al (2001); 10=Harrap et *al* (1996); 11=Feare *et a*l (1998); 12=Clement *et al* (1993)

40 *Small yellow bird with a black coat, black beak, fruit eater.*

Insects*

*The author worked with pictures from McGavin (2000) and collected specimens which she identified with the other references appended at the end of this table.

Katu name	English name	Family	Specie or genus	Order	Lao name
kokpoh	[1] appearance equates harvestmen	[1]	*[1]*	Opiliones	meng tabtao
toz aleuaz	[1] appearance equates harvestmen	[1]	*[1]*	Opiliones	meng tabtao
	CRICKETS				
aroy	Cricket	Gryllacrididae	*[1]*	Orthoptera	meng chilo
aroy chaktil	Cricket	Gryllacrididae	*[1]*	Orthoptera	meng chilo
aroy atorr	Mole Cricket	Gryllotalpidae	*[1]*	Orthoptera	meng chilo
aroy kotgon	Cave Cricket	Rhaphidophoridae	*[1]*	Orthoptera	meng chilo
aroy rid	King Cricket	Stenopelmatidae	*[1]*	Orthoptera	meng chilo
aroy reng	True Cricket	Gryllidae	*[1]*	Orthoptera	meng chilo
(p)aru-y akong	[1]	[1]	*[1]*	[1]	[9]
(p)aru-y k(r)erneung	[1]	[1]	*[1]*	[1]	meng bong deng
(p)aru-y chaktil	[1]	[1]	*[1]*	[1]	[9]
(p)aru-y krrbat	[1]	[1]	*[1]*	[1]	meng bong han
(p)aru-y lalong	[1]	[1]	*[1]*	[1]	[9]
(p)aru-y ohm	[1]	[1]	*[1]*	[1]	[9]
(p)aru-y papual	[1]	[1]	*[1]*	[1]	[9]
(p)aru-y peu-y	[1]	[1]	*[1]*	[1]	[9]
(p)aru-y rei (roi)	[1]	[1]	*[1]*	[1]	meng bong keu
(p)aru-y roh	[1][41]	[1]	*[1]*	[1]	meng bong kalin
(p)aru-y zazedth	[1][41]	[1]	*[1]*	[1]	[9]
	KATYDIDS, GRASSHOPPERS, LOCUSTS				
alim koh!	Pygmy Locust	Tetrigidae	*[1]*	Orthoptera	meng takten
alim ala azoh	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim achong	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim araid (ariad)	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten

[41] *Cricket-like insect (but different from aroy).*

Katu name	English name	Family	Specie or genus	Order	Lao name
alim asah	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim aseum	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim atok	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim chachang	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim laleuak	Grasshopper	Acricidae	*[1]*	Orthoptera	meng takten
alim ma moidth	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim pirr	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
alim sa oh	Grasshopper	Acrididae	*[1]*	Orthoptera	meng takten
aro ako!n	[1]	[1]	*[1]*	Orthoptera	meng takten
perjua a ohm	Katydid	Tettigoniidae	*[1]*	Orthoptera	meng takten
achoong	Katydid	Tettigoniidae	*[1]*	Orthoptera	meng takten
aradth rang	Monkey Hopper	Eumastacidae	*[1]*	Orthoptera	meng takten
aradthh mong	Monkey-Hopper	Eumastacidae	*[1]*	Orthoptera	meng takten
	CICADAS				
ayum terr, a. tirr	Cicada	Cicadidae[42]	*[1]*	Hemiptera	meng khinun
ayum kein	Cicada	Cicadidae	*[1]*	Hemiptera	meng khinun
	MANTIDS AND LEAF INSECTS				
anong [!]	[1]	Hymenopodidae	*[1]*	Mantodea	meng inieu
anong kai	Common Praying Mantid	Mantitae	*[1]*	Mantodea	[9]
anong peu-y	Flower Mantid	Hymenopodidae	*[1]*	Mantodea	[9]
anong asah	Flower Mantid	Hymenopodidae	*[1]*	Mantodea	[9]
anong kai	Leaf Insect	Phylliidae	*[1]*	Phasmatodea	[9]
	Cockroaches				
prroh a-ohm	Live-bearing Cockroaches	Blaberidae	*[1]*	Blattodea	[9]
	BEETLES			Coleoptera	[9]
ayum abaeh	[1]	[1]		Coleoptera	[9]
ayum abang	Jewel Beetle	Buprestidae	*[1]*	Coleoptera	meng gnot may
ayum abok	Weevil	Curculionidae	*[1]*	Coleoptera	[9]

42 *In Thailand Dundubia mannifera, D. emanatura, and D intemerata are eaten (Mungkorndin 1981).*

Katu name	English name	Family	Specie or genus	Order	Lao name
ayum aja-I	[1]	[1]	*[1]*	Coleoptera	[9]
ayum akok	Bess Beetle	Passalidae	*[1]*	Coleoptera	[9]
ayum aliang […]	Dor Beetle	Geotrupidae	*[1]*	Coleoptera	meng man
ayum aliang […]	Scarab	Scarabaeidae	*[1]*	Coleoptera	[9], [meng kham]
ayum aliang trui	Giant Fungus Beetle	Erotylidae	*[1]*	Coleoptera	meng hoa khoay
ayum aluam	[1]	[1]	*[1]*	Coleoptera	meng khab
ayum angeun	[1]	[1]	*[1]*	Coleoptera	[9]
ayum anoh! (a-oh)	[1]	[1]	*[1]*	Uropygi	[9]
ayum a-oh, a. a-uh	[1]	[1]	*[1]*	Coleoptera	[9]
ayum apoz	Chequered Beetle	Cleridae	*[1]*	Coleoptera	[9]
ayum ariz	Ground Beetle	Carabidae	*[1]*	Coleoptera	meng mali
ayum asom	[1]	[1]	*[1]*	Coleoptera	[9]
ayum ayiz	[1]	[1]	*[1]*	Coleoptera	meng kheng
ayum chertong anoh!	Fungus Weevil	Anthribidae	*[1]*	Coleoptera	[9]
ayum jajaeh	Scarab	Scarabaeidae	*[1]*	Coleoptera	[9]
ayum jeo	Darkling Beetle	Tenebrionidae	*[1]*	Coleoptera	[9]
ayum kapong	[1]	[1]	*[1]*	Coleoptera	[9]
ayum kadarr, a. akam	[1]	[1]	*[1]*	Coleoptera	[9]
ayum krror a(r)modth	[1]	[1]	*[1]*	Coleoptera	[9]
ayum kla dohmm	Jewel Bettle	Buprestidae	*[1]*	Coleoptera	meng kab
ayum klod	Hister Beetle	Histeridae	*[1]*	Coleoptera	[9]
ayum ngo nop, a. ngeu neup	Pollen Beetle[43] (Sap Beetle)	Nitidulidae	*[1]*	Coleoptera	[9]
ayum ngum angun	Scarab	Scarabaeidae	*[1]*	Coleoptera	meng tchutchi
ayum oz	[1]	[1]	*[1]*	Coleoptera	[9]
ayum panaz	Longhorn Beetle	Cerambycidae	*[1]*	Coleoptera	meng pu
ayum papong	[1]	[1]	*[1]*	Coleoptera	meng xaang
ayum pian, ayum kerrhong	Ladybird	Coccinellidae	*[1]*	Coleoptera	[9]
ayum roy	[1]	[1]	*[1]*	Coleoptera	[9]
ayum taling bahn	Stag Beetle	Lucanidae	*[1]*	Coleoptera	[9]
ayum takoy	[1]	[1]	*[1]*	Coleoptera	[9]
ayum tatroi	[1]	[1]	*[1]*	Coleoptera	[9]

43 *Especially occurring at decaying animal materials in traps and snares. They are harvested and eaten (raw), whereas the rotten meat is sometimes considered inedible.*

Katu name	English name	Family	Specie or genus	Order	Lao name
ayum tatrop	Pollen Beetle[43] (Sap Beetle)	Nitidulidae	*[1]*	Coleoptera	[9]
ayum tatrop atop tia	Pollen Beetle[43] (Sap Beetle)	Nitidulidae	*[1]*	Coleoptera	[9]
ayum tawak	[1]	[1]	*[1]*	Coleoptera	[9]
ayum tchea	[1]	[1]	*[1]*	Coleoptera	meng tchak tchan
ayum tirr	[1]	[1]	*[1]*	Coleoptera	[9]
ayum tu(k) teuk	Scarab	Scarabaeidae	*[1]*	Coleoptera	meng tchuchi
ayum tuturr	Scarab	Scarabaeidae	*[1]*		[9]
ayum uh, a. arek	[1]	[1]	*[1]*	Coleoptera	meng kinen
ayum klah dohmm arang	Click Beetle	Elateridae	*[1]*	Coleoptera	[9]
ayum klah dohmm mong	Click Beetle	Elateridae	*[1]*	Coleoptera	meng hngam
krrjua	Vinegaroons	Thelyphonidae	*[1]*	Uropygi	meng som
				Hemiptera	[9]
	BUGS				
a~niz kadih	Bug	[1]	*[1]*	Hemiptera	meng kaen
a~niz empian	Bug	[1]	*[1]*	Hemiptera	meng kaen
a~niz to	Bug	[1]	*[1]*	Hemiptera	meng kaen
n.d.	Squash Bug	Coreidae	*[1]*	Hemiptera	[9]
ayum (a) teum kah[44] (koh)	Giant Water Bug	Belostomatidae	*Lethocerus indicus*	Hemiptera	[9]
	TERMITES				
klab b~uen[45]	Higher Termites	Termitidae	*[1]*	Isoptera	meng mau
klab [!}[46]	Higher Termites	Termitidae	*[1]*	Isoptera	meng mau
tumurr, tuteuk	[1]	[1]	*[1]*	Isoptera	meng mau
	ANTS				
hong	Ant	Formicidae	*[1]*	Hymenoptera	mod deng som
ingurr[47]	Ant	Formicidae	*[1]*	Hymenoptera	meng mim

---

44 *It should be noted that this insect is often classified as crab.*

45 *Making hills.*

46 *Always in the soil.*

47 *Could also be a bee, possibly meng mim (Lao).*

Katu name	English name	Family	Specie or genus	Order	Lao name
ka mirr	Ant	Formicidae	*[1]*	Hymenoptera	[9]
kasau […][48]	Ant	Formicidae	*[1]*	Hymenoptera	mod deng som, meng khaw san
	BEES[49]				[9]
ktcho	Bee	Apidae	*[1]*	Hymenoptera	pheung […]
nga nual	Bee	Apidae	*[1]*	Hymenoptera	meng pu
taning asodth	Bee	Apidae	*[1]*	Hymenoptera	pheung […]
taning hong	Bee	Apidae	*[1]*	Hymenoptera	pheung […]
taning ktchor	Bee	Apidae	*[1]*	Hymenoptera	pheung […]
taning ngarr	Bee	Apidae	*[1]*	Hymenoptera	pheung […]
taning tarai	Bee	Apidae	*[1]*	Hymenoptera	pheung […]
carot, kraut	Bee	Apidae[50]	*[1]*	Hymenoptera	pheung khon
kadarr (akam)	Bee	Apidae	*[1]*	Hymenoptera	pheung […]
	DRAGONFLIES				
tang tid	Dragonfly	[1]	*[1]*	Odonata	[9]
tang akoh	Dragonfly	[1]	*[1]*	Odonata	[9]
zazedth	Rock Crawlers	Grylloblattidae	*[1]*	Grylloblattodea	[9]
	CATERPILLARS				
atu[51]	Caterpillar	Lepidoptera	*[1]*	[1]	duang

References: Chujo (1964); Napompeth (1965); Baudon (1968); Gressitt (1970); McGavin (2000).

48 *From the ants also the eggs are eaten, especially as souring condiment.*

49 *For Sekong Apis dorsata, A. cerana, A. florae have been reported in the NOVIB NTFP study (Beer et al 1994).*

50 *These bees have their hive in the soil.*

51 *The Katu know various kinds of edible caterpillars.*

Fish

Katu name	English name	Scientific name	Lao name	References	Method
axiu cho	[1]	*Poropuntius laoensis*	pa chat	1	1,3
axiu atchor	[1]	*Mastacembelus spp.*	pa lat	1	1,3
axui anteng	[1]	*Clarias batrachus*	pa duk	1	1,3
axiu alon	[1]	*Acantopsis sp.*	pa hak kuay, p. panh, p. ilon	1	1,3
axiu brung xoi	[1]	*[1]*	pa hang deng	-	3
axiu xia	[1]	*[1]*	pa hua muan	-	3
axiu andong	Eel	*[1]*	pa ian	-	3
axiu kadeud	[1]	*Labeo yunnanensis*	pa ka, p. ika	1	1,3
axui akloh, a. don	Catfish	*[1]*	pa kang	-	3
axiu athong	[1]	*[1]*	pa kathong	-	3
axiu arlidth	[1]	*[1]*	pa kemdeng	-	3
axui kadeud	[1]	*Cirrhinus molitorella*	pa keng	1	1,3
n.d.	[1]	*Parambassis siamensis*	pa khap khong	1	1,3
axiu chotek	[1]	*[1]*	pa ki hia	-	3
axiu krong, a. asodth	[1]	*Cyclocheilichthys*	pa khao […]	1	1,3
axiu akez	[1]	*[1]*	pa khen deng	-	3
axiu lalae, axiu adeut	[1]	*[1]*	pa kheng/lalae	-	3
axiu atong meun	[1]	*[1]*	pa kheung	-	3
axiu trial	[1]	*[1]*	pa khiang	-	3
axiu emprok	[1]	*[1]*	pa khiang pai, p. phok	-	3
enchong (chong)	[1]	*[1]*	pa kong, p. khung	-	3
axiu karong	[1]	*Channa spp.*	pa kho	1	1,3
axiu yuan	[1]	*[1]*	pa khob	-	3
axiu ariang	[1]	*[1]*	pa khon	-	3
axiu tchu (entchu)	[1]	*[1]*	pa kihia	-	3
axiu karong	[1]	*[1]*	pa kô	-	3
axiu alik, a. arlidth	[1]	*[1]*	pa koa	-	3
axiu plah	[1]	*[1]*	pa koa	-	3
axiu kratroh	[1]	*[1]*	pa koanhin	-	3
axiu akez, a. kakaeh	[1]	*Mystus nemurus*	pa kot	-	1,3
axiu takok	[1]	*[1]*	pa kow	-	3
axiu katroh	[1]	*[1]*	pa kua	-	3
axiu krong	[1]	*[1]*	pa kuan	-	3
axiu andong	[1]	*[1]*	pa lan	-	3

Katu name	English name	Scientific name	Lao name	References	Method
axiu tcharlia	[1]	*[1]*	pa langnam, p. lang ko	-	3
axiu tapah	[1]	*[1]*	pa lay	-	3
n.d.	[1]	*[1]*	pa lot	-	3
axiu kachep	[1]	*[1]*	pa mai	-	3
axiu emprok	[1]	*[1]*	pa mak buab	-	3
n.d.	[1]	*[1]*	pa mak way	-	3
axiu chirluak	[1]	*[1]*	pa mu manh	-	3
axiu rupi	[1]	*[1]*	pa nin	-	3
n.d.	[1]	*Labiobarbus leptocheilus*	pa lang nam	-	1,3
axiu krrbom	[1]	*[1]*	pa paak	-	3
axiu (p)alid	[1]	*[1]*	pa pak khua	-	3
axiu aluam	[1]	*[1]*	pa komm	-	3
arxiu arlon	[1]	*[1]*	pa parlon	-	3
axiu entrrod	[1]	*[1]*	pa pao	-	3
axiu tarloi	[1]	*[1]*	pa pek	-	3
n.d.	[1]	*[1]*	pa pok	-	3
axiu ploh	[1]	*[1]*	pa puak	-	3
axiu tcheroll	[1]	*Luciosoma spp.*	pa xiu au	-	1,3
axiu arlau, a. aploh kral, aploh tarong	[1]	*Hampala spp.*	pa sut	-	1,3
axui axob (big), asir (small)	[1]	*[1]*	pa tithin	-	3
axiu axir	[1]	*[1]*	pa tihan	-	3
axiu ka oy	[1]	*Notopterus notopterus*	pa thong	-	1,3
axui adoth	[1]	*[1]*	pa xeuam	-	3
axiu aplak	[1]	*[1]*	pa xiu	-	3
tcherol	[1]	*[1]*	paa xiu ao (big)	-	3
n.d.	[1]	*[1]*	pa xiu ao (small)	-	3
axiu mod	[1]	*[1]*	pa soy	-	3
axiu treung	[1]	*[1]*	pha do	-	3
axiu cheraeng	[1]	*[1]*	[9]	-	3

Reference: Baird (1999a)

Frogs and toads

Katu name	English name	Scientific name	Family	Lao name	References	Method
(akut) hing	[1]	*Kaloula pulchra*	Microhylidae	eun ang	p.c.	3
apung nerr (3 types)	tadpole	*various frog spp.*	[1]	huak khiet	p.c.	3
apung	tadpole	*various frog spp.*	[1]	huak kob	p.c.	3
andong	[1]	*[1]*	[1]	ian	-	-
akut aluy	toad	*[1]*	[1]	khiet mod	-	-
akut arok	toad	*Bufo melanostictus*	Bufonidae	kang kak	p.c.	3
akut chakon	toad	*[1]*	[1]	kob […]	-	-
akut cho!	frog	*[1]*	[1]	kob […]	-	-
akut karpat[52]	toad	*[1]*	[1]	khiet […]	-	-
akut klong (a)roy	toad	*[1]*	[1]	khiet […]	-	-
akut long	toad	*[1]*	[1]	khiet hoy	-	-
akut ok, a. klo alu-y	toad	*Limnonectes sp.*	Ranidae	khiet mo	p.c.	3
akut taraz	toad	*[1]*	[1]	khiet tat	-	-
akut targodah!	toad	*[1]*	[1]	khiet xay	-	-
akut tcherio	frog	*[1]*	[1]	kob […]	-	-
akut tcherodth	toad	*Rana nigrovittata*	Ranidae	khiet […]	p.c.	3
akut trrluaz, a. terr	toad	*Polypedates leucomystax*	Rhacophoridae	khiet ta pat	p.c.	3
akut terreuk	frog	*[1]*	[1]	kob […]	-	-
akut trrlong	frog	*Calluella guttulata*	Microhylidae	kob […]	-	3
akut uah	frog	*Leptobrachium sp.*	Bufonidae	kob […]	-	3

Fejervarya (formerly Rana) *limnocharis* and *Hoplobatrachus rugulosa* are the two most commonly consumed frogs in Laos (p.c. Bryan Stuart 2004), but no corresponding Katu name could be identified.

References: Manthey and Grossmann (1997); Duckworth, Saulter *et al* (1993)

---

[52] *Krrpat mat however is too difficult to hunt.*

Snails and shrimps

Katu name	English name	Scientific name	Lao name	References	Method
klaw[53]	snail	-	hoy tchub	-	-
klaw	snail	-	hoy deua	-	-
klaw	snail	-	hoy gnay	-	-
klaw	snail	-	hoy nong (brown)	-	-
klaw	snail	-	hoy hom (white)	-	-
klaw haeng, kloy haeng	snail[54]	-	hoy […]	-	-
ateum tok	Crab	*Pudaengon sp.*	kapu	1	2,3
ateum tiang	Crab	*Pudaengon sp*	kapu	1	2,3
ateum kham	Crab	*Pudaengon sp.*	kapu	1	2,3
ateum dak	Crab	*Pudaengon sp.*	kapu	1	2,3
ateum alesoh	Crab	*Pudaengon sp.*	kapu	1	2,3
anchong	Shrimp	*Atya sp* .	kung	2	2,3

References: 1=Ng and Naiyanetr (1995); 2=Toft-Mogensen (2001)

Turtles*

*Including eggs

Katu name	English name	Scientific name	Family	Lao name	References	Method
akob rang or akob ko (tree)	Keeled Box Turtle	*Pyxidea mouhotii*	Emydidae	tao	1	2
akob rang or akob ko (tree)	Keeled Box Turtle	*Pyxidea mouhotii*	Emydidae	tao	1	1
akob deu, tamum (water)	Yellow Headed Temple Turtle	*Hieremys annandalii*	Bataguridae	tao	1,2	2
akob kataeh, tamum (water)	Asian Leaf Turtle	*Cyclemys dentata complex*	Bataguridae	tao	1,2	2
[tapa]	Asiatic Softshell Turtle	*Amyda cartilaginea*	Trionychidae	pa fa	1,2	2,3

References: 1=Stuart *et al* (2001); 2=Manthey and Grossmann (1997)

---

53 *The Katu differentiate between klaw trrlong and klaw jo-y.*

54 *Shell appearance equates to large garden snail.*

Snakes*

*Including eggs

Katu name	English name	Scientific name	Family	Lao name	References	Method
kaxeng talan	Reticulated Python	*Python reticulatus*	Pythonidae	ngu leuam	1,2	2
kaxeng turr [!]	King Cobra	*Ophiophagus hannah*	Elapidae	ngu hao	1,2	2
n.d.	Indochinese Sand Snake	*Psammophis condanarus indochinensis*	Colubridae	[9]	1,2	2
kaxeng karong karaeh	Ratsnake	*Elaphe spp.*[55]	Colubridae	ngu xing dong	1,2	2,3
kaxeng koch karaeh	Ratsnake	*Ptyas sp.*	Colubridae	ngu xing	1,2	2
[kaxeng pan kloh]	Indochinese or Laotian Wolfsnake	*Lycodon laoensis*	Colubridae	[9]	1,2	2
kaxeng ter ur	Flowerpot Snake (Blindsnake)	*Ramphotyphlops braminus*	Typhlopidae	ngu din	1	2
kaxeng plaz	Siamese Russel's Viper	*[Viperaru russellii]*[56]	Viperidae	[9[	3	2
kaxeng khom, k. peud	[1]	*[1]*	[1]	[9]	-	-
kaxeng cherrlung[57]	Pit-viper	*Trimeresus spp.*[58]	Viperidae	ngu kiau	1	2,3
kaxeng lalai	[1]	*[Maticora bivirgata]*[59]	Elapidae	[9]	2, 3	2
[kaxeng prrkloh]	[1] Water Snake	*Enhyris spp.*	Colubridae	[9]	1, 2	2

Venomous *kaxeng pariz* (Keelbacks, e.g. *Rhabdophis subminiatus*) and Kraits such as *Bungarus candicus* are not considered edible. The venomous King Cobra, however, is considered edible. Snakes which could not be identified were: *kaxeng turr parai* (*ngu akon*), *kaxeng turr tud* (*ngu maikon*), *kaxeng marr* (brownish) and *kaxeng turr ton* (yellow).

References: 1=Duckworth, Saulter *et al* (1993); 2=Manthey and Grossmann (1997); 3=Cox, Dijk (1998)

55 *Duckworth, Saulter et al (1993) have listed Elaphe porphyracea, E. prasina, E. radiate, E. taeniura.*

56 *Duckworth, Saulter et al (1993) have listed only Calloselasma rhodostoma (Malayan Pit-Viper) for Laos.*

57 *Taboo in TD.*

58 *Duckworth, Saulter et all (1993) have listed Trimeresurus albolabris, T. mucrosquamatus , T. popeiorum, T. stejnegeri.*

59 *Not confirmed for Laos by Duckworth, Saulter et all (1993), but listed by Manthey and Grossmann (1997).*

Sauria - Lizards*

*Including eggs

Katu name	English name	Scientific name	Family	Lao	References	Methods
akui deu	Indochinese Water Dragon	*Phsignathus cocincinus*	Agamidae	katang	2	2,3
akui embaerr	Blue Crested Lizard	*Calotes mystacus*	Agamidae	[9]	1, 2	2,3
akui kung	Speckeled Forest Skink	*Mabuya macularia*	Gekkonidae	tchiko	1,2,3	2
akui leup, a. lop	[1], vary rare animal	*[1]*	Gekkonidae	[9]	-	-
akui raeng	Long-tailed Sun Skink Skink	*Mabuya longicaudata*	Gekkonidae	[9]	1,2,3	2
akui reuz	Small-scaled Forest Lizard	*Pseudocalotes microlepis*	Agamidae	kapom	1,2	2
akui tang	Dusky Gliding Lizard	*[Draco obscurus]*[60]	Agamidae	[9]	2, 3	2
akui tar	[1]	*[1]*	-	[9]		
akui taree	[Water Monitor]	*[Varanus salvator]*	Varanidae	hea	1,2,3	2,3
akui tcherro	Even-toed Supple Skink	*[Lygosoma isodactyla]*[61]	Scincidae	tchiko	2,3	2
akui tcherro	Khorat Supple Skink	*Lygosoma koratense*	Scincidae	[9]	2	2
akui teruaz	Water Skink	*Tropidophorus ssp.* [62]	Scincidae	[9]	2,3	2
akui teup	Barred Gliding Lizard	*[Draco taeniopterus]*[63]	Agamidae	[9]	2	2
akui tokae	Tockay	*Gecko gecko*	Gekkonidae	[9]	1,2	2
akui tri	[1]	*[1]*	-	[9]		
akui trkot	Bengal or Clouded Monitor	*Varanus bengalensis nebolosus*	Varanidae	len	1,2,3	2
akui zerledth	Speckled Leaf-litter Skink	*Scincella reevesi*	Scincidae	[9]	1,2	2
akui zok	Streamside Skink	*Sphenormorphus maculatus*	Scincidae	[9]	2	2
akui zok	Starry Forest Skink	*[Sphenomorphus stellatus]*[64]	Scincidae	[9]	2	2
akui zok	Indian Forest Skink	*Sphenomorphus indicus*	Scincidae	[9]	1,2,3	2
akui zok	Garden Fence Lizard	*Calotes versicolor*	Agamidae	[9]	1,2,3	2
akui zok	Northern Forest Crested Lizard	*Calotes emma emma*	Agamidae	[9]	1,2,3	2

References: 1=Duckworth, Saulter et al (1993); 2=Cox, Dijk (1998); 3=Manthey and Grossmann (1997)

---

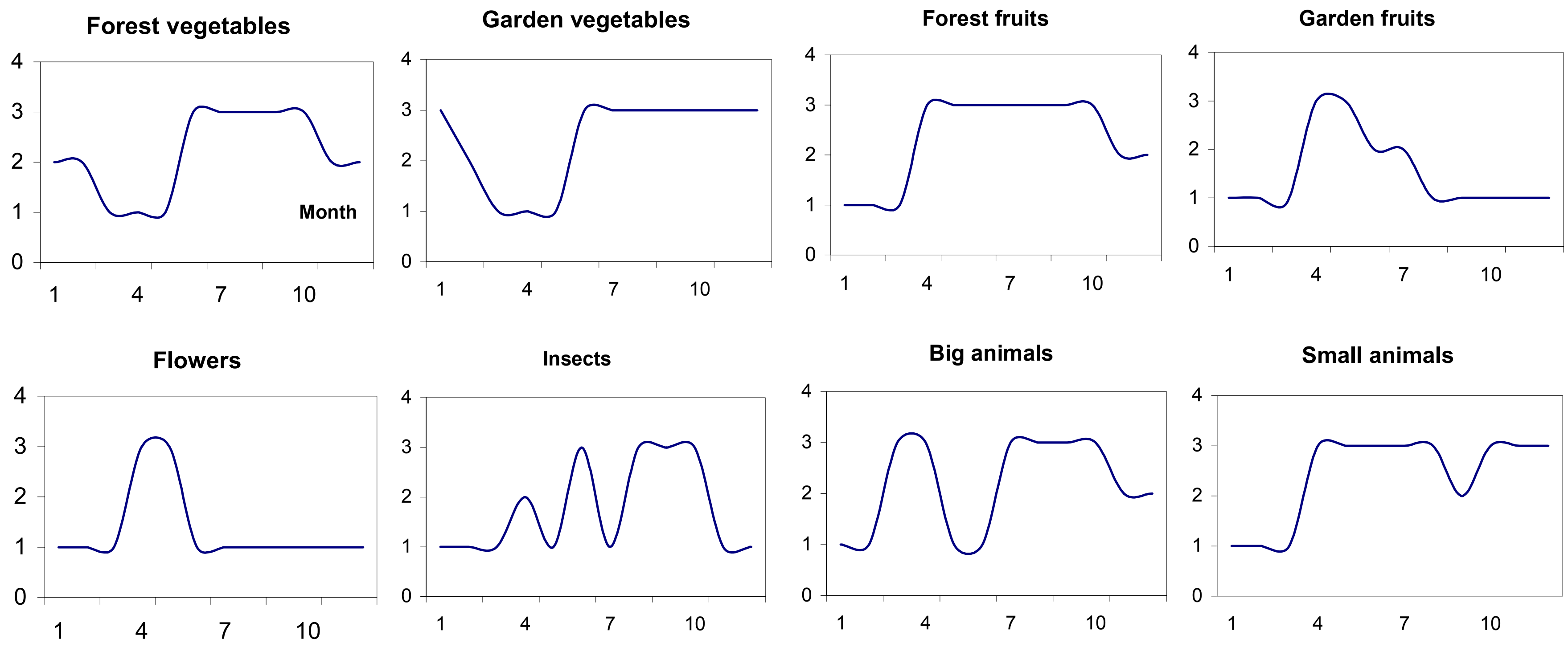
60 *Initially identified as such, but probably Draco blanfordi (Manthey et al 1997). Draco obscurus is not confirmed for Laos by Duckworth, Saulter et al (1993).*

61 *Not confirmed for Laos by Duckworth, Saulter et al (1993).*

62 *E.g. Tropidophorus berdmorei (Berdmore's Water Skink), Tropidophorus microlepis (Small-scaled Water Skink).*

63 *Not confirmed for Laos by Duckworth, Saulter et al (1993).*

64 *Not confirmed for Laos by Duckworth, Saulter et al (1993).*

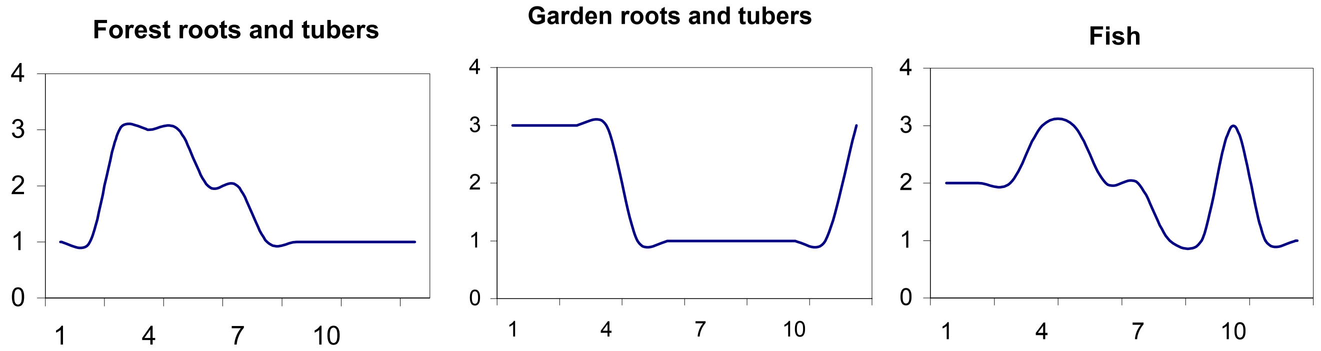


APPENDIX 1.3

SEASONALITY OF DIET

The y-axis indicates the consumption frequency (ranging from low consumption=1 to high consumption=3)

Source: Own production



APPENDIX 2

RESULTS OF CHEMICAL ANALYSIS OF SELECTED KATU FOODS

Plant foods*

*per 100g edible portion

Food	Gross energy	Water	Crude P	Crude F	CHO	β-Car	Vit E	Vit B_1	Vit B_2	Niacin	Vit C	Biotin	Vit B_6	Vit B_{12}	Folate	Ca	Fe	Zn	Se	Cu	Mg	K
	kcal	g	g	g	g	µg	mg	mg	mg	mg	mg	mg	mg	µg	µg	mg	mg	µg	mg	mg	mg	mg
ROOTS AND TUBERS																						
tcherrok/trrong (with cassava)	64	82.70	0.20	0.20	15.40	n.d.	n.d.	0.01	< 0.01 (0.002)	8.50	n.d.	1	n.d.	n.d.	n.d.	19	0.30	0.10	n.d.	n.d.	14	187
pong kleuz (steamed)	120	69.30	3.70	0.10	26.20	n.d.	n.d.	0.07	< 0.01 (0.003)	0.30	n.d.	4	n.d.	n.d.	n.d.	18	0.50	0.40	n.d.	0.19	n.d.	195
pong atuz (steamed)	57	n.d.	2.60	0.10	11.50	n.d.	n.d.	0.02	*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	15	0.40	0.40	n.d.	n.d.	n.d.	229
pong azoch (steamed)	94	n.d.	2.60	0.10	20.70	n.d.	n.d.	0.02	*	0.20	n.d.	n.d.	n.d.	n.d.	n.d.	35	0.40	0.50	n.d.	n.d.	n.d.	230
CEREALS																						
Rice (glutin., steamed)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.03	< 0.01 (0.004)	n.d.	n.d.	1	n.d.	n.d.	n.d.	4	0.04	n.d.	n.d.	n.d.	n.d.	n.d.
malmel (Katu dish)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	66	n.d.	1.60	n.d.	0.50	n.d.	n.d.
STARCHY HUNGERFOOLDS																						
ariad (steamed)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	16	0.20	0.40	n.d.	0.02	18	n.d.
patong (cheo)	26	92.20	2.10	0.20	4.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	20	0.10	0.60	n.d.	n.d.	29	n.d.
mak kabau (steamed)	147	62.50	3.00	0.30	33.00	n.d.	n.d.	0.08	< 0.01 (0.001)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	25	0.90	0.90	n.d.	0.09	n.d.	n.d.
aleng (steamed)	n.d.	n.d.	3.20	n.d.	n.d.	496	n.d.	n.d.	n.d.	n.d.	1	n.d.	n.d.	n.d.	n.d.	20	1.10	1.10	n.d.	n.d.	21	321
Cassava leaves (steamed)	n.d.	n.d.	n.d.	n.d.	n.d.	555	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	49	1.00	0.90	n.d.	n.d.	n.d.	n.d.
tcheruak pirr ayul (Katu dish)	42	86.80	2.60	0.90	5.80	n.d.	n.d.	n.d.	n.d.	0.50	n.d.	4	0.08	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	32	n.d.
GARDEN VEGETABLES																						
phak iku KDM (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	266	4.80	0.80	n.d.	n.d.	n.d.	n.d.

Food	Gross energy	Water	Crude P	Crude F	CHO	β-Car	Vit E	Vit B_1	Vit B_2	Niacin	Vit C	Biotin	Vit B_6	Vit B_{12}	Folate	Ca	Fe	Zn	Se	Cu	Mg	K
phak falang (raw)	n.d.	n.d.	2.10	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	112	3.80	0.50	n.d.	n.d.	67	250
phak kat som (fermented)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	10.50	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Vegetable salt (dried)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	5,542	163.60	22.20	n.d.	1.77	1,044	3,599
LEAFY FOREST VEGETABLES																						
agnoy (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	71	1.90	n.d.	n.d.	n.d.	26	n.d.
ala kawah (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	19	n.d.	n.d.	n.d.	n.d.	121	0.50	n.d.	n.d.	n.d.	n.d.	n.d.
ala aruy (raw)	n.d.	n.d.	4.30	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.		1.90	n.d.	n.d.	n.d.	915	401
ala cherraeng	n.d.	n.d.	1.60	n.d.	n.d.	467	n.d.	n.d.	n.d.	n.d.	6	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ala kaki (raw)	n.d.	n.d.	3.40	n.d.	n.d.	392	n.d.	n.d.	n.d.	n.d.	15	n.d.	n.d.	n.d.	n.d.	37	0.80	0.50	n.d.	n.d.	20	142
ala katiang (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	639	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	253	0.70	0.50	n.d.	n.d.	81	359
ala krrong (raw)	n.d.	n.d.	9.50	n.d.	n.d.	2,096	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	23	2.50	n.d.	n.d.	n.d.	34	592
ala krrtoy (raw)	n.d.	n.d.	1.90	n.d.	n.d.	n.d.	1.00	0.07	0.04	n.d.	73	n.d.	n.d.	n.d.	n.d.		0.80	n.d.	n.d.	n.d.	33	141
ala tchirkatt (steamed)	n.d.	n.d.	6.80	n.d.	n.d.	2,062	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	29	2.30	0.90	n.d.	n.d.	59	220
aneng (steamed)	n.d.	n.d.	n.d.	n.d.	n.d.	593	n.d.	n.d.	n.d.	n.d.		n.d.	n.d.	n.d.	n.d.	121	2.30	0.70	n.d.	n.d.	21	405
atogn (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	2.60	0.60	n.d.	0.78	51	n.d.
atogn (steamed)	n.d.	n.d.	n.d.	n.d.	n.d.	809	n.d.	n.d.	n.d.	1.50	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
FOREST FRUITS																						
palaeh agnoaz (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.60	0.40	n.d.	n.d.	n.d.	n.d.
mak kho (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	41	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
GARDEN FRUITS																						
palaeh tui (raw)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	4	n.d.	n.d.	n.d.	n.d.	n.d.	1.00		n.d.	n.d.	n.d.	n.d.
mak khay (raw)	146	63.10	1.10	0.40	34.50	85	4.00	0.10	0.05	3.60	n.d.	n.d.	0.50	n.d.	n.d.	33	0.50	0.10	n.d.	n.d.	n.d.	n.d.

*Not detected

Source: Own compilation

Animal foods

Food	Energy	Water	Ash	Crude P	Crude F	CHO	Vit A	Vit E	Vit B_1	Vit B_2	Niacin	Ca	Fe	Zn	Cu
	kcal	g	g	g	g	g	µg	mg	mg	mg	mg	mg	mg	mg	mg
WILD MAMMALS															
bob (with skin, cheo)	231	42.3	7.40	45.2	6	0	0	n.d.	n.d.	n.d.	n.d.	2,240	24.1	3.3	n.d.
aroll (with skin, grilled)	454	28.1	3.20	13.9	35.9	[19]	0	n.d.	n.d.	n.d.	3	n.d.	n.d.	n.d.	n.d.
abuat (Viventer spp., tcheruak)	70	80.4	4.60	12.1	2	0.9	0	n.d.	n.d.	n.d.	9.3	944	5.5	2.4	n.d.
Amphibians, reptiles															
akut klong roy (cheo)	82	74.3	7.40	16.7	1.7	0	34	0.1	n.d.	n.d.	n.d.	1,319	4	2.9	n.d.
akut tcherodth (boiled)	67	79.9	5.20	10.4	1.5	3	0	n.d.	n.d.	n.d.	1.5	n.d.	n.d.	n.d.	0.08
apugn nerr (boiled)	75	77.6	n.d.	9.6	2.9	2.5	n.d.	n.d.	0.22	0.33	n.d.	488	22.2	1.3	n.d.
akuy reuz (grilled)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.03	0.7	4	1,705	4.7	4.5	0.14
FRESHWATER FISH															
klaw (boiled)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	12	0.2	n.d.	n.d.	n.d.	792	n.d.	3	n.d.
ateum kham (braised)	n.d.	n.d.	n.d.	n.d.	0.9	n.d.	*	1.5	n.d.	n.d.	n.d.	6,225	11.2	3.4	2.49
ateum kham (tcheruak)	47	73.9	15.40	9.7	0.8	0	9	1	n.d.	n.d.	n.d.	4,534	7.3	7.7	n.d.
axiu cho (tcheruak)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	28	968	2.8	3.6	n.d.
axiu cho (grilled)	140	62.6	7.40	26	4	0	528	1.6	0.03	0.02	3.6	1,782	29.8	5.9	0.78
Fish (mixed spp., simmered)	n.d.	n.d.	n.d.	n.d.	5.3	n.d.	110	1.2	n.d.	n.d.	2.5	1,329	6.3	11	n.d.
Fish (mixed spp. dried, cheo)	118	66.8	n.d.	20	4.2	0	n.d.	n.d.	n.d.	n.d.	n.d.	1,227	3.9	4	n.d.
padek Katu (fermented indigenous fish)	196	n.d.	n.d.	34.4	5.6	2.1	n.d.	n.d.	*	0.25	2.2	3,752	4.3	5.3	0.22
INSECTS															
papoll, braised	n.d.	n.d.	n.d.	8.80	0.70	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	26	n.d.	n.d.	n.d.
zazed, braised	n.d.	n.d.	n.d.	10.30	1.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

*Not detected.

Source: Own compilation

APPENDIX 3

OVERVIEW OF PROXIMATE NUTRITIONAL VALUES OF SELECTED KATU FOODS

The following four tables are compiled from: Own laboratory results (marked with *), the Asian databases compiled at Mahidol University (INMU 2002; Puwastien *et al* 2002), the international database from Souci-Fachmach-Kraut (DFA 2001), the online USDA database (at http://www.nal.usda.gov), Dierenfeld *et al* (2002), Ohtsuka *et al* (1984), Viwatpanitch (2541), GOV (1994; 2000), Chan *et al* (1995), FAO (1968), Yhoung-Aree (1997)

Staples

Food	Gross energy	Water	Crude protein	Crude fat	CHO	β- Car	Vit. B_1	Vit B_2	Niacin	Vit C	Ca	Fe	Zn	Se	Cu	Mg	K
	kcal	g	g	g	g	µg	mg	mg	mg	mg	mg	mg	mg	µg	mg	mg	mg
ROOTS AND TUBERS																	
tcherrok, trrong (cassava)*	64	82.70	0.20	0.20	15.40	n.d.	0.01	0.002	8.5	n.d.	19	0.30	0.10	n.d.	n.d.	14.00	187
pong kleuz (steamed)*	120	69.30	3.70	0.10	26.20	n.d.	0.07	0.003	0.30	n.d.	18	0.50	0.40	n.d.	0.19	n.d.	195
pong atuz (steamed)*	57	n.d.	2.60	0.10	11.50	n.d.	0.02	**	n.d.	n.d.	15	0.40	0.40	n.d.	n.d.	n.d.	229
pong azoch (steamed)*	94	n.d.	2.60	0.10	20.70	n.d.	0.02	0.00	0.20	n.d.	35	0.40	0.50	n.d.	n.d.	n.d.	230
Taro (boiled)	124	67.8	1.9	0.3	28.8	39	0.08	0.05	0.6	4	48	0.90	0.3	0.9	0.2	30	484
Yam Bean (raw)	35	90.5	0.9	0.1	7.6	12	0.03	0.01	0.3	9	9	0.50	0.20	0.7	0.05	11	144
Yam (purple, boiled)	77	80.4	0.7-4	0.1	18.2	n.d.	0.05	0.01	0.3	4	10-17	0.4-1.4	0.3	0.9	0.1	10	495
Yam (spiny, boiled)	69	83.8	0.4	1.2	14.1	n.d.	0.03	0.01	0.2	9	41	0.30	0.3	0.9	0.1	10	495
Cassava (boiled and raw)	111	71.8	0.4	0.1	27.1	20-60	0.03	0.01	0.4	22	10	0.30	0.3	0.7	0.1	21	271
Sweet potatoe (yellow, boiled)	128	68.1	0.3	0.3	30.7	1,470	0.04	0.02	0.3	14	30	0.4	0.40	n.d.	n.d.	n.d.	n.d.
Potatao (boiled)	71	81.0	1.9	0.1	16.3	n.d.	0.06	0.02	1.3	11	7	0.80	0.64	n.d.	n.d.	n.d.	n.d.
Arrowroot (raw)	125	67.4	1.7	0.2	29.5	18	0.15	0.02	0.5	7-16	15	1.90	1.1	n.d.	0.20	n.d.	769
CEREALS																	
Glutnious rice (hand-pounded, steamed)*	229	42.9	4.6	0.3	52	0	0.03	0.01	1	0	4	0.04	1	5.6	0.12	5	24
Non-glutinous rice* (brown, hand-pounded, steamed)	146	65	2.2	0.3	32.4	0	0.04	0.01	1	0	3	0.2	0.6	7.8	0.1	44	79
Malmel (Katu dish)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	66	n.d.	1.60	n.d.	0.50	n.d.	n.d.
Corn (whole kernel, yellow, boiled, raw)	167	59.2	3.3	1.2	35.7	104	0.09	0.08	0.9	5	10	1.2	0.75	3-15	0.02	127	15
Millet (cooked,	110	71.4	2.8	0.4	23.8	11	0.10	0.02	0.2	n.d.	142	2.42	0.9	0.9	0.2	44	62

Food	Gross energy	Water	Crude protein	Crude fat	CHO	β- Car	Vit. B_1	Vit B_2	Niacin	Vit C	Ca	Fe	Zn	Se	Cu	Mg	K
transformed from 88.6% DM)																	
Job's tear (seed, whole, transformed from 89.4%DM, cooked)	118	71.4	4.7	0.8	23.0	n.d.	0.11	0.03	0.7	5	6	1.55	n.d.	n.d.	n.d.	n.d.	n.d.
Sorghum (cooked, tranformed from 91.9% DM)	119	71.4	3.0	1.2	24.1	n.d.	0.09	0.03	1.3	nil	13	1.56	0.62	n.d.	0.13	n.d.	n.d.
STARCHY "FILLING" FOODS																	
ariad (steamed)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	16	0.20	0.40	n.d.	0.02	18.00	n.d.
patong (cheo)*	26	92.20	2.10	0.20	4.00	n.d.	n.d.	n.d.	n.d.	n.d.	20	0.10	0.60	n.d.	n.d.	29.00	n.d.
mak kabau (steamed)*	147	62.50	3.00	0.30	33.00	n.d.	0.08	< 0.01 (0.001)	n.d.	n.d.	25	0.90	0.90	n.d.	0.09	n.d.	n.d.
aleng (steamed)*	n.d.	n.d.	3.20	n.d.	n.d.	496.00	n.d.	n.d.	n.d.	1.00	20	1.10	1.10	n.d.	n.d.	21.00	321.00
Cassava leaves (steamed)*	56	85.8	4.3	0.3	9.2	555-8,280	0.13	0.22	1.3	100-295	49	1.00	0.90	n.d.	n.d.	n.d.	n.d.
tcheruak pirr ayul*	42	86.80	2.60	0.90	5.80	0	0.02	0.22	0.50	1.82	23	0.36	0.4	n.d.	0.02	32.00	n.d.
Banana (4 Thai types, ripe)	126	67.7	0.8-1.4	0.2	29.7	345	0.03	0.11	0.8-1.1	12	(6-16)	0.6	0.1	1	0.04-0.2	27	328
PULSES																	
Soybean (steamed, transformed from 90.7% DM, mean for boiled with 62% water	176	62.00	14.25	6.96	14.13	5.00	0.40	0.14	1.13	3.33	142.92	3.71	1.21	7.4	0.59	117	662.50

**Not detected

Source: Own compilation

Vegetables

Food	Gross energy	Water	Crude protein	Crude fat	CHO	β- Car	Vit B_1	Vit B_2	Niacin	Vit C	Ca	Fe	Zn
	kcal	g	g	g	g	µg	mg	mg	mg	mg	mg	mg	mg
GARDEN VEGETABLES													
phak falang*	n.d.	n.d.	2.10	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	112	3.80	0.50
Cucumber	23	93.9	0.8	0.1	4.6	52	0.040	0.050	0.3	12	20	0.40	0.20
Pumpkin (fruit, raw)	49	87.4	1.3	0.3	10.2	1,019	0.060	0.050	0.5	15	31	0.70	0.90
Pumpkin (leaves,raw)	32	91.2	2.6	0.3	4.7	1,289	0.070	0.140	0.9	21	51	3.50	0.20
Long beans (Phaseolus vulgaris, boiled)	37	88.4	2.9	0.1	8.1	66	0.100	0.110	0.9	19	55	0.70	0.30
Eggplant (pleun, Solanum torvum)	74	80.9	2.8	0.8	13.9	103	0.180	0.130	1.6	18	182	0.90	0.20
Eggplant (akeun, Solanum spp., raw)	27	92.9	1.0	0.1	5.5	0	0.060	0.090	0.5	4	15	0.40	0.20
Mustard green (Brassica spp.,cooked)	23	92.8	2.5	0.4	2.4	2,726	0.030	0.050	1.5	118	178	4.30	0.20
Bambooshoots (boiled)	20	94	1.5	0.5	3.5	0	0.020	0.030	0.1	0	16	0.00	0.70
Spong gourd (Luffa cylindrica, raw)	24	94	0.8	0.1	5.1	12	0.310	0.090	0.4	14	17	0.40	0.40
Bitter gourd (wild)	17	94	1.2	0.4	2.2	103	0.090	0.050	0.4	190	18	0.50	0.10
Bitter gourd leaves (raw)	79	76	5.8	0.3	13.3	4,820	0.130	0.260	1.2	110	126	3.00	n.d.
Banana (flower, bud, raw)	34	91	1.6	0.5	5.9	156	0.020	0.040	0.6	17	35	0.50	0.30
Rattanshoots (raw)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.0	0.030	n.d.	n.d.	85	n.d.	2.50
mak baep (adapted from garden peas)	47	88	3.0	0.1	9	71	0.11	0.12	1.2	48	43	0.9	0.60
CONDIMENTS													
Lemongrass	77	89.0	0.9	1.3	18.4	35	0.050	0.020	1.7	1	34	2.80	0.60
Garlic	51	86.6	2.1	0.1	10.4	18	0.200	0.100	2.1	4	25	0.70	1.20
Springonion	37	90.4	1.8	0.3	6.7	827	0.040	0.100	0.3	25	76	1.80	0.30
Galgant	49	87.8	0.9	0.5	10.2	8	1.000	0.130	0.1	6	14	1.20	0.60
Ginger	38	89.0	1.2	0.3	7.5	0	0.020	0.020	0.8	3	21	0.50	0.20
phak iku KDM (rare variety, raw)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	286	n.d.	4.80
Basil (Ocimum spp., raw)	45	87.0	3.1	0.3	7.4	4,107	0.080	0.470	1.0	22	179	5.15	0.65
Chilli (raw)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	4	n.d.	n.d.	1.00
Chilli (mean, red and green, raw)	65	84.0	2.5	1.5	10.0	4,681	0.110	0.070	1.8	138	12	1	0.4
FLOWERS													
Cassia flowers (raw)	102	73.8	4.2	0.5	20.0	n.d.	0.110	0.540	1.8	441	19	1.50	n.d.
Sesbania flowers (raw)	40	89.6	1.7	0.2	7.9	107	0.090	0.490	0.5	27	128	1.35	4.00
Squash flowers (raw)	15	94.8	1.3	1.3	2.8	104	0.050	0.080	0.8	27	88	3.10	n.d.

Food	Gross energy	Water	Crude protein	Crude fat	CHO	β- Car	Vit B_1	Vit B_2	Niacin	Vit C	Ca	Fe	Zn
MUSHROOMS													
Shiitake (Lentinus sp., dry)	333	13.2	16.0	1.0	64.9	n.d.	0.070	1.500	12.3	9	6	1.00	0.30
Blackwood ear (Auricularia plytricha, dry)	340	11.4	8.3	0.3	76.0	n.d.	0.070	0.620	2.8	2	223	20.10	5.70
Straw mushroom (Volvaria volvacea, calculated from 9.2%DM)	340	12.3	30.0	2.0	50.0	n.d.	0.900	3.200	64.0	90	60	10.00	3.00
FOREST VEGETABLES													
agnoy (raw)*	18.00	93.10	2.50	0.90	1.90	340	n.d.	n.d.	n.d.	10	71	1.90	n.d.
ala kawah (raw)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	19	121	0.50	n.d.
aneng (steamed)*	n.d.	n.d.	n.d.	n.d.	n.d.	593	n.d.	n.d.	n.d.	n.d.	121	2.30	0.70
ala krrtoy (raw)*	n.d.	n.d.	1.90	n.d.	n.d.	n.d.	0.070	0.040	n.d.	73	n.d.	0.80	n.d.
ala krrong (raw)*	n.d.	n.d.	9.50	n.d.	n.d.	2,096	n.d.	n.d.	n.d.	n.d.	23	2.50	n.d.
ala aruy (raw)*	n.d.	n.d.	4.30	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1.90	n.d.
ala tchirkatt (steamed)*	n.d.	n.d.	6.80	n.d.	n.d.	2,062	n.d.	n.d.	n.d.	n.d.	29	2.30	0.90
atogn (raw, steamed for β-Car)*	27.00	92.00	2.00	0.20	4.40	809	0.030	0.200	1.50	n.d.	34	2.60	0.60
Oak fern	19.00	93.70	1.70	0.40	2.20	n.d.	0.340	0.080	0.50	15	5		
ala katiang (raw)*	n.d.	n.d.	n.d.	n.d.	n.d.	639	n.d.	n.d.	n.d.	n.d.	253	0.70	0.50
phak kat som*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ala kaki (raw)*	n.d.	n.d.	3.40	n.d.	n.d.	392	n.d.	n.d.	n.d.	15	37	0.80	0.50
ala cherraeng*	n.d.	n.d.	1.60	n.d.	n.d.	467	n.d.	n.d.	n.d.	6	n.d.	n.d.	n.d.
ala pelang (Melientha suavis, raw)	50	83.3	1.9	0.1	10.3	3,713	0.020	0.190	1.3	1	35	7.20	n.d.
Pennywort (raw)	86	44.0	1.8	0.9	7.1	1,236	0.240	0.090	0.8	4	146	3.90	n.d.
Young mango leaves (raw)	54	82.1	3.9	0.2	12.1	187	0.060	0.090	1.5	27	19	2.80	n.d.
entarr (Cratoxylum formosum, raw)	81	81.0	2.4	1.2	15.1	2,045	0.090	0.310	1.0	17	51	1.70	n.d.
arok (Lasia spinosa, raw)	18	94.1	2.1	0.2	2.0	269	0.040	0.170	0.9	23	14	0.90	n.d.
Hog plum leaves (raw)	88	77.5	3.1	1.0	16.6	1,231	0.960	0.220	1.9	53	49	9.90	n.d.
phak kadon (raw)	81	76.5	2.9	0.4	19.0	946	0.07	0.26	0.9	13	6	1.90	n.d.
phak samek (raw)	67	82.7	2.5	0.3	13.6	562	0.03	0.33	1.1	9	31	1.10	n.d.
phak nam (raw)	18	94.1	2.1	0.2	2.0	269	0.04	0.17	0.9	23	14	0.90	n.d.
phak ileut (raw)	60	81.9	4.2	0.6	9.3	3,095	0.08	0.28	1.3	17	275	4.40	1.00
phak peo (raw)	57	84.1	3.6	0.4	9.7	3,718	0.11	0.32	1.6	11	191	5.60	n.d.
bay kilek (raw)	115	70.2	6.3	0.7	20.9	56	0.43	0.63	3.2	56	125	2.40	n.d.

Source: Own compilation

Fruits and oilseeds

Food	Gross energy	Water	Crude protein	Crude fat	CHO	β- Car	Vit. B_1	Vit. B_2	Niacin	Vit C	Ca	Fe	Zn
	kcal	g	g	g	g	µg	mg	mg	mg	mg	mg	mg	mg
FOREST FRUITS													
palaeh agnoaz (raw)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.60	0.40
mak kho (raw)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	41	n.d.	n.d.	n.d.
mak khay (raw)*	146.00	63.10	1.10	0.40	34.50	85.00	0.100	0.050	3.60	n.d.	33	0.50	0.10
palaeh kariang (here: cultivated, ad. from cherry)	27	93.1	0.6	0.0	6.2	4	0.760	0.030	0.3	24	5	0.2	0.1
Fig (here: cultivated, ripe)	54	85.8	1.5	0.3	11.3	7	0.010	0.920	0.0	2	56	0.9	0.1
Mangosteen (here: Garcinia spp.)	32	92.0	0.3	0.1	7.4	0	0.010	0.040	0.2	11	60	n.d.	0.1
Hogplum (here: cultivated)	48	86.3	0.8	0.0	11.1	98	0.060	0.020	0.4	70	20	1.2	3.4
Starfruit (here: cultivated)	37	90.0	0.4	0.1	8.7	19	0.020	0.170	0.8	28	9	0.9	0.1
Longan (here: culitvated)	76	80.5	1.2	0.1	17.5	52	0.020	0.060	0.9	52	6	0.3	0.2
Litchi (here: cultivated)	65	83.3	1.0	0.2	14.9	12	0.020	0.100	0.9	29	6	0.7	0.2
GARDEN FRUITS													
Pineapple (ripe)	61	84.4	0.4	0.1	14.7	16	0.090	0.040	0.3	12	14	0.4	0.1
Mango (4 Thai types, ripe)	80	79.6	0.9	0.2	18.8	897	0.080	0.320	1.2	25	24	0.3	0.1
Sugarcane	67	81.4	0.2	0.4	17.6	n.d.	0.010	0.020	0.0	2	8	1.3	n.d.
Papaya (ripe)	41	89.2	0.5	0.1	9.5	1,043	0.040	0.050	0.4	49	15	1.1	0.1
Melon (Cucumis melon)	24	93.7	0.6	0.1	5.1	1,285	0.030	0.020	0.8	34	15	0.5	0.1
Jackfruit (ripe)	108	72.6	1.7	0.5	24.1	136	0.080	0.090	0.8	7	24	0.6	0.4
OILSEEDS													
Groundnut (seeds, fresh)	530	11.4	29.7	38.7	15.6	18	1.400	0.140	2.2	8	50	10.4	n.d.
Sesame (seeds, roasted)	682	3.0	26.1	64.2	n.d.	0	0.830	1.540	5.0	0	771	17.5	7.2
Almond (roasted)	597	2.6	22.0	52.8	19.3	0	0.070	0.800	3.8	0	266	4.5	3.5
Pumpkin (seeds, roasted)	574	4.5	27.0	51.8	11.5	43	0.210	0.190	4.4	0	44	6.5	10.3
Jackfruit (seeds, boiled)	161	58.8	5.0	0.2	34.8	24	0.910	0.075	1.8	8	122	1.8	n.d.
Cucurbitaceae (seeds, roasted)	545	5.9	30.1	46.4	10.5	16	0.100	0.160	0.8	0	70	5.3	10.3

Source: Own compilation

Meat

Food	Energy	Crude P	Crude F	CHO	Vit A	Vit E	Vit B_1	Vit B_2	Vit B_6	Vit B_{12}	Folate	Ca	Fe	Zn	Se	Cu
	kcal	g	g	g	µg	mg	mg	mg	mg	µg	µg	mg	mg	mg	µg	mg
WILD MAMMALS																
Sambar Deer (cheo)*	231	45.2	6	0	0.0	n.d.	0.2	0.6	n.d.	n.d.	n.d.	2,240	24.1	3.3	12.9	0.3
Venison (haunch, roasted)	165	35.6	2.5	0	n.d.	n.d.	0.16	0.69	0.65	1	6	6	5.1	3.9	n.d.	0.36
Wild boar (roasted)	160	28.3	4.4	0	0.0	0.4	0.3	0.1	0.4	0.7	6	16	1.1	3	13	0.1
Serow (ad. from wild goat, roasted)	143	27.1	3	0	0.0	0.3	0.1	0.6	0	1.2	5	17	3.7	5.3	11.8	0.3
Bear (simmered)	259	32.4	13.4	0	0.0	0.5	0.1	0.8	0.3	2.5	6	4	10.7	10.3	11.2	0.1
Marten, otter, weasel (ad. from beaver)	212	34.8	7	0	0.0	0.5	0.1	0.3	0.5	8.3	11	22	10	2.3	43.1	0.2
Ferret badger (grilled with skin)*	454	13.9	35.9	[19]	0.0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Rat (*Viventer* spp., tcheruak)*	70	12.1	2	0.9	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	944	5.5	2.4	n.d.	n.d.
Squirrel (*Sciurus lis*)	116	26.3	0.4	0	n.d.	n.d.	0.07	0.21	n.d.	n.d.	n.d.	23	1.9	n.d.	n.d.	n.d.
AMPHIBIA, REPTILIA, OAAS																
Toad (2 sp., boiled)*	74.5	13.55	1.6	1.5	17.5	0.1	n.d.	n.d.	n.d.	n.d.	n.d.	1,319	4	2.9	n.d.	0.08
Frog (leg, meat, raw)	73	16.4	0.3	0	12	1	0.07	0.3	0.075	0.28	10.5	18	1.5	1	14.1	0.3
Tadpole (apugn nerr, braised)*	75	9.6	2.9	2.5	774.9	0.3	0.22	0.33	n.d.	n.d.	n.d.	488	22.2	1.3	n.d.	0.3
Lizard (akuy reuz, grilled)*	249	47.6	6.4	0.4	60.1	1.2	0.435	0.71	n.d.	n.d.	n.d.	2,756	8.5	4.5	1.2	0.14
Snake (Cobra, raw)	139	31.2	1.6	n.d.	n.d.	n.d.	0.01	0.14	n.d.	n.d.	n.d.	66	2.3	n.d.	n.d.	n.d.
Snake (Python, raw)	94	14.4	3.3	0.8	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Freshwater snails (2 sp., cooked)*	82	14.1	1.05	3.45	12	0.2	0.005	0.25	0.1	0.5	3.6	792	6.1	3	27.4	0.4
Freshwater crab (mean 3 sp.)*	67	11	1.7	1	9.1	1.25	0.01	0.51	n.d.	n.d.	n.d.	5,266	7.7	5.55	n.d.	2.49
Freshwater shrimp (mean 2 sp.)	90.5	18.55	1.2	0.2	68.1	68.1	0.02	0.07	0.1	0.1	0.1	100	2.65	1.6	39.6	0.2
Freshwater fish (mean 4 sp.)*	129	23.00	4.5	0.0	319	1.40	0.03	0.02	n.d.	n.d.	n.d.	1,327	10.70	6.13	n.d.	0.78
padek Katu (incl. bones)*	196	34.40	5.6	2.10	n.d.	n.d.	[0]	0.25	n.d.	n.d.	n.d.	3,752	4.30	5.30	n.d.	0.22
INSECTS																
papoll (braised)*	n.d.	8.80	0.70	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	26	n.d.	n.d.	n.d.	n.d.
zazed (braised)*	n.d.	10.30	1.00	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

Food	Energy	Crude P	Crude F	CHO	Vit A	Vit E	Vit B_1	Vit B_2	Vit B_6	Vit B_{12}	Folate	Ca	Fe	Zn	Se	Cu
WILD BIRDS																
Quail (raw)	154	21.1	7.7	0	490	0.85	0.05	0.27	n.d.	n.d.	n.d.	n.d.	1.5	n.d.	n.d.	n.d.
Patridge (meat, roasted)	212	36.7	7.2	0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	46	7.7	n.d.	n.d.	n.d.
Pigeon (meat, roasted)	187	29	7.9	0	n.d.	n.d.	0.27	1.17	0.82	8	8	32	7.2	1.7	n.d.	0.33
Sparrow (meat, bones)	125	19.4	4.6	0	12	n.d.	0.3	0.25	n.d.	n.d.	n.d.	470	n.d.	n.d.	n.d.	n.d.
Jungle Fowl (mean)	180.8	22.425	10.1	n.d.	n.d.	n.d.	0.135	0.18	n.d.	n.d.	n.d.	n.d.	2.25	n.d.	n.d.	n.d.
Pheasant (meat with bone, roasted)	114	14.5	6.2	0	n.d.	n.d.	0.01	0.15	0.3	1	10	15	1.1	0.7	20.7	0.05
DOMESTIC MEATS																
Chicken (soft bone with flesh)	261	21.50	14.90	10.10	38	n.d.	0.01	0.13	n.d.	n.d.	n.d.	575	2.00	2.80	n.d.	n.d.
Chicken (giblets)	113	18.40	4.20	0.40	4,800	n.d.	0.20	1.44	n.d.	n.d.	n.d.	9	5.10	0.61	n.d.	n.d.
Pork spare ribs	276	25.80	18.80	0.90	0.0	n.d.	0.39	0.35	n.d.	n.d.	n.d.	6	1.30	1.50	n.d.	0.10
Pork loin, (boiled)	204	33.00	7.90	0.10	0.0	n.d.	0.58	0.26	n.d.	n.d.	n.d.	10	1.50	1.30	n.d.	0.10
Pork shoulder (boiled)	284	35.90	14.00	3.60	0.0	n.d.	0.68	0.42	n.d.	n.d.	n.d.	8	1.40	1.50	n.d.	0.20
Beef (meat lean, boiled)	187	32	6	0	251	n.d.	0.16	0.24	n.d.	n.d.	n.d.	9	3	n.d.	n.d.	n.d.
Beef (meat lean, grilled)	190	39	3	0	206	n.d.	0.25	0.34	n.d.	n.d.	n.d.	9	5	n.d.	n.d.	n.d.
Beef (blood)	81	19.80	0.30	0.0	72	n.d.	0.0	0.03	n.d.	n.d.	n.d.	17	41.00	n.d.	n.d.	n.d.
Beef (kidney)	91	15.60	2.50	0.40	274	n.d.	0.30	1.58	n.d.	n.d.	n.d.	14	7.50	n.d.	n.d.	n.d.
Beef (heart)	122	14.40	5.80	1.00	14	n.d.	0.35	0.36	n.d.	n.d.	n.d.	7	4.80	n.d.	n.d.	n.d.
Beef (liver)	128	19.00	3.10	5.00	16,313	n.d.	0.32	1.68	n.d.	n.d.	n.d.	7	8.70	n.d.	n.d.	n.d.
Beef (lung)	61	11.80	1.20	0.0	51	n.d.	0.09	0.20	n.d.	n.d.	n.d.	10	5.00	n.d.	n.d.	n.d.
Beef (stomach)	30	7.40	0.0	0.20	n.d.	n.d.	0.0	0.0	n.d.	n.d.	n.d.	125	0.50	n.d.	n.d.	n.d.
Beef (intestine)	139	14.50	8.30	0.60	31	n.d.	0.20	0.20	n.d.	n.d.	n.d.	10	3.40	n.d.	n.d.	n.d.
Beef (heart)	122	14.40	5.80	1.00	42	n.d.	0.35	0.36	n.d.	n.d.	n.d.	7	4.80	n.d.	n.d.	n.d.

Source: Own compilation

APPENDIX 4

Example for RDA calculation (per age group and per number of people), here for NB-TM

Years	M* 19-50	W** 19-50	G/B*** 13-18	G/B 9-12	G/B 6-8	G/B 4-5	G/B 1-3	G/B <1, but >0.5	Total	per /cap
Kcal	36,400.0	33,750.0	1,7504.0	14,000.0	2,800.0	5,200.0	2,000.0	800.0	112,454	2,082.48
Protein	798.0	780.0	420.0	336.0	56.0	100.0	38.0	16.0	2,544	47.11
Ca	11,200.0	12,000.0	8,000.0	8,000.0	1,600.0	3,200.0	1,000.0	270.0	45,270	8,38.33
Fe	182.0	450.0	216.0	120.0	20.0	32.0	14.0	12.0	1,046	19.37
Cu	770.0	825.0	440.0	320.0	60.0	120.0	40.0	20.0	2,595	48.06
Vit B1	16.8	16.5	8.8	7.2	1.2	2.4	1.0	0.3	54	1.00
Vit B2	18.2	16.5	9.2	7.2	1.2	2.4	1.0	0.4	56	1.04
Vit C	1,260.0	1,125.0	610.4	360.0	80.0	160.0	80.0	35.0	3,710	68.71
Vit A	9,800.0	9,000.0	5,600.0	4,800.0	1,000.0	1,800.0	800.0	400.0	33,200	614.81

*M=men

**W=women

***G/B=girls and boys

Source: Own compilation

APPENDIX 5

5.1 Villagers' estimation of annual staple production (in tons), whole village

	Crop	1998	1999	2000	2001	2002	2003
NB-TM	Non-glutinous rice	n.d.	0.8	0.5	1	0.8	n.d.
	Glutinous rice	n.d.	30	38	40	36	n..d.
	Maize	n..d.	1	2	1	2	n..d.
	Cassava	n.d.	0.4	0.6	0.9	0.8	n..d.
	Taro	n..d.	0.8	1	0.7	1	n..d.
	Sweet potato	n..d.	2	0.5	0.2	0.1	n..d.
KDM	Non-glutinous rice	n..d.	n..d.	15	18	20	n..d.
	Glutinous rice	n..d.	n..d.	260	240	250	n..d.
	Maize	n..d.	n..d.	4	3	4	n..d.
	Cassava	n..d.	n..d.	3	5	7	n..d.
	Taro	n..d.	n..d.	0.6	0.8	1	n..d.
	Sweet potato	n..d.	n..d.	0.3	0.4	0.5	n..d.
TK	Non-glutinous rice	1	2	2	1	n..d.	n..d.
	Glutinous rice	6	8	10	5	n..d.	n..d.
	Maize	1	0.5	0.75	1	n..d.	n..d.
	Cassava	1.5	3	1.5	1	n..d.	n..d.
	Taro	1	1	1	1	n..d.	n..d.
	Sweet potato	0.5	0.5	1	1.5	n..d.	n..d.
TD	Non-glutinous rice	1	n..d.	2	3	2	1
	Glutinous rice	8	n..d.	11	21	20	29
	Maize	n.d.	n..d.	1	1.5	2	1
	Cassava	n.d	n..d.	20	20	25	30
	Taro	n.d.	n..d.	0.15	0.2	0.25	0.5
	Sweet potato	n.d.	n.d.	0.05	0.1	0.2	0.5

Source: Own compilation

5.2 Ranking of wildlife groups for taste

NB-TM (n=10)	KDM (n=10)	TD (n=10)	TK (n=10)	Ban Pom* (n=10)
Fish	Deer, muntjac	Fish	Fish	Fish
Deer, muntjac	Fish	Deer, muntjac	Bird	Wild boar
Bird	Bird	Pangolin	Porcupine	Birds
Wild boar	Squirrel, rat	Porcupine	Wild boar	Deer, muntjac
Squirrel, rat	Porcupine	Wild boar	Frog, lizard, toad	Frog, lizard, toad
Pangolin	Pangolin	Birds	Turtle	Squirrel, rat
Frog, lizard, toad	Bear, serow	Turtle	Pangolin	Langur, macaque, gibbon
Civet	Langur, macaque, gibbon	Frog, lizard, toad	Deer, muntjac	Linsang
Porcupine	Civet	Squirrel, rat	Langur, macaque, gibbon	Porcupine
Flying squirrel, bat	Linsang	Langur, macaque, gibbon	Squirrel	Turtle
Insect	Frog, lizard, toad	Bear, serow	Bear, serow	Flying squirrel, bat
Langur, macaque, gibbon	Turtle	Linsang	Civet	Pangolin
Turtle	Flying squirrel, bat	Flying squirrel, bat	Crab, snail, shrimp, etc	Big cat
Bear, serow	Insect	Civet	Flying squirrel, bat	Civet
Crabs, snails, shrimp, etc	Big cat	Big cat	Big cat	Bear, serow
Linsang	Crab, snail, shrimp, etc	Crab, snail, shrimp, etc	Insects	Crab, snail, shrimp, etc
Big cats		Insects	Linsang	Insects

* Upper Kaleum

Source: Own compilation

5.3 Estimate of annual consumption of rat species

Rat species	TD	TK
abuat ajay, a. songdong	20 f/y	10 f/y
abuat ajoy	3 f/y	3 f/y
abuat aklok, a. aplok	20-30 f/y	2-3 f/y
abuat ansomm	30 f/y	7 f/y
abuat chong arid	5 f/y	n.d.
abuat dep	n.d.	1-2 f/y
abuat kandaeh!	20 f/y	n.d.
abuat kokong	10 f/y	n.d.
abuat kayung soy	20-30 f/y	5 f/y
abuat laluat	20 f/y	5 f/y
abuat paruz	5 f/y	7-8 f/y
abuat pong	10 f/y	n.e.
abuat raromm	10 f/y	3 f/y
abuat tong achi (2 species)	20 f/y	3/f
abuat wawarr	5 f/y	1 f/y

Source: Own compilation

5.4 Estimated annual per capita consumption of selected birds in TD (as mean of 2000-2002)

English	Weight (g)	Per number
Great hornbill	1429.60	0.74
Red Jungle Fowl	1003.27	1.63
Whimbrel	897.06	2.45
Darter	469.44	0.41
Pheasants (all species)	785.60	0.97
Heron	403.59	0.41
Pigeon	300.00	2.45
Owl	295.34	0.41
Eagle, kite, buzzard, hawk	183.65	0.49
Starling	175.37	2.45
Hoopoe	150.00	2.45
Egret	147.06	0.25
Nightjar	123.53	1.63
Grey Headed Lapwing	108.53	0.74
Parrot	83.46	0.41
Barbet	73.20	0.57
Large billed Crow	71.90	0.16
Cuckoo	61.55	0.41
Partridge and buttonquail	49.47	1.06
Spiderhunter	48.81	2.45
Woodpecker	39.80	0.33
Long-tailed Sibia	30.15	0.41
Sultan Tit	29.12	0.90
Myna	27.79	0.25
Oriole	27.57	0.41
Trongo	27.48	0.41
Laughingtrush	27.21	0.41
Iora, leafbird	25.74	0.57
Flycatcher	21.10	0.57
Blue Whistling Thrush	19.85	0.16
Beeeater	17.95	0.41
Asian Paradise Flycatcher	15.07	0.41
Flycatcher	15.07	0.41
Broadbill, pitta	12.32	0.16
Stork	11.32	0.01
Bunting	8.98	0.41
Babbler	7.74	0.25
Wagtail	6.99	0.41
Swift, swallo	5.00	0.33
Finch	4.96	0.41
[9]	4.90	4.90
Minivet	4.41	0.41
Bulbul	3.40	0.16
Duck	2.64	0.01
Sunbird	2.33	0.41
White-eyes	1.91	0.19

Source: Own compilation

APPENDIX 6

Article 18: List of Restricted Wild and Aquatic Life Species (List I)

No.	Lao name	English name	Scientific name
		Mammals	
1.	*He NO Diao (kasoo)*	Lesser One-Horned Rhinoceros	*Rhinoceros sondaicus*
2.	*He songno*	Asian Two-Horned Rhinoceros	*Dicerohinus sumatresis*
3.	*Ngau Ba*	Kouprey	*Bos sauveli*
4.	*Sang*	Asian elephant	*Elephas maximus*
5.	*Khuay pa*	Wild water buffalo	*Bulablus arnee*
6.	*Ngua pa*	Banteng	*Bos javanicus*
7.	*Muey – Kathing*	Gaur	*Bos gaurus*
8.	*Muay*	Sunbear	*Ursus malayanus*
9.	*Mee khuay*	Asiatic black bear	*Ursus thibetanus*
10.	*Mee deng*	Red panda	*Ailurus fulgens*
11.	*Sua khong*	Tiger	*Panthera tigris*
12.	*Suadao*	Leopard	*Panthera pardus*
13.	*Suatakoot*	Clouded leopard	*Pardofelis marmorata*
14.	*Sua fa*	Asian golden cat	*Catopuma temmincki*
15.	*Sua meolay hin on*	Marble cat	*Felis marmorat*
16.	*La Ong/Mang*	Eld-deer	*Cervus eldii*
17.	*Say (Kuang say)*	Hog deer	*Axis porcinus*
18.	*Nyuang pha*	Longtailed goral	*Naemorhedus caudatus*
19.	*Nyuang*	Southern serow	*Naemorhedus sumatrensis*
20.	*Moo nguang*	Asian tapir	*Tapirus indivus*
21.	*Khadeng*	Redshanked douc langur	*Pygathrix nemaeus*
22.	*Thanee khen khao*	Whitehanded gibbon	*Hylobates lar*
23.	*Thanee phom chook*	Pileated gibbon	*Hylobates pileated*
24.	*Thanee kem dam*	Blackcheeked grested gibbon	*Hylobates concolor*
25.	*Thanee kem khao*	Whitecheeked grested gibbon	*Hylobates leucogenys*
26.	*Khong*	Francol langur	*Presbytis cristatus*
27.	*Khang*	Silvered langur	*Presbytis cristatus*
28.	*Kuang dao*	Spotted deer	*Cervus Nippon*
29.	*Saola*	Saola	*Pseudoryx nghetinhensis*

30.	*Fan khao nyay*	Large antlered muntjac	*Munidacus vuquangensis*
31.	*Banglua*	Giant flying squirrel	*Petaurista spp.*
32.	*Naknam khonlieb*	Smooth coated otter	*Lutrogole perspicillata*
33.	*Naknam lepsan*	Oriental small clawed otter	*Aonyx cinerea*
34.	*Pakha*	Irrawady dolphin	*Orcaella Brevirotris*
		Reptiles	
35.	*Khe*	Siamese crocodile	*Crocodylus siamensis*
36	*Taokham*	Chinese three striped box turtle	*Cuora trifasciata*
	Ngoo chong ang	Kong cobra	*Phiophgus Hannah*
38.	*Ngoo lam*	Rock python	*Python molurus molurus*
39.	*Ngoo luam*	Reticulated python	*Python reticulates*
		Birds	
40.	*Nok nyung*	Green peafowl	*Pavo muticus*
41.	*Nok kokkham*	Great hornbill	*Bucerus bicornis*
42.	*Nok kok kho kham*	Rufous necked hornbill	*Aceros nipalensis*
43.	*Nok kokka*	Wreathed hornbill	*Rhyticeros undulatus*
44.	*Heng khokham*	White backed vulture	*Gyps bengalensis*
45.	*Heng huadeng*	Redheaded vulture	*Saycogyps calvus*
46.	*Nok Voovao/ Nyung thong*	Crested argus	*Rheinardia ocellata*
47.	*Nok Petka pikkhao*	Whitewinged duck	*Cairina scutulata*
48.	*Nok khien*	Sarus crane	*Grus antigone*
49.	*Nok kabbua*	Painted stork	*Ibis leucocephala*
50.	*Nok Oomlua*	Giant ibis	*Pseudibis gigantean*
51.	*Kay khualuang*	Silver pheasant	*Lophura nycthemera*
52.	*Kai khuanin*	Siamese fireback	*Lophura diardi*
53.	*Nok kasa khokhao*	Woollynecked stork	*Ciconia episcopus*
54.	*Nok kasumseng*	Greater adjutant	*Lepttolos dubius*
55.	*Nok khokan*	White ibis	*Threskiornis melanoceppharus*
56.	*Nok khiti*	Brown wood owl	*Strix leptogrammica*
		Fish	
57.	*Palai fayfa*		*Anguilla marmorata*

Article 19: Managed Wild and Aquatic Life Species (List II)

No.	Lao name	English name	Scientific name
		Mammals	
1.	*Lin*	Pangolin	*Manis javanicus*
2.	*Machok*	Jackal	*Canis aureus*
3.	*Kay*	Lesser mouse deer	*Tragulus javanicus*
4.	*Men*	Porcupine	*Hystrix brachyura*
5.	*Fan dong*	Giant muntjack	*Megamuntiacus vuqangensis*
6.	*Kuang*	Sambar deer	*Cervus unicolor*
7.	*Ling*	Monkeys	*Macaca spp.*
		Reptiles	
8.	*Hie*	Water monitor	*Varanus salvator*
9.	*Katang*		*Calotes spp.*
10.	*Tao ngap dam*	Asian box turtle	*Cuora emboiensis*
11.	*Tao Ngap Pheung*	Indochinese box turtle	*Cuora galbinifrons*
12.	*Tao kuy/poulou/len*	Bid headed turtle	*Platysternon megacephalum*
13.	*Tao vay*	Giant Asian pond turtle	*Heoseys grandis*
14.	*Tao kon*	Yellow headed temple	*Hiereys annandalii*
15.	*Tao samsan*	Malayan snail eating turtle	*Malayemys subtrijuga*
16.	*Tao samlien kong*	Keeled box turtle	*Pyxidea mouhotii*
17.	*Tao Huasita*	Four-eyed turtle	*Sacalia quadriocellata*
18.	*Tao phek*	Elonmgated tortoise	*Indotestudo elongate*
19.	*Tai Pheung, duay*	Impressed tortoise	*Manauria impressa*
20.	*Pa fa*	Soft shell tortoise	*Amyda spp.*
21.	*Ngoo hao*	Monocled cobra	*Naja kaouthia*
		Fish	
22.	*Pa kueng*		*Mystus microphtalmus*
23.	*Pa fa lay*		*Amphostistius laosensis*
		Birds	
24.	*Nok keng*	Oriental pied hornbill	*Anthracoceros albirostris*
25.	*Nok keng si namtan*	Brown hornbill	*Ptilolaemus tickelli*
26.	*Nok salika*	Hill myna	*Gracula religiosa*
27.	*Nok kho ngoo*	Oriental darter	*Anhinga melanogaster*
28.	*Nok kangkod*	Grey peacock pheasant	*Polyplectron bicalcaratum*
29.	*Nok Khek tao*	Red breasted parakeet	*Prittacula spp.*
30.	*Nok huakhuan/salay*	Woodpecker	*Picus spp.*
31.	*Nok keo*	Parakeets	*Psittacula spp.*

32.	*Nok petlay*	Garganey	*Anas querquedula*
33.	*Nok khaotoo*	Spotted pecked dove	*Strepalia tranmquebarica*
34.	*Nok kasa deng*	Purple heron	*Ardea purpurea*
35.	*Nok khao*	Owls	*Glaucidium spp.*
36.	*Nok tebte*	Reawattled lapwing	*Vanellus indicus*
37.	*Leo*	Imperial eagle	*Aquilla heliaca*