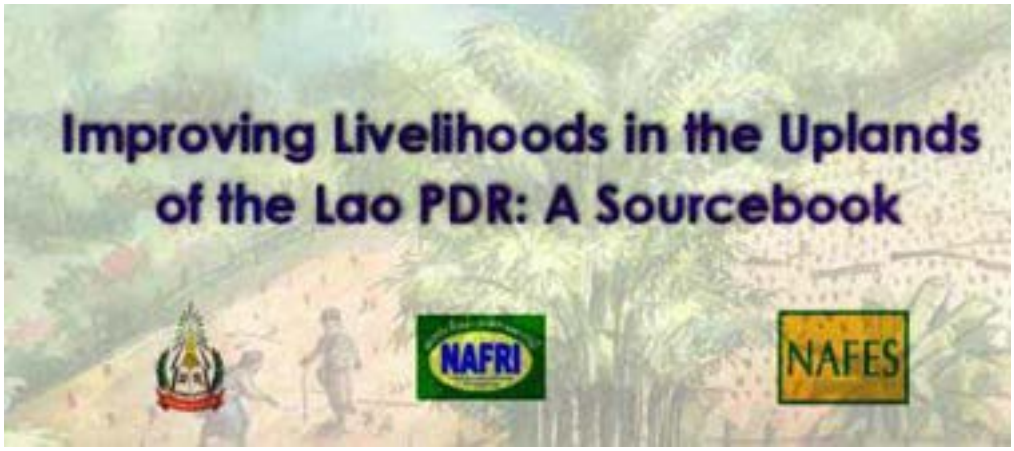

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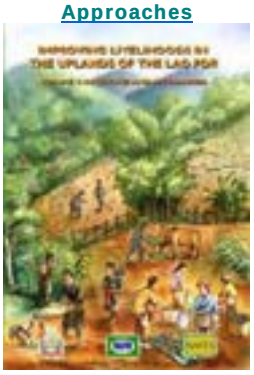
Volume 1: Initiatives and Approaches



Volume 2: Options and Opportunities

If you would like a copy of the publication or would like more more information contact: info@nafri.org.la

Foreword

The Government of the Lao PDR is determined to eradicate extreme poverty and move beyond the category of Least Developed Country by the year 2020. To achieve this, the Government has adopted the National Growth and Poverty Eradication Strategy (NGPES) as a comprehensive framework for all its development and poverty eradication programmes.

Much of the NGPES is focused on Lao upland communities where poverty and environmental problems are most acute. The NGPES places renewed emphasis on decentralization and participatory approaches to development. This has two major implications. First, it means redefining central-local government relations. Government services are to focus on supporting local efforts and be demand-driven so as to develop a menu of production options in concert with market signals. Second, community-based participation is viewed as a catalyst for diversifying and modernizing the agriculture sector. For participation and bottom-up planning to be effective, a long-term commitment is needed to building capacity at the local level.

NAFRI, NAFES and NUOL have joined hands to produce this sourcebook on "Improving Livelihoods in the Uplands of the Lao PDR" as a means to help facilitate the flow of information between and among those working in the uplands. The sourcebook is meant to be a compendium of best practices and lessons learned in upland resource management. The sourcebook aims to provide fieldworkers and program managers with a range of options to consider when planning activities, rather than step-by-step guidelines or instructions.

Because of the overwhelming interest and the amount of information available, the sourcebook is split into two volumes. The first volume provides the reader with a broad understanding of upland resource management policies, practices and issues. It includes the following chapters: (1) Policy Framework and Issues, (2) Understanding Shifting Cultivation and Upland Livelihoods, (3) Food Security, (4) Land Use and Management Strategies, (5) Marketing, and (6) Approaches. The second volume provides a range of more specific technical options for agriculture, livestock, fisheries and forestry. The chapters include: (1) Annual and Perennial Cropping Systems, (2) Livestock and Fisheries, and (3) Forest and Natural Resources Management.

NAFRI, NAFES and NUOL envision that the sourcebook will not be an end unto itself but rather the first step to develop joint materials and information that can be widely disseminated and used by different actors throughout Lao PDR. To this end, readers are encouraged to provide feedback on this document and suggest ways it can be made more relevant and appropriate in subsequent editions. This English version of the sourcebook will soon be followed by a Lao language edition.

It is hoped that these two volumes will be of special reference to field workers, decision-makers, project staff, provincial and district staff, educators or any other persons interested in upland resource management. Readers are also encouraged to directly contact the original authors or our three organizations whenever more information is needed. It is also expected that the sourcebook will be useful to others in the Asia region working in similar contexts.

This sourcebook is truly a collaborative effort and we would like to extend our gratitude and appreciation to all those who contributed to its development. We are extremely grateful to the financial support provided by the Swedish International Development Cooperation Agency (Sida), the Swiss Agency for Development Cooperation (SDC) , and the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). In addition, we would like to thank all the individuals and organisations which contributed articles to the sourcebook.

Using these two volumes as a starting point, we encourage all organizations and individual working in the uplands to come together to find joint solutions to the complex problems facing the uplands. For it is only through collaboration and cooperation that participation is able to blossom.

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NUOL

Dr. Bounthong Bouahom
Director General
NAFRI

Mr. Annonth Khamhung
Director General
NAFES

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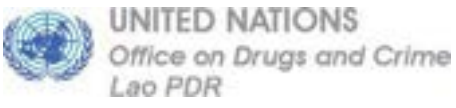


Introduction

The Lao uplands represent an area of key development interest to both the Government of Lao PDR and most international donor agencies. Marginalised by remoteness, inaccessibility and language barriers, upland farmers have the highest poverty and lowest quality of life indicators in the country. Cash income is very low in most upland areas and for many households the main problem is still to achieve basic food security.

The stabilisation of shifting cultivation is a key programme of the Lao government. The aim is to sedentarise villages and gradually modify, diversify and intensify agriculture production to ensure its long term sustainability under growing population pressure. To this end the government recognizes two types of shifting cultivation: rotational shifting cultivation and pioneering shifting cultivation. The government's priority is to halt pioneering shifting cultivation or the uncontrolled clearance of primary and new forest areas. This does not apply to productive secondary forests that are part of rotational shifting cultivation-NTFP production systems in permanent villages where land has been adequately allocated.

Defining Shifting Cultivation

Shifting cultivation is often defined as any agricultural system in which the fields are cleared by fire and cultivated for shorter periods than they are fallowed. It is also considered as a resource management strategy in which fields are shifted in order to exploit the energy and nutrient capital of the natural vegetation-soil complex of the future site.

Shifting cultivation is also called by various names. It is known as "*hai*" in Lao, "slash-and-burn agriculture" or "swidden cultivation", "swiddening" in English, and "*essartage*", "*agriculture itinérante*", "*défriche-brûlis*" or "*abattis-brûlis*" in French.

What is shifting cultivation?

Shifting cultivation is a complex agricultural system that, under certain conditions, is well-adapted to the environmental limitations of the tropics. It is not primitive or necessarily destructive. It requires in-depth knowledge of the tropical environment and a high degree of managerial skills to succeed. Although shifting cultivation was widely practised in a sustainable manner in the past it is generally recognised that in many places, it no longer can be practised in a sustainable manner without appropriate modifications (or "stabilisation"). This is mainly due to an increasing population pressure resulting in lower land availability and shortening fallow periods.

Where adequate fallow length occurs, it results in ecosystem maintenance. While the highest incidence of poverty are found in the uplands, it is also an area of immense biological and social diversity. The largest number of upland rice gene stock is found in the uplands of Lao PDR, only behind India and different aged fallows provide opportunities for a wide range of non-timber forest products to flourish.

Decreasing fallow periods result in decreasing system nutrient stocks, degrading soils, and decreasing biological diversity. This in turn affects living conditions and nutritional quality.

The Lao shifting cultivation systems are not static and are evolving. Upland farmers are responsive to market opportunities and are also very much influenced by government policies. Besides crop production (for which rice is still the most important crop), Lao shifting cultivators are also involved in other important activities such as animal husbandry, fishing, hunting, collection of NTFPs, as well as off-farm labour. Most Lao shifting cultivators are, in fact, no longer subsistence farmers but directly or indirectly connected to the market economy.

Why a sourcebook?

The complexities of working in shifting cultivating communities with their ethnic, cultural, tenure and biophysical realities, make upland resource management a rather challenging task. The "one solution fits all" approach to extension does not work under the diverse environmental, economic and cultural conditions found in the uplands. The development of this sourcebook offered an opportunity to bring together the learning gained by different projects and programs working in the uplands, and most importantly to provide field level staff with a range of tools, options and approaches to draw upon.

The sourcebook format was chosen for a couple of reasons. First, there were already a number of materials that could be easily repackaged, especially in light of the upland workshop. A sourcebook also provides a vehicle by which this information can be more broadly disseminated. The sourcebook does not contain information from a single source or organization, but rather a wide range of experiences that have been tested in different conditions and settings throughout the country.

Each article 'stands alone' and the book does not have to be read from front to back. Scientific concepts and complex processes are simplified and articles are richly illustrated, shortened and focused to draw attention to the essential messages.

Finally, the sourcebook provided a good opportunity to improve research-extension-education linkages. Research papers and reports generally do not adequately meet the needs of extensionists, who require a different sort of information. With its focus on collaboration, the sourcebook offers one way to share information between and among different organizations which normally find it difficult to do so otherwise.

What is the sourcebook and who is the target group?

The sourcebook is meant to be a compendium of best practices, lessons learned, and experiences gained by those working in the uplands. It is intended to provide field workers (provincial and district level staff) with practical, easy to understand ways to solve problems facing upland development. The compilation can serve as a rich source of ideas and reference materials for trainers. It might also be useful to educators, policy makers, local officials and administrators. While the articles within the sourcebook can be further adapted to create community-based materials, the sourcebook as such is not meant for direct use with farmers or community groups.

A sourcebook is not an extension manual or a set of guidelines. It is meant to offer menu of choices whereas an extension manual provides step-by-step instructions and focuses more on technologies and field techniques. The sourcebook is meant to be a source of ideas and options to consider when planning programs and activities.

How was this sourcebook developed?

In January 2004, NAFRI held a workshop in Luangprabang on shifting cultivation stabilisation and poverty eradication. Attended by more than 300 people, the workshop demonstrated that projects working in the uplands have gained a wealth of knowledge and experience. During the workshop, one working group explored ways in which these experiences and lessons could be shared and disseminated more widely. A key recommendation of this group was then to develop a "sourcebook" focused on shifting cultivation stabilisation, poverty eradication and sustainable resource management.

An English version was proposed since many experiences have been written up in English but not translated into Lao. By shortening articles and simplifying the language, it would be much easier to eventually translate into Lao and it might have a better chance to be read than long scientific papers.

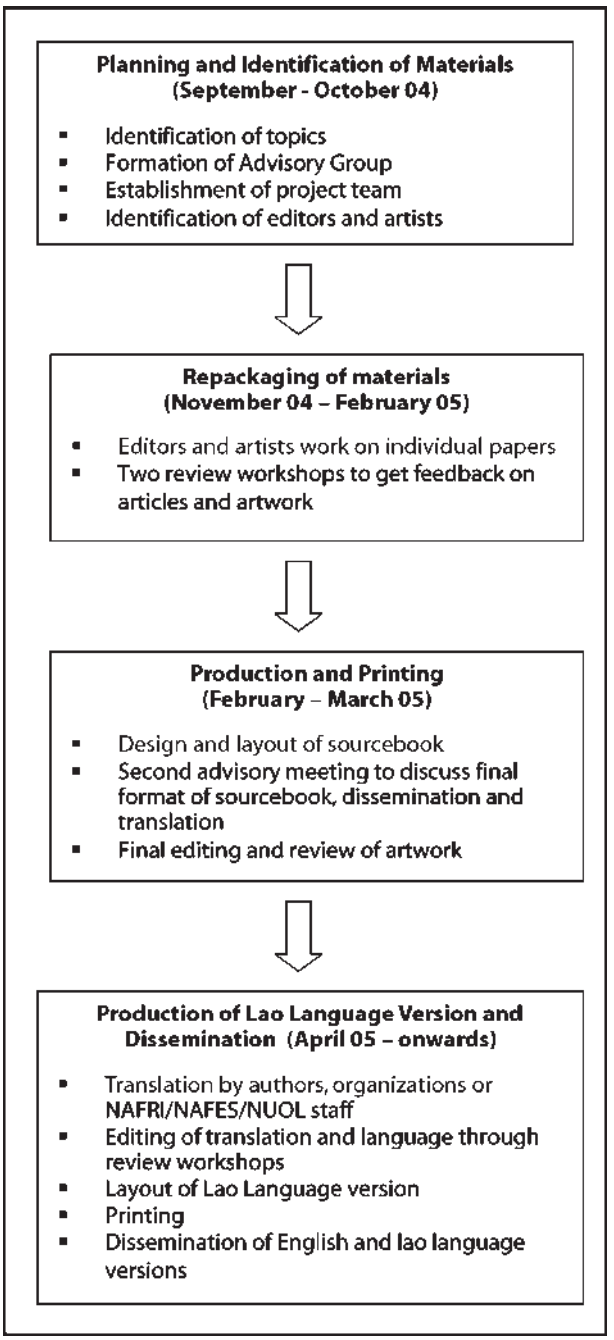
While it was decided at the workshop that NAFRI would take the lead, it was also recommended that the sourcebook be developed in partnership with other agencies. In addition, two major considerations needed to be taken into account: capacity building and participation.

Capacity building was important because nothing of this kind had been done in Laos before. It is hoped that those who have been involved will adapt the process to develop other types of materials in the future. Participation was important so as to ensure that the sourcebook encompassed a wide range of topics and issues. In addition this book should not be seen as an end unto itself but rather as the first step of NAFRI, NUOL and NAFES to develop materials jointly.

Development of the sourcebook began in earnest in September 2004. During the planning stage, an advisory committee was formed comprised of staff from NAFRI, NAFES and NUOL as well as key support projects. In addition, a project management team was formed within NAFRI to oversee the process throughout. Potential articles were identified from three broad sources:

1. Papers from the 2004 uplands workshop
2. Previously produced reports, publications and materials.
3. New articles on identified gaps or where experiences had not been written up.

Once articles had been identified, artists and editors were asked to repackage them. In a repackaged article, original articles are shortened and a clear focus provided. Language is simplified and complex concepts are broken down into easy to understand steps. It was also decided to tap the pool of talented young Lao artists to help illustrate each article. Artwork is a key part of the sourcebook as the illustrations bring the concepts and key messages to life and make the publication user-friendly.



Staff from NAFRI, NAFES and NUOL were asked to review and provide feedback on the draft articles at two review workshops. The objectives of the review workshops were to provide an opportunity for staff from key organizations to comment and critique draft articles and ensure feedback from a range of disciplines. The review process also allowed staff to critically review articles outside their normal area of

expertise. Some of these staff are also expected to assist with the Lao language production process and in the promotion of the publication.

With the English language version of the sourcebook finalized, activities will focus on production of the Lao language version and widespread dissemination. In order for the sourcebook to reach its intended audience, the adaptation and translation into the Lao version will be an important step. A process has been proposed whereby articles are first translated and then review workshops held to test out and get feedback on the translated articles. It is expected that the Lao language version of the sourcebook will be available in October 2005. For more information regarding the Lao version please contact NAFRI.

Dissemination and use of the sourcebook

Dissemination will be broad and go beyond conventional means of sending out the materials through mail. It is expected that key organizations will receive multiple copies and that eventually posters and other promotional materials could be developed. In addition, it is hoped to link up with other organizations to further dissemination and use. All articles as well as selected artwork can also be found on the NAFRI website (www.nafri.org.la).

Readers are encouraged to select a range of articles and produce smaller booklets. Articles could be used as training handouts and posters or as reference materials. For example, they could be recast and the main points used to develop locally appropriate posters or used in a farm-radio broadcast. They could also be used in higher secondary schools and agriculture and forestry colleges. Indeed, it is hoped that the Lao language version will be readily available to all students and faculties at the agriculture and forestry colleges. Newsletters and newspapers could also serialize the sourcebook materials.

Revisions, adaptations and further translations of these are welcome and encouraged. There is intentionally no copyright and the book has been designed and formatted to ensure easy photocopy and reuse of articles. If articles are reused or adapted, please acknowledge the authors and publishers. In addition, NAFRI is interested to learn how the sourcebook has been used and would be grateful for any comments and feedback so as to improve subsequent editions.

Commonly Used Acronyms

AD	Alternative Development
ACF	Action Contre la Faim
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AEZO	Agriculture Extension Zone Offices
AFD	French Agency for Development
ARC	Agriculture Research Centre (NAFRI)
CBNRM	Community-based natural resource management
CD	Community development
CETDU	Central Extension and Training Development Unit (NAFES)
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Centre for Tropical Agriculture
CIRAD	French Agriculture Research Centre for International Development
CPC	Committee for Planning and Cooperation
DAFEO	District Agriculture and Forestry Extension Office (formerly DAFO)
DAFO	District Agriculture and Forestry Office
DDV	District Development Volunteer
DED	German Development Service
DMC	Direct Mulch-based Cropping
ETU	Extension and Training Unit
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFEM	French Global Environmental Facility
FFS	Farmer Field Schools
FIPD	Forestry Inventory and Planning Division (Department of Forestry)
FLSP	Forages and Livestock Systems Project (CIAT)
FRC	Forest Research Centre (NAFRI)
FoF	Faculty of Forestry (National University of Laos)
FoS	Faculty of Sciences (National University of Laos)
FSP	Forages for Smallholders Project
FSR/E	Farming Systems Research/Extension
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GMS	Greater Mekong Subregion
GoL	Government of the Lao PDR
GTZ	German Technical Cooperation
HH(S)	Household(s)
HRC	Horticulture Research Centre (NAFRI)
ICRAF	International Centre for Research in Agroforestry (World Agroforesty Centre)
IFAD	International Fund for Agricultural Development
IMSPD	Information Manatgement and Strategic Planning Division (NAFRI)

IPM	Integrated Pest Management
IRR	Internal rate of return
IRRI	International Rice Research Institute
IUARP	Integrated Upland Agriculture Research Project (NAFRI)
IUCN	The World Conservation Union
IWM	Integrated Watershed Management
IWMI	International Water Management Institute
KBS	Knowledge-Based System
LA	Land Allocation
Lao PDR	The Lao People's Democratic Republic
Lao-IRRI	Lao-IRRI Rice Research Programme (NAFRI)
LARReC	Living Aquatic Resources Research Centre (NAFRI)
LCDC	Lao National Commission for Drug Control and Supervision
LCNJ	Lions Club of Nagoya Johoku (Japan)
LDC	Least Developed Countries
LEAP	Laos Extension for Agriculture Project (NAFES)
LECS	Lao Expenditure and Consumption Survey
LEK	Local Ecological Knowledge
LFAP	Land and forest allocation programme
LRP	Lao Revolutionary Party
LSUAFRP	Lao Swedish Upland Agriculture and Forestry Research Programme (NAFRI)
LTSP	The Lao Tree Seed Project (NAFRI)
LUP	Land Use Planning
MAE	French Ministry of Foreign Affairs
MAF	Ministry of Agriculture and Forestry
MMSEA	Montane Mainland Southeast Asia
MRC	Mekong River Commission
MSEC	Managing Soil Erosion Consortium (IWMI)
NAEP	National Agro-Ecological Program (NAFRI)
NAFES	National Agriculture and Forestry Extension Service
NAFReC	Northern Agriculture and Forestry Research Centre (NAFRI)
NAFRI	National Agriculture and Forestry Research Institute
NCAW	National Commission for the Advancement of Women
NERI	National Economic Research Institute
NGO	Non-Governmental Organization
NGPES	National Growth and Poverty Eradication Strategy (previously called NPEP)
NPA	National Protected Area
NPEP	National Programme for the Eradication of Poverty
NPV	Net present value
NTFP	Non-Timber Forest Product
NUOL	National University of Lao PDR
PAFEC	Provincial Agriculture and Forestry Extension Centre (formerly PAFES)
PAFES	Provincial Agriculture and Forestry Extension Service
PAFO	Provincial Agriculture and Forestry Office

PDDP	Rural Development Project of Phongsaly District
PLLUP	Participatory Landscape Land Use Planning
PLUP	Participatory Land Use Planning
PM&E	Participatory monitoring and evaluation
PRA	Participatory Rural Appraisal
PVS	Participatory Variety Selection
RDMA	Rural Development in Mountainous Areas Programme (GTZ)
RDP	Rural Development Project
SADU	Small-Scale Agro-Enterprise Development in the Uplands (CIAT)
SALT	Sloping Agricultural Land Technology
SCSPP	Shifting Cultivation Stabilisation Project
SDC	Swiss Agency for Development and Cooperation
SEP-Dev	Sekong Ethnic People's Development Program
Sida	Swedish International Development Cooperation Agency
Sida/SAREC	Sida/Department for Research Cooperation
SLU	Swedish University of Agricultural Sciences
SPFS	Special Programme for Food Security (FAO)
TLUC	Temporary Land Use Certificates
UADC	Upland Agriculture and Development Centre
UNODC	United Nations Office on Drugs and Crine
UNDP	United Nations Development Programme
UNGASS	United Nations General Assembly Special Session
UXO	Unexploded Ordnance
VA	Village Authority
VDC	Village Development Committee
VDP	Village Development Project
VES	Village Extension System
VEW	Village Extension Worker
V-FORCAP	Village-based Forest Conservation and Afforestation Project
WCS	Wildlife Conservation Society
WFP	World Food Programme (UN)
WWF	World Wildlife Fund

Please note that English spelling used for all Lao provinces and districts comes from: State Planning Committee. 2001. Basic Statistics of Lao PDR, 1975 - 2000. National Statistics Centre. Vientiane, Lao PDR

Glossary of Relevant Terms

This glossary contains definitions for a selected number of terms used in the articles of the sourcebook. The glossary includes broader concepts and terms which can be easily misunderstood. It should not be considered as a comprehensive glossary for upland resource management. Whenever possible, examples have been added to help clarify the definitions.

Action research: dynamic research that follows an ongoing cycle of understanding a situation, identifying the problems/opportunities, developing solutions, planning, implementing, reviewing and reflecting, understanding the situation… *Example: the farming systems research conducted at NAFRI belongs to a category of "action research".*

Agrarian system: an historically constituted mode of exploitation of the environment, durably adapted to the bioclimatic conditions of a given area and corresponding to social conditions and needs at that moment (Mazoyer, 1985). *Example: the cash-crop oriented agrarian system of southern Sayaboury that has been evolving through growing links with the Thai agro-processing industry.*

Agricultural production system: this is the whole structured set of plants, animals and other productions or activities selected by a farmer for his production unit to realize his objectives. *Example: the agricultural production system of farmers on the Boloven plateau that is based on coffee production combined with some domestic animals and some food crops.*

Agro-ecosystem: an ecological system partly modified by man to produce food, fiber, and/or other agricultural products. It is an agricultural-socio-economic-ecological system (Conway et al. 1987). *Example: the swidden agroecosystem of Ban Semoun, a village of Sepone district in Savannakhet province.*

Agro-ecosystem analysis (AEA): AEA is a methodology for zoning and analysing agricultural systems in order to plan and prioritise research and development activities in the fields of agriculture and natural resource management. It uses a holistic or systems approach to gather bio-physical and socio-economic information and to identify key issues or problems within the ecosystem that will be useful for rural development, extension and research programs.

Agro-enterprise development approach: it is an approach that links small farmers to expanding markets so they can develop sustainable livelihoods in the rural sector. The emphasis is on helping producers and traders identify strengths and weaknesses in the market chains in which they are involved.

Animal husbandry system (or "livestock system"): techniques and practices applied by a community in a given space, for the exploitation of plant resources by animals, in conditions that are compatible with the community's objectives and adapted to the constraints of its environment. *Example: the animal husbandry systems of most upland villages are characterised by a combination of managing small and large livestock (poultry, pigs, cattle and buffalo).*

Applied research: applied agricultural research aims to solve farmers' problem by taking existing technologies coming from "basic research" and tailoring them to defined groups of farmers in defined areas. *Example: introducing and testing improved rice varieties from abroad in farmer's fields of Northern Laos.*

Basic research: explores new frontiers of science, and develops new theories and research methodologies. Its major objective is to improve the scientific understanding of subject matter areas rather than develop techniques to solve practical problems. *Example: the study of the evolution of cattle races in Asia.*

Biodiversity: the total diversity of plants and animals living in the same area. *Example: in agricultural landscapes of Laos, biodiversity is generally higher in the more traditional upland areas than in the more modern lowland areas.*

Bio-physical: related to both biological and physical features (often used as opposed to socio-economic features). *Example: the bio-physical elements influencing agricultural production comprise both biotic (living) and abiotic (non-living) factors.*

Business Development Services (BDS): BDSs are small businesses, which enhance the effectiveness of a market chain by assisting other businesses operate and improve their efficiency.

Capacity building: the term capacity is defined as the ability of individuals and organizations to perform functions effectively, efficiently and in a sustainable manner. Capacity building and capacity development are often used as synonyms. Capacity development is the process by which individuals, groups, organisations and institutions strengthen their ability to carry out their functions and achieve desired results over time. It is a process of improving the ability of organisations and sytems to perform their assigned tasks in an effective, efficient and sustainable manner. It involves strengthening the capabilities of individuals, organisations and linkages among them.

Community Based Tourism (CBT): is tourism that takes environmental, social and cultural sustainability in account. It is managed and owned by the community, for the community, with the purpose of enabling visitors to increase their awareness and learn about community and local ways of life.

Cropping system: this is a sub-system of the whole Agricultural Production System, defined for a given cultivated area and treated homogeneously with regard to the crops and their successions, and the itineraries of techniques. *Example: upland rice-based cropping systems are the most common cropping systems observed throughout the Lao uplands.*

Cultural practices: elementary action of an itinerary of techniques. Action of farmers on the environment and/or on crops in a process of plant production. *Example: weeding is often considered as the most time-consuming cultural practice in the itinerary of techniques of swidden farmers.*

Diagnosis: investigation or analysis of the cause or nature of a condition, situation or problem. *Example: an agronomic diagnosis can be conducted in an upland rice field by digging several cultural profiles and relating all field observations to bio-physical factors, farmer's cultural practices and the scientific concepts of the rice yield components in order to reconstitute the specific history of that rice crop and diagnose its possible problems.*

Ecosystem: the communities of plants and animals (including humans) living in a given area and their physical and chemical environment (e.g. air, water, soil), including the interactions between them and with their environment. It is a system which includes all the organisms of an area and the environment in which they live. *Example: Vientiane wetlands are examples of lowland ecosystems that have been shaped by humans.*

Entrusting (livestock): 'entrusting animals' (or 'confiage animal' in French) is a form of livestock revolving fund during which a female cattle or buffalo is successively entrusted to different poor families of the same village, under certain conditions and for a certain period in order to increase animal production through birth. When the cow delivers a calf, the family entrusted with the cow can keep the calf but must transfer the mother cow to another family, and so on.

Ethnoscience: ethnoscience or cognitive anthropology is used in the context of understanding farmers. It is the study of people's perception of their surroundings as reflected in their use of language. It is also an organised examination of thought across culture, modeled after the principles of linguistics, specifically, phonetic analysis. *Examples: ethnoscientific studies have been successfully used throughout the world in ethnobotany, ethnopedology, ethnoforestry, ethnoveterinary medicine and ethnoecology.*

Experiential learning: learning related to or derived from experience.

Extension: agricultural extension is a process for which the primary goal is to assist farming families in adapting their production and marketing strategies to rapidly changing social, political and economic conditions so they can, in the long term, shape their lives according to their personal preferences and those of the community. The task of extension is, thus, to improve interactions among actors involved in agricultural knowledge so that farmers have optimum access to any information that could help them enhance their economic and social situation.

Fallow period: in a shifting cultivation cycle, it is the duration during which a field is left to plant regrowth, from harvesting to replanting. *Example: in traditional shifting cultivation, a fallow period of ten years generally results in better yields for rice than a fallow period of only three years.*

Farming system: farming is defined as the practice of cultivating the land or raising stock. A system is a set of elements contained within a boundary such that they have strong functional relationships with each other. A farming system is thus an agricultural system composed of various sub-systems and various categories of farming systems could be defined according to the relative importance of each sub-system.

Focus groups: People who share particular sets of interests or have common characteristics, i.e. single mothers, dry rice farmers. Groups of people are convened to discuss topics or answer questions prepared by researcher.

Food security: the concept of producing enough food for the whole household to live healthily, whatever the weather or situation. Food security could be studied at different levels (household, village, district, province and national levels).

Gender: refers to social attributes that are learned when growing up as a member of a community. *Example: in remote villages, boys and men often learn how to hunt for the family while girls and women often learn how to prepare meals for the family.*

Group meetings: Village meetings which allow all types of people in an area to come together to collectively discuss ideas.

Household: is a group of people who live and eat together and typically engage in joint economic actitivity. This group is usually based on kinship and in Laos is normally comprised fo the nuclear or stem family. Nuclear family is father, mother and children. In Laos, stem family = nuclear family + surviving members of the grandparental generation. Other household groupings are rare.

Indigenous knowledge: is the local kowledge that is unique to a given culture or society. It contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis fo local-level decision making in agriculture, health care, food preparation, education, natural resource management, and a host of other actitivities in rural communities. *Example: the indigenous knowledge that many lowland Lao farmers already have in traditional irrigated rice production techniques has been an asset for the expansion and modernisation of irrigated rice production in Lao PDR during the last decades.*

Integrated fruit tree systems: a fruit-tree based cropping system where fruit culture is well integrated into a broader agricultural production system. *Example: some upland farmers of Luang Prabang province have integrated fruit tree cultivation into their production system for income generation.*

Integrated Pest Management (IPM): IPM is an ecosystem-based management strategy used in plant protection that focuses on long-term prevention of pests and their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant cultivars. In IPM pesticides are used only when needed as determined by established guidelines.

Itinerary of techniques: in agronomy, it is a logical and well-ordered succession of techniques (or "cultural practices") performed on one plot for a given crop. *Example: the itinerary of techniques of a swidden farmer consists of a succession of cultural practices (cutting, burning, sowing, weeding, etc.) performed to produce upland rice and associated crops in his/her field.*

Intercropping: growing two or more crops in the same field at the same time in a mixture (Also known as "mixed cropping" or "multiple cropping", as opposed to "monocropping" where only one crop is grown). *Example: intercropping upland rice with various other crops (maize, cassava, chillies, watermelon, sesame, etc.) is widely practiced tn the Lao uplands. The possibility of intercropping is an advantage of upland rice compared to irrigated rice.*

Land allocation: a process that provides land tenure entitlements to families. Land allocation is generally performed towards the end of land use planning and land use zoning processes.

Land-use plan: a "Land Use Plan" could be defined as a spatial arrangement of land uses and a proposed course of government action to influence land use. It is also defined as a collection of policies and maps that serve as a community's blueprint for growth. In general terms, it is also defined as the official statement of a legislative body which sets forth its major policies concerning desirable physical development.

Land-use planning: an activity generally conducted by a local government, which provides public and private land-use recommendations consistent with community policies and is generally used to guide decisions on zoning. It is also considered as a systematic attempt to minimise the adverse effects land changes have on society and environments and to maximise human benefits. Alternate definition: the systematic assessment of land and water potential, alternative patterns of land use and other physical, social and economic conditions, for the purpose of selecting and adapting land-use options which are most beneficial to land users without degrading the resources or the environment, together with the selection of measures most likely to encourage such land uses. Land-use planning may be at international, national, district (project, catchment) or local (village) levels. It includes participation by land users, planners and decision-makers and covers educational, legal, fiscal and financial measures.

Land-Use Planning/Land Allocation (LUP/LA): consists of the entire process of land use planning and land allocation.

Land-use zoning: in Laos, during a LUP/LA process, it is an activity that serves to delineate forest and agricultural land use categories that contribute to a satisfactory village livelihood system, while offering potential for retaining current forest cover levels.

Livelihood: can simply be defined as the way people make a living. A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities both now and in the future, while not undermining the natural resource base.

Livelihood approaches: research and development approaches based on the concept of livelihood. *Example: the Sustainable Livelihood Approach (SLA) used by some donor agencies.*

Local Ecological Knowledge: is the knowledge based on local peoples' ideas and beliefs and traditional knowledge of their environment.

Lodging: falling over of a plant because of a) wind or b) too heavy or c) too much nitrogen. *Example: tall traditional lowland rice varieties are often subject to lodging (and thus falling down in the field), if given too much nitrogen. On the contrary, improved short-stemmed rice varieties are more resistant to lodging even when high doses of nitrogen are applied.*

Microfinance: The term microfinance refers to the provision of a broad range of financial services (savings and credit) to poor and low-income households and their microenterprises. These financial services may generally include deposits, loans,

payment services and insurance. Microfinance services are provided by three type of sources: formal institutions, such as rural banks and cooperatives; semiformal institutions, such as nongovernment organisations; and informal sources such as money lenders and shopkeepers. Institutional microfinance is defined to include microfinance services provided by both formal and semiformal institutions. Microfinance institutions are defined as institutions whose major business is the provision of microfinance services.

Migration: with specific reference to rural or village migration, it is defined as the movement of people from one settlement to another. Migrations could be temporary (seasonal) or permanent. *Examples: some young rural people prefer to migrate to urban centres after completing their studies. In Lao PDR, several highland villages have permanently moved down to the lowlands.*

Monoculture: system of cultivation where only one crop is grown on the same piece of land over a period of years. Also known as "monocropping". *Example: rainfed lowland rice is grown as a monoculture.*

National Protected Area (NPA): NPA is the more modern term for the 'National Biodiversity Conservation Areas' (NBCAs) designated by the Lao government. The government has announced that they prefer the English translation to be NPA. *Example: the Phou Den Dinh, located in Phongsaly province, is the nothernmost NPA of Lao PDR.*

Nematodes: also known as eelworms, tiny thread-like worms; some live in the soil and can damage plant roots.

Non-Timber Forest Product (NTFP): the term NTFP encompasses all biological materials other than timber which are extracted from forests for human use (edible plants, non-edible plants, medicinal plants, edible animal products and non-edible animal products). The term Non-Wood Forest Product (NWFP) is also sometimes used. *Examples: wild cardamom, wild paper mulberry, broom grass, orchids, mushrooms, bamboo shoots, bamboo rats are among the many NTFPs found throughout the Lao uplands.*

Over-harvesting: taking more of a product than is sustainable. *Example: in the Lao PDR, some species of large birds such as the Green Peafowl that were common in the past are now only found in small numbers because they have been over-harvested for many years following widespread hunting practices.*

Participatory development: involving people in diagnosing their situation and problems, planning and deciding courses of action, implementing agreed upon tasks, monitoring, evaluation and sharing the benefits as well as responsibilities of joint action.

Participatory methods: allow stakeholders to interact and build a kind of partnership which allows better understanding of the important elements, dynamics, problems and opportunities of local communities.

Participatory Rural Appraisal (PRA): is a practical research and planning approach that supports decentralised planning and democratic decision-making. A PRA values social diversity, community participation and empowerment. The main objective of PRA is to improve a target communities' understanding of their own situation and environment. This sets the stage for participatory planning for conservation and development activities.

Pioneering shifting cultivation: a form of shifting cultivation that involves the periodic movement of a group or village into a new forest area (often a primary forest area).

Poverty: in the Lao PDR, according to Prime Ministerial Instruction No 10 on poverty reduction, poverty has been defined as "the lack to fulfil basic human needs such as: not having enough food (i.e. less than 2,100 calories per day/capita), lack of adequate clothing, not having permanent housing, not capable of meeting expenses for health care, not capable of meeting educational expenses for one's self and other family members, and lack of access to transport routes".

Production forestry: a category of forest used for production of various commodities, for example timber.

Rotational cropping: repeated cultivation of a succession of crops (also known as "crop rotations"), possibly in combination with fallow, on the same field. *Example (of Southern Xayabury): growing upland rice in year 1, followed by maize in year 2 and then groundnut in year 3.*

Rotational shifting cultivation: a form of shifting cultivation that involves a sedentary village which rotates the cultivation of its fields.

Savannisation: conversion of a swidden field into a savanna due to the invasion of invasive grasses that drive out other species.

Semi-structured interview: a relatively flexible type of interview used during field surveys. The interviewer uses a checklist of topics and questions but, depending on the interviewee, not everyone will be asked the same question.

Shifting agriculture: see "shifting cultivation".

Shifting cultivation: a form of agriculture in which soil fertility is maintained by rotating fields rather than crops. A piece of land is cropped until the soil shows signs of exhaustion or is overrun by weeds, when the land is left to regenerate naturally while cultivation is done elsewhere. Also known as swidden agriculture and slash-and-burn cultivation.

Shifting cultivation stabilisation: term referring to the Lao government programme to reduce and control shifting cultivation. The aim is to sedentarize villages, gradually modify and intensify agriculture production to ensure its long-term sustainability under growing population pressure. To this end the Lao government recognizes two types of shifting cultivation: rotational and pioneering shifting cultivation. The government's priority is to halt pioneering shifting cultivation or the uncontrolled clearance of primary and new forest areas. This does not apply to productive secondary forest that are part of rotational shifting cultivation-NTFP production systems in permanent villages where land has been officially allocated.

Slash-and-burn cultivation: see 'shifting cultivation'.

Sustainable: that can continue or be continued for a long time. Also, involving the use of natural products and energy in a way that does not harm the environment.

Sustainable development: development that meets the needs of the people today without compromising the ability of future generations to meet their own needs. Development involves a progressive transformation of economy and society. Sustainable development is also defined as maintaining a delicate balance between the human need to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend.

Swidden agriculture: see 'shifting cultivation'.

Swidden cultivation: see 'shifting cultivation'.

Swidden or swidden field: a field under shifting cultivation.

System: a set of elements contained within a boundary such that they have strong functional relationships with each other. *Examples: a farming system, a cropping system, an agroecosytem.*

Terrestrial: living on or found on the ground. Example: the wild boar is a terrestrial animal species.

Transect: a straight line placed on the ground along which ecological measurements are taken. *Example: when studying a village agro-ecosystem a "transect walk" could be performed by an observer along an imaginary line passing through the entire length of that village territory. Various landscape units would then be identified, described and illustrated in a sketch diagram (often called the "transect") that would help understand the various land-use units found in that village territory.*

Transect walks: a combination of interview and observation as researchers walk through an area with their interviewee and ask about what is seen.

The glossary was compiled by Dirk Van Gansberghe with contributions from Sophie Nilsson, Margarita Fernandez, Aiden Glendinning, Mark Dubois and David Clayton.

Improving Livelihoods in the Uplands of the Lao PDR: A Sourcebook

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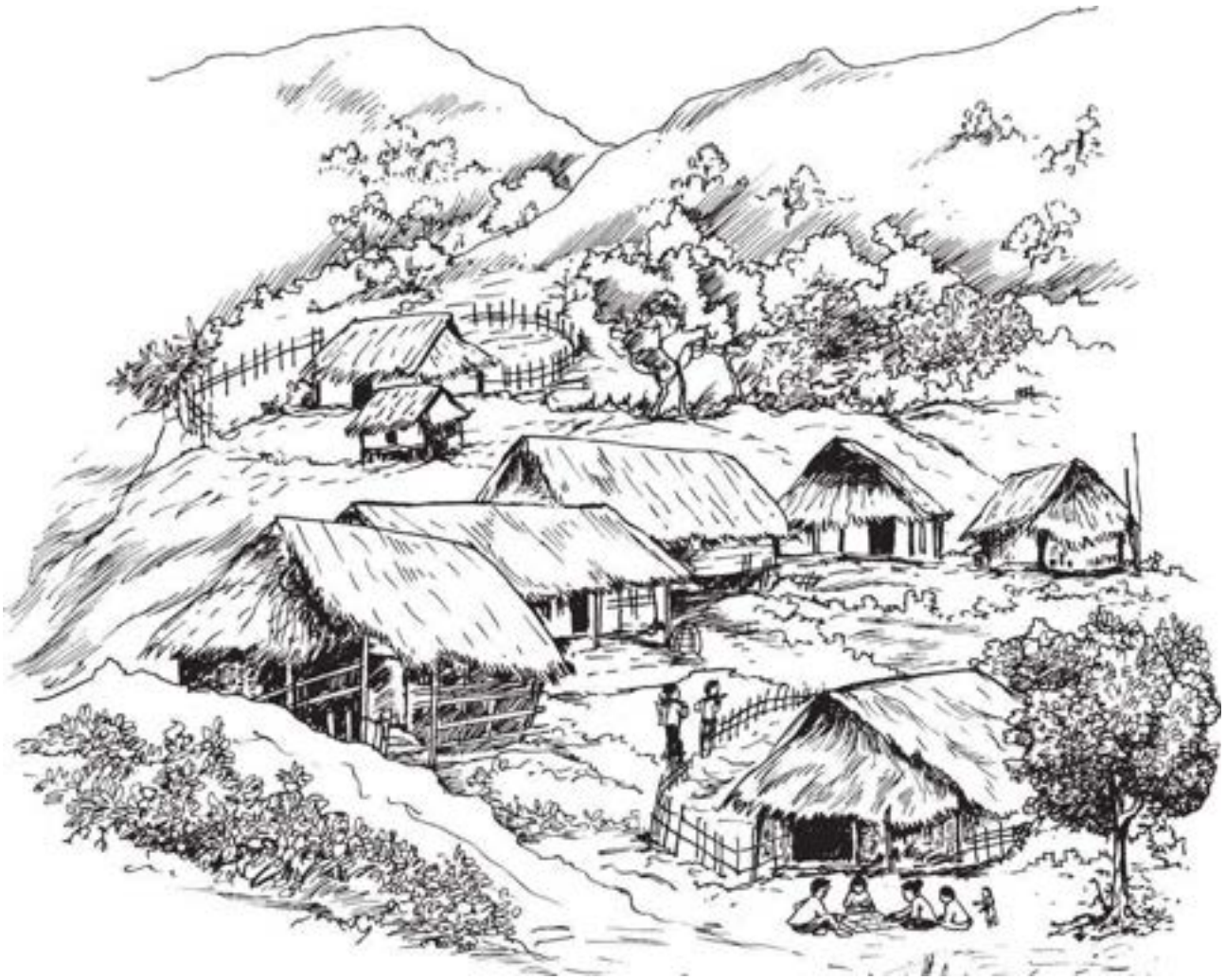
Agriculture and Forestry in the National Growth and Poverty Eradication Strategy



The National Growth and Poverty Eradication Strategy (NGPES) is the strategic framework under which all of the government's future growth and poverty eradication programmes will be developed and implemented. The NGPES is a holistic and comprehensive framework for tackling poverty and achieving the government's goal of leaving behind Least Developed Country status by the year 2020. The NGPES has a dual objective: (1) to enhance growth and development, and (2) to reduce poverty, with a particular focus on poverty alleviation in 47 poor districts.

The agriculture and forestry sector provides the economic, social and cultural base for more than 80% of the population and accounts for more than 50% of GDP, making it one of the key components of the NGPES.

Identifying poverty at different levels

Criteria have been developed to assist local authorities in monitoring changes in poverty, especially in poor households and districts, and to help district and provincial authorities better understand the poverty situation at grassroots level.

Prime Ministerial Instruction No. 10 on poverty reduction states that poverty can be defined as "the lack of ability to fulfil basic human needs, such as not having enough food (i.e. less than 2,100 calories per day/capita), lack of adequate clothing, not having permanent housing, not capable of meeting expenses for health care, not capable of meeting educational expenses for one's self and other family members, and lack of access to transport routes".

There are two poverty lines: 1) the food poverty line and 2) an overall poverty line. These are equivalent in the first instance to a lack of food security, and in the second to lacking a combination of food and non-food necessities.

These officially used criteria are divided into three levels, as follows:

1. **Household level**: rural households considered poor have an income of less than 82,000 Kip (100,000 kip for urban households) per person per month (at 2001 prices). This sum allows about 16 kg of milled rice per person per month; the balance is insufficient to cover other necessities, such as clothing, shelter, schooling and medical costs.

2. **Village level**: villages considered poor are those:

- Where at least 51% of households are poor.
- Without nearby and accessible schools.
- Without dispensaries or traditional medical practitioners, or over six hours of travel away from a hospital.
- Without safe water supply.
- Without access to roads (at least trails accessible by cart during the dry season).

3. **District level**: Poor districts are those:

- Where over 51% of the villages are poor.
- Where over 40% of villages do not have local or nearby schools.
- Where over 40% of villages do not have a dispensary or pharmacy.
- Where over 60% of villages have no access road.
- Where over 40% of villages do not have safe water.

The 7th Party Congress (2001) established guidelines for poverty eradication and sustainable economic growth in the Lao PDR:

- The socio-economic development of the country must be balanced between economic growth, socio-cultural development and environmental preservation. These are the three pillars of Lao development policy.

- Socio-economic development must be harmoniously distributed between sectoral and regional development, and between urban and rural development, so as to fully and efficiently utilise human and natural resources.
- Socio-economic development must be based on sound macro economic management and institutional strengthening in order to enhance national solidarity and cohesiveness and to promote democracy within society.
- The national development potential and strengths must be combined with regional and global opportunities in order to enable the Lao PDR to participate in regional and international economic integration.
- Socio-economic development must be closely linked with national security and stability.

Objectives of the NGPES

- To sustain economic growth with equity at an average rate of about 7%, considered as the necessary rate for tripling per-capita income of the multi-ethnic Lao population by 2020.
- To halve poverty levels by 2005 and eradicate mass poverty by 2010.
- To eliminate opium production by 2006 and phase-out shifting cultivation by 2010.

Operational framework of the NGPES		
Four main pro-poor sectors for public efforts and expenditures	**Supporting sectors (or potential growth sectors)**	**Cross-sector priorities**
1. Agriculture and Forestry 2. Education 3. Health 4. Infrastructure (especially roads)	• Emerging industrial development through energy and rural electrification, agro-forestry, tourism, mining and construction material industries. • Trade and financial services are also considered important for poverty eradication.	1. Environment 2. Gender 3. Information and culture 4. Population and social security Capacity building is a crosscutting issue.
Three poverty-related national programmes • the National Drug Control Programme • the Unexploded Ordnance (UXO) Decontamination Programme • the National Action Plan for HIV/AIDS/STD		

Rural development and the NGPES

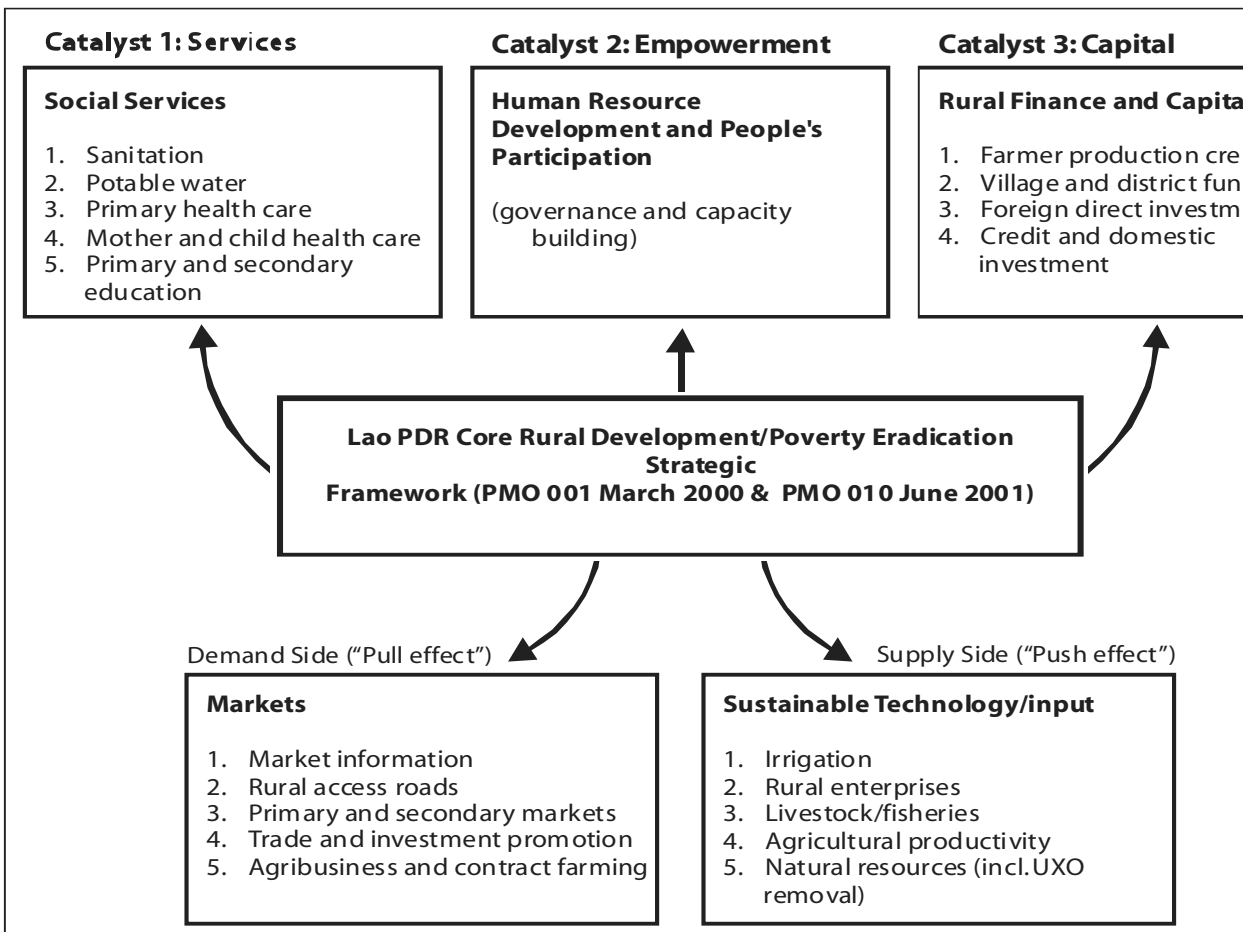
Rural poverty is of prime concern and a community-based approach to its eradication is considered essential. The government's rural development strategy has two major components:

(1) Improving access to factors essential for development.

(2) Strengthening a comprehensive, poverty-focused planning process at the district level to ensure all initiatives are mutually supportive and coordinated.

Improving access to factors for development means access to production inputs, markets, human resources, social services and rural finance. These five categories include a wide range of factors, including rural infrastructure, technology, education and health services and natural resource management. Market information, market linkages and trade facilitation and other factors are needed to help the transition from subsistence to commercial farming and from overwhelming dependence on agriculture to a more diversified economy

Figure 1: Rural poverty eradication - strategic approach



A particular challenge is the development of alternatives to pioneering shifting cultivation: hence the need to support initiatives for diversification into livestock, horticulture and cash crops. Forestry, agro-forestry and NTFPs also offer alternatives. Poor households in rural areas must first and foremost secure their food supply. Planning must start with this basic reality.

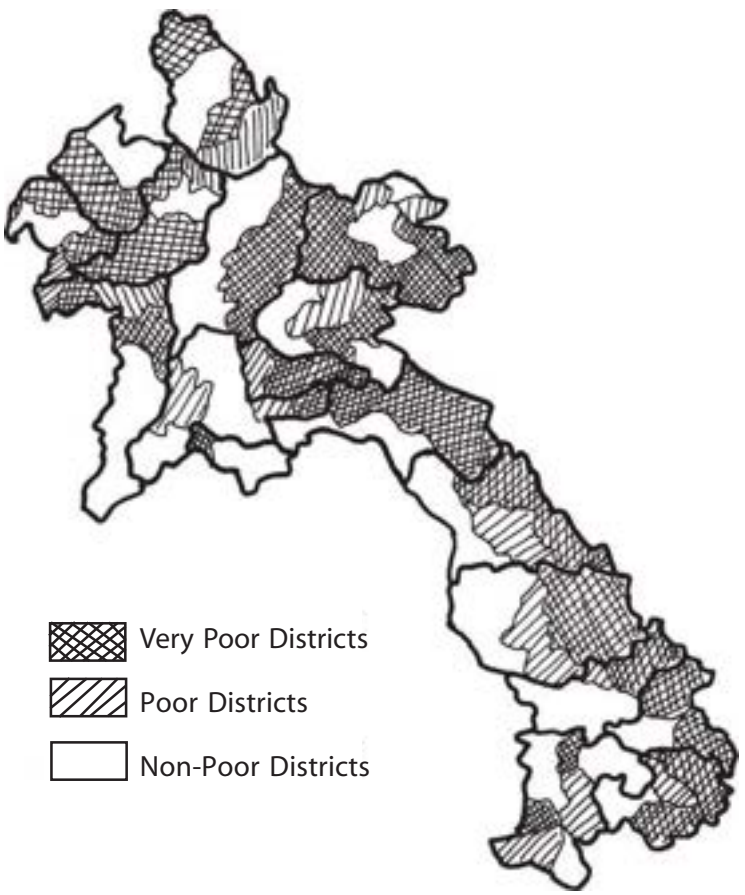
(see Fig. 1). All factors must be mutually supportive. Thus, the NGPES places a great emphasis on enabling the rural poor to attack their own poverty.

Capacity building at the district and village level is urgently needed. Improved skills are required in determining land use and watershed management, in social/environmental impact analysis and in mitigation regarding rural and other developments. Complementarity in all undertakings at the district level is necessary, including for the elimination of poppy cultivation and UXO.

Geographical focus of the NGPES

The NPGES identified 72 poor districts, the poorest 47 of which will receive priority investments during 2003-2005. To channel support to these districts the NGPES promotes local District Development Funds, which provide communities with public resources: forty billion Kip was earmarked by the national government as part of the domestic contribution to the Public Investment Programme for 2003-2004. Within this group, 18 districts (one per province) were selected for priority targeting in 2004-2005. For each of these districts, a District Development Fund of approximately 500 million Kip will be established.

Figure 2: The 72 districts identified as poor



Role and importance of the agriculture and forestry sector in poverty reduction

Most of the poorest Lao are upland farmers belonging to ethnic groups and living in diverse socio-economic and agro-ecological settings. The agriculture and forestry sector is important to national economic growth and due to its close linkage with food production, the sector has a long history in alleviating poverty for Lao people.

- From 1976 to 2000, the role of the agriculture and forestry sector in poverty reduction was characterised by a dramatic increase in wetland rice production. This success occurred mainly in the lowlands, while poverty in isolated upland areas remained unsolved.

- From 2000 onwards, the agriculture and forestry sector worked from a strategic vision and master plan. MAF was reorganised to better deliver services at the local level and NAFRI, NAFES, and the Department of Planning and Inspection were all established.

Agriculture and forestry policy priorities

Market orientation

Market principles are to be combined with community-based initiatives to facilitate the transformation from subsistence to commercial farming. Farmers are being helped to diversify into cash crops, horticulture, livestock, fisheries and NTFPs.

Development objectives of the agriculture and forestry sector for 2020 are designed to contribute to the overarching goal of poverty alleviation:

- Ensure food security for all Lao people
- Maintain a growth rate in agricultural output of 4-5 per cent annually
- Promote commodity production, especially for export
- Stabilise shifting cultivation and eradicate poppy cultivation
- Diversify and modernise the agriculture and forestry sector
- Maintain a healthy and productive forest cover as an integral part of the rural livelihood system, and generate a sustainable stream of forest products
- Improve rural livelihoods.

Participation and human resource development

Community-based participation is the catalyst for diversifying and modernising the agricultural sector. It is fundamental to the area-focused development approach that forms the core of the strategic plan for the sector. For participation to be effective, a long-term commitment is needed to build capacity at the local level.

Decentralisation

The government is redefining central-local government relations: "the provinces as the strategic units, the districts as the planning and fiscal units, and the villages as the implementation units". Responsibilities at each level are being reviewed to develop a fully integrated system that is highly responsive to local needs and opportunities.

Development goals of the agriculture and forestry sector

A strategy has been prepared by MAF for the uplands and lowlands. Its key elements are summarised below.

Sloping/Uplands	Lowlands/Mekong Corridor
Plan land-use zoning based on biophysical (slope and land capability) and socio-economic parameters	Improve and diversify farming systems with increased and intensified cash crop, livestock and fisheries production
Accelerate participatory land allocation and land use occupancy entitlement	Expand and intensify value added processing by promoting local and foreign investment
Diversify farming systems and agro-forestry development through adaptive research, trials and demonstrations of farmers' fields	Develop market research and information systems and regional market links between producers and wholesale and retail buyers throughout the region
Promote community management of natural resources	Develop internationally accepted product grades and standards
Sustainable land use management with soil erosion control, afforestation, plantation forestry and conservation management	
Strengthen demand driven extension programs	
Expand and intensify small-scale community managed irrigation schemes	Rehabilitate, expand and intensify irrigation schemes with community based management
Develop and expand rural savings and credit systems: target credit to support technology adoption by the poor	Strengthen and expand rural credit facilities through free competition and market determined interest rates
Strengthen the capacity and legal framework of State-Owned Commercial Banks (SOCBs) in commercial banking transactions	Strengthen rural and agribusiness lending by State-Owned Commercial Banks (SOCBs) and private commercial banks
Open community market access by upgrading and expanding feeder roads and market information	

Diversification

To encourage cash crops, horticulture and livestock as supplements and alternatives to rice cultivation, the government will use market incentives and better services (e.g. rural roads and access to credit) to help farmers diversify. In recognition of the special hardships in the uplands, the government is taking a more proactive approach. As part of efforts to phase out shifting cultivation and poppy production, the government will:

- Strengthen multi-sector approaches to reduce shifting agriculture.
- Help shifting cultivators to become successful sedentary farmers.
- Assist poppy growers with developing alternative livelihoods.
- Extend irrigation systems.
- Strengthen animal health services and livestock extension systems.
- Promote private sector involvement in plantation forestry and agro-forestry.
- Promote cultivation of NTFPs.

Technology transfer

Recognising the potential for domestic research to contribute significantly to raising agricultural output, the agricultural development plan includes the following goals:

(1) Develop an integrated extension system to transfer agricultural production technologies to poor people and upgrade the extension capacity of NAFES, particularly in uplands areas.

(2) Ensure that research (NAFRI) and extension services (NAFES) are demand-driven.

(3) Develop area-based applied technologies and agro-zoning.

Sustainability

The agricultural sector development plan balances growth and conservation concerns, taking into account the socio-economic and agro-ecological conditions of each region. Long-term sustainability of the country's natural resource base is essential for poverty eradication.

Integrated watershed management

Watersheds are recognised as playing an essential role in natural resource conservation in the Lao PDR. In cooperation with the Mekong River Commission, MAF has developed a multi-sectoral and community-based process for area-based socio-economic and integrated agricultural development. Decentralisation of responsibilities is assumed to facilitate natural resource management, centred on watersheds.

Priority actions and operational considerations

Directives, measures and projects have been laid out by MAF based on a characterisation of the 47 poorest districts of the country. A series of priority development projects have been identified:

(1) Commodity production projects to increase people's income

(2) Food security projects.

(3) Production-supportive infrastructure development projects.

(4) Supporting projects implemented jointly by central, provincial and district authorities.

The following fundamental actions for securing poverty eradication have also been identified:

(1) Development planning, particularly at district level.

(2) Improvement of research and extension systems in provinces and focal districts.

(3) Government investments that are well-suited to local conditions.

Planning at the district level

- Participatory or `bottom-up' planning at the village level, supporting district plans as well as the preparation of integrated watershed plans for upland areas; village and district-level action is the main catalyst for agricultural growth.
- Regional planning, particularly in upland areas.
- Zoning in accordance with watershed boundaries or where irrigation is available.
- Ensuring appropriate land use linked to socio-economic development, in order to secure sustainable use of natural resources while minimising negative impacts on the economy and environment.

Improvement of research and extension systems at district and focal sites

- Placing extension networks in villages.
- District staff should perform extension work as generalists.
- Provincial staff should act as subject matter specialists to train and assist district staff in solving specific problems.
- Establishment of demonstration plots in representative focal sites.
- Establishment of model families, model villages and model focal sites.

For more detailed information please consult the following document:
GoL. 2004. *National Growth and Poverty Eradication Strategy* (NGPES). Vientiane.

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Evolving Operational Upland Policies

The National Growth and Poverty Eradication Strategy (NGPES) coordinates agriculture, integrated watershed management and forestry sectors to facilitate the transformation of upland livelihoods with the aim of reducing rural poverty and conserving natural resources. There are five major policy themes relevant to upland development.

It is claimed that for shifting cultivation to be sustainable, a cycle of 20 to 25 years is needed to give forests a chance to recover before being 'slashed-and-burned' again. The government sees shifting cultivation as unsustainable and intends to stop it by:

- Making agriculture sedentary through diversification and agro-forestry.
- Opening market access through feeder roads and market information.
- Land allocation and land use entitlements (MAF 1999).
- Land-use zoning based on slope and land capability.
- Rural savings and credit.

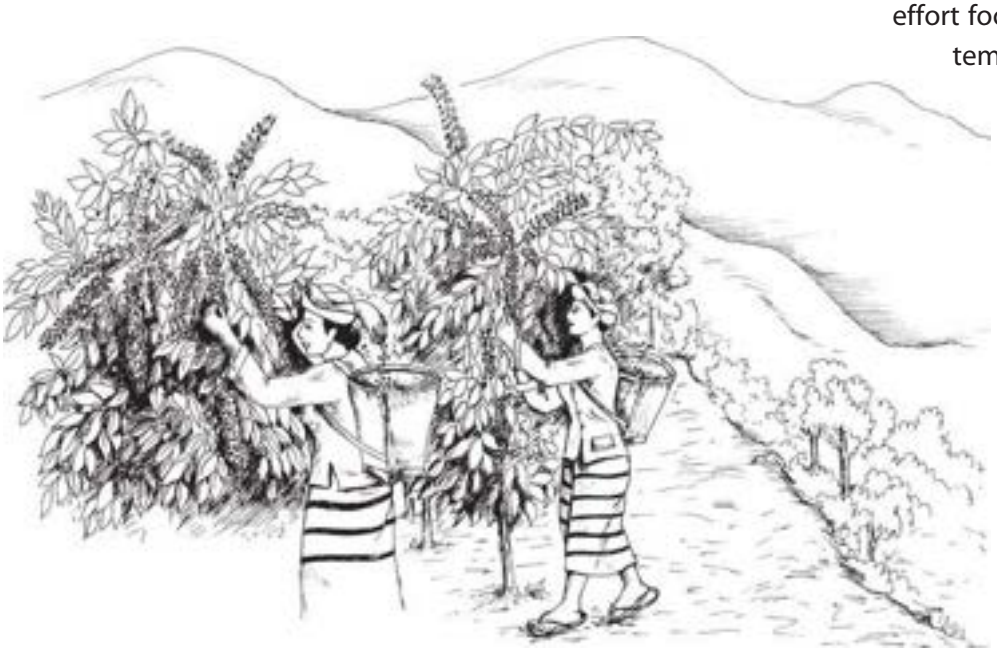
1. Shifting cultivation

Estimates in 2000 indicated that 39% of the Lao PDR's population, covering 13% of the total land area, depended on shifting cultivation (JICA 2001). Concern about the negative impacts of shifting cultivation has been a consistent theme of government policy since the founding of Lao PDR. Although implementation of early decrees prohibiting shifting cultivation was limited, the 1989 National Forestry Conference proposed forest land allocation to villagers as a policy to rationalise forest use and introduce alternatives to shifting cultivation (MAF 2003b). Subsequent land-related polices have had 'stabilisation' of shifting cultivation as a central objective, and by 1998 the government acknowledged that rural development priorities had been aimed mainly at national rice self-sufficiency and restricting shifting cultivation (SPC 1998).

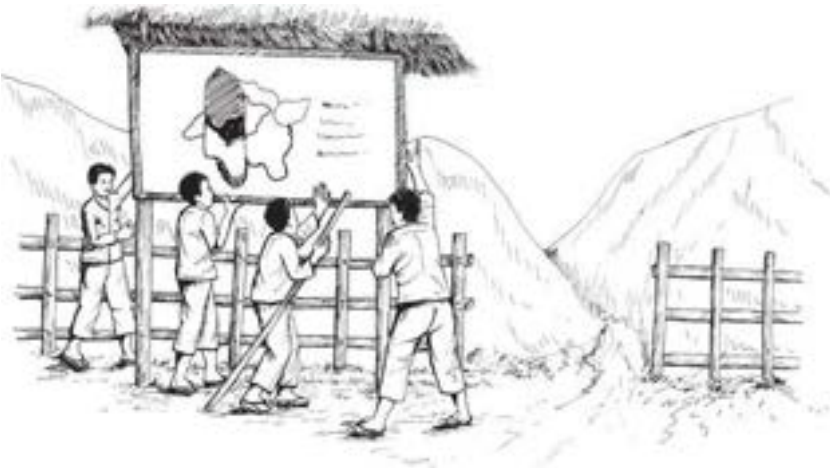
2. Opium eradication

Opium provided income to compensate villagers for poor rice productivity at high elevations. Because highland paddy sites are scarce, opium is viewed as a special case of the 'shifting cultivation problem'. In neighbouring Thailand, opium income earned by mountain villagers was low enough that crop substitution programmes (combined with enforcement once viable alternatives are in place) were successful. Experience has evolved into what is now called 'alternative development' for drug control.

Efforts to control opium production in Laos began in the 1990s with a central commission, provincial committees and a Comprehensive Drug Control Programme. The 1999 Opium Elimination Strategy aims to eliminate production by 2006. A review during 1989-2001 indicated that progress and constraints (except for special issues like drug addiction) are similar to those encountered by development projects in mountainous areas of Laos. Most effort focuses on sub-tropical and temperate tree crops, as well as on alternative income sources to replace that obtained from opium.

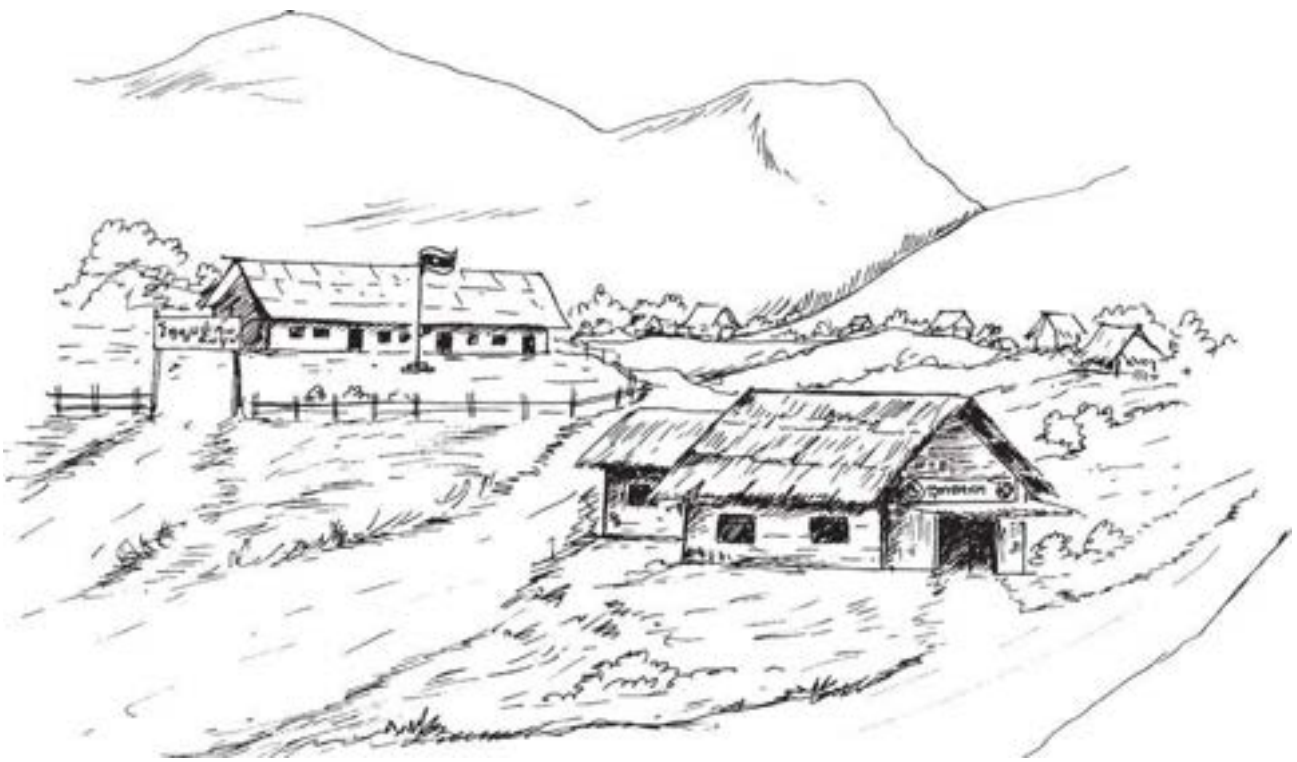


3. Land and forest allocation



Along with eliminating shifting cultivation and opium production, the government wants 'settled' upland communities practicing permanent agriculture on defined land parcels, with access to infrastructure and social services linking them to wider economic and social systems. To achieve this, tools developed during 1989-96 included land use planning and land and forest allocation.

Under MAF guidelines, the Land-Use Planning and Land Allocation (LUP/LA) process takes local communities through an eight-step Participatory Land-Use Planning exercise. A Central Committee for Land and Forest Allocation set and review annual targets, and from 1996 to 2002 land allocation was carried out in some 6,200 villages (>50% of the national total) and more than 379,000 households (>60% of all agricultural households), covering more than eight million hectares. LUP/LA has been characterised as one of the few forest related programmes with clearly defined policy objectives, detailed instructions for field implementation and nationwide implementation (MAF 2003b).



4. Focal site strategy and village relocation and consolidation

The focal site strategy has been a central feature of rural development strategies in Laos for almost ten years. This area-based approach begins with selected locations where policies and activities are implemented. In principle, the approach is a pilot project to test systematic and coordinated implementation under a range of conditions and a demonstration area to show the process and its results, facilitating further implementation and adoption.

Progress of the focal site approach was assessed a number of times and lessons learned implemented. Village participation was not convincing and sites were biased toward poor and politically important areas, with few areas having high potential for development. Roles were unclear, monitoring and evaluation systems were absent, operational targets were not clear, and staff capacity at provincial levels was weak. However, the focal site approach is seen as warranting further effort because:

- It has the potential to encourage integrated planning and implementation that is difficult for line agencies.
- It has potential for bottom-up participatory planning and implementation essential for rural development.
- It is an effective way to use a limited budget and scarce local human resources.

Adjustments under the policy included rationales for both village consolidation and relocation. These centred on perceived needs for efficient extension services and community development structures to bring local people into development planning and implementation. In this way, 'unsettled families' living in 'scattered, remote communities' whose 'traditional methods of slash-and-burn cultivation are no longer sustainable' are to be attracted to sites with improved access to services. Pull-effects can already be seen as a number of villagers are voluntarily establishing new settlements along road corridors.

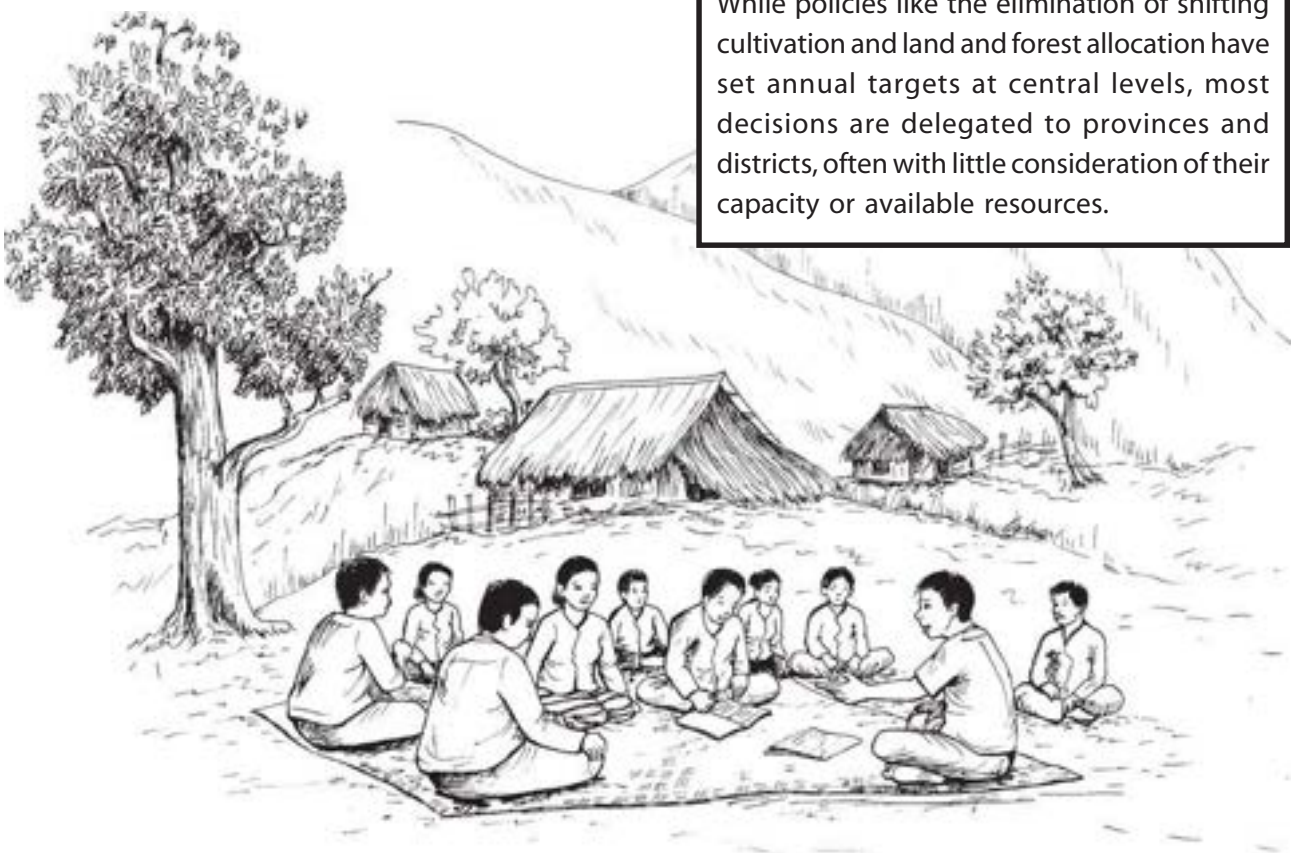
Development is concentrated in zones where activities in agriculture, social sectors, institutional capacity building and physical access to villages and markets are conducted in a synergistic manner to boost household income and eradicate poverty (CPC 2003). Since most poor districts are in upland areas, the focal site strategy is important for upland development.

The NGPES seeks to expand core elements of the focal site approach to the poorest districts of the country. In recognition of the close links between rural poverty and agriculture, responsibility for planning and coordinating rural development was shifted back to MAF in 1999. The strategy uses the 'focal area approach' to target poor remote areas and areas with growth potential. The focal site development approach aims to:

- Stabilise shifting cultivation.
- Improve access to social services.
- Facilitate market-oriented economic activities.
- Allow integrated development by access to remote areas.
- Integrate all regions into a dynamic national economy.

5. Decentralisation

All the above policies place strong emphasis on decentralised approaches, reflecting natural resource governance trends across the region (Dupar and Badenoch 2002). Decentralisation



While policies like the elimination of shifting cultivation and land and forest allocation have set annual targets at central levels, most decisions are delegated to provinces and districts, often with little consideration of their capacity or available resources.

in Laos is aligned with a 2000 directive that redefined central-local relations with provinces as strategic planning units, districts as planning and budgeting units, and villages as implementation units (CPC 2003). For example, after the government recognised problems with village resettlement and consolidation, the focal site programme saw its 'cornerstones' as consultation, coordination and strengthening provincial and district institutions, with village level focus on volunteers and committees (SPC 1998). Human resource development is key to local implementation of the strategy.

While policies like the elimination of shifting cultivation and land and forest allocation have set annual targets at central levels, most decisions are delegated to provinces and districts, often with little consideration of their capacity or available resources.

Given its agriculture, forestry and rural development mandates, MAF was reorganised to better meet decentralisation objectives. This 'demand-driven' approach sees villagers interacting directly with district staff, under guidance and support from provincial offices. Central support services are channelled through NAFRI and NAFES. Consolidated central research services were launched under NAFRI through reorganisation and elaboration of the existing research units within various departments of the old structure. However, since the consolidated extension agency needed to be created, its establishment could not be so rapidly accomplished. Development of staff capacity at provincial and district agriculture and forestry offices has been more problematic because of constraints on human and financial resources.

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Impacts of Policies on Upland Communities and their Livelihoods

Recent policy and strategic vision documents embrace holistic views on transforming the livelihoods of poor upland villagers. Thus, while policies seek more allocation of household resources to commercial enterprise, there are also concerns about basic food security and the need to build incrementally on what already exists. Livelihoods are currently centred on the basic resource of household labour, which includes human knowledge, skills and health.

Household livelihood strategies affect how resources are allocated among available opportunities, which can be land-based or non land-based, within the 'subsistence core', in activities centred on commercial production (if available), or based in enterprises managed at household, group, or community levels.

Traditional livelihoods

Descriptions of traditional 'farming systems' found in policies and studies recognise that resources are allocated across a mix of opportunities, and usually result in a combination of agricultural and forest products. Indeed, shifting cultivation uses forest regeneration to maintain productivity, resulting in much ambiguity about whether products from fallow fields are agricultural or forest in nature.

Farming systems form the core subsistence activities. Major options include:

- Upland fields.
- Paddy fields (if available).
- Various types of homegarden.
- Small and large livestock.
- Hunting and fishing.
- NTFPs.

Households allocate their resources (labour and knowledge, land, inputs) among these options, depending on access, productivity and risk, as well as on their perceived needs, preferences, and opportunity costs. System outputs can meet immediate subsistence needs or go into reserves, and any surplus can be traded or sold (if possible) to help meet subsistence, savings or capital investment needs.

As households, lineages and communities engage in various component enterprises over the years and through generations, they build a knowledge base about the land, crops, wild plants and animals within their management and production domain. This continually evolving familiarity with how plants and animals prosper or suffer under the range of conditions found in local domains is an important part of agro-ecosystem management practices, and a major resource for further transformation. A few examples are instructive:

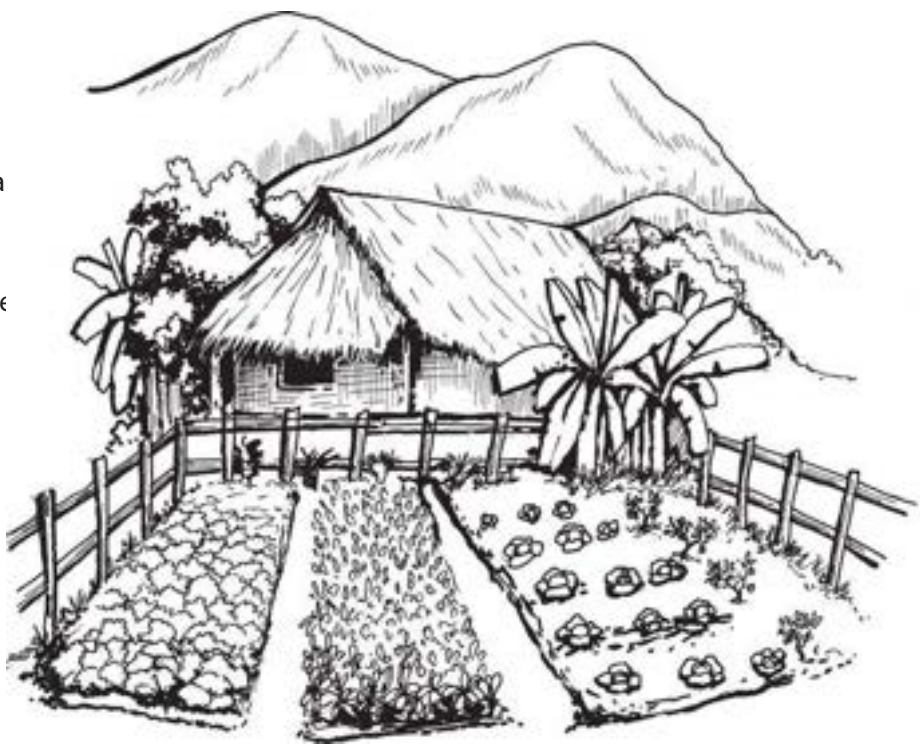
- Upland people depend on **forests** for subsistence and income generation. Benefits from forests include food, wood, fuel, NTFPs, land for crops, shifting cultivation, tree planting or regeneration, and livestock feed and fencing. Associated (often extensive) knowledge of wild species found in local fallows, forests, and waters, and how they can be used for human benefit, complements knowledge of cultivated species, providing a basis for the domestication processes that help livelihoods adapt as conditions and needs fluctuate.

- Since paddy sites are very limited, **upland fields (*hai*)** are often the main source of rice, along with other products. The degree to which a household can or cannot meet its subsistence rice needs is considered a main indicator of poverty. However, since upland rice cannot be grown in a field continuously without yield decline, traditional technologies use forest regeneration to maintain productivity without chemicals. The many types of upland rice systems are viewed simply as 'shifting cultivation', and thus targeted for 'stabilisation'. The NAFRI socio-economics unit is studying the disruption of this policy on rice self-sufficiency.

- **Livestock** provide food or draught power as well as a growing store of wealth that can be mobilised for cash, trade, dowries and so on. Since feed is usually from crop residues, scraps, and/or wild or volunteer plants, livestock cross household-community land and domesticated-wildland boundaries according to needs, seasons or opportunities. Common barriers to livestock production are obtaining initial stock and reliable feed sources, while risks are disease, weather a theft.

- **Homegardens** are a rich and ofte underestimated repository of germplasms, knowledge and familiarity. Homegardens have a variety of forms and locations that can vary by season and other conditions, and are frequently diverse mixes of exotic and domesticated species that meet nutritional, herbal, medicinal and even aesthetic or spiritual needs; they are also an 'incubator' for observing and evaluating newly acquired species. Thus, they are a pool of plants, knowledge and experience from which larger specialised commercial plantings can be built if and when reliable marketing opportunities emerge.

The overall mix of a household enterprise portfolio reflects current livelihood strategies. Whenever there is a disturbance or stress (or new opportunity) that affects one component, the overall system seeks to compensate, adapt, or cope by readjusting allocations among the components. Since disturbances by weather, disease and war have happened many times in the past, mechanisms have been developed to make it through hard times: wild or domesticated 'famine crops', and social or kinship networks for emergency assistance are two examples.

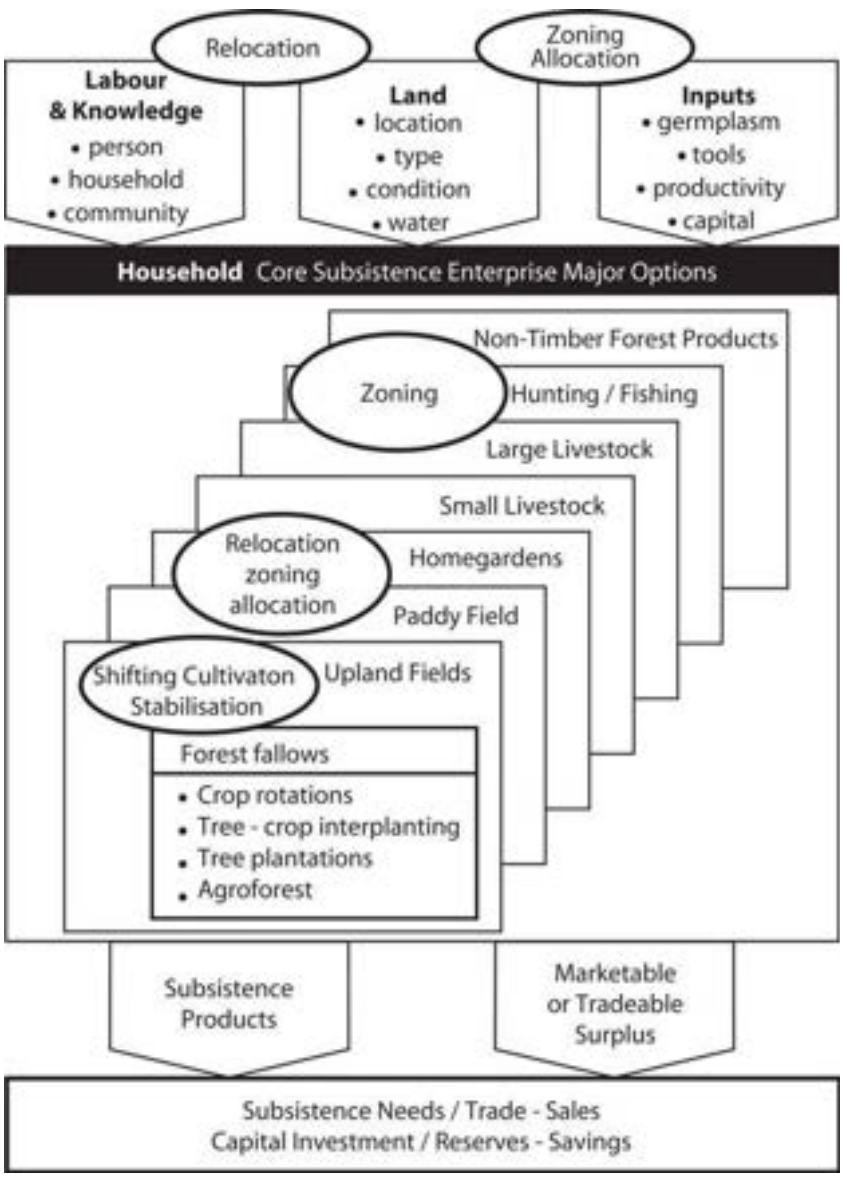


Impacts of government policies

Most government policies seek to induce transformation of household portfolios by constraining some components (especially *hai* cultivation), and opening new opportunities for others (especially road access and government services). This results in major sustained changes in the operating environment, and can challenge the capacity of households and communities to make major adjustments in short periods of time. One study even proposed that such sustained pressures for rapid change be viewed as an 'ongoing disaster' for livelihood systems (Brahmi and Poumphone 2002).

Current constraints are affecting household livelihoods through impacts on specific components of their core subsistence enterprise portfolio:

Land policy impacts on upland households



- **Shifting cultivation stabilisation**. These policies eliminate the forest fallow option from the upland field component, thereby limiting that option to other types of technologies. Fallows are seen as degraded or destroyed forest, rather than as a phase in an agricultural cycle, and since lands 'abandoned' for more that three years are reclassified as regeneration forest, there is pressure to not allow forest to regenerate for more than three years. This is cited as evidence of system deterioration, making calls to convert to permanent fields something of a self-fulfilling prophecy. While recent policies show more flexibility, it is already too late in many cases.

- **Zoning and allocation**. Land-use zoning within village boundaries can affect several components either positively or negatively. The key determinant of the nature and degree of impact is the way in which the zoning is conducted. Since the participatory poverty assessment indicated that upland people associated land allocation with increasing hardship (ADB 2001), these issues have been under study. Early results show that village zoning should set the context for identifying why, where and how any household allocation should be done.

- **Relocation**. This changes the whole land context of household enterprise, which could be for better or worse, but will certainly be different. Where new conditions are substantially different from the old, there can be an impact on the relevance of local knowledge related to land resources, and on the likely viability of plant and production system options. Major change in social capital is likely, especially for relationships among households and villages at the new site. New opportunities may also emerge, so there could be a net gain in household well-being, which is, of course, what the government hopes will happen.

Balancing Restrictions with Opportunities

Government development strategies seek to transform livelihoods of upland poor villagers in a holistic manner. Yet many initial impacts of upland polices have been to disrupt traditional household and village livelihood strategies, and to increase constraints on their land use practices. Development of effective demand-oriented support services takes time, and progress of governmental and non-governmental efforts to help open new opportunities for production for commercial markets have often been sparsely scattered and relatively slow. Many development workers see a need to bring more balance into the transformation process under NGPES by increasing efforts to build on local knowledge and traditional practices, and to strengthen basic food security and self-reliance, in order to provide a solid foundation for engaging in commercial production enterprise compatible with upland policy objectives as opportunities emerge. Increased levels of interaction and exchange among development projects and NAFRI and NAFES staff at provincial and district levels may be one approach that can help accelerate learning and more widespread accumulation of experience and knowledge needed to meet this goal.

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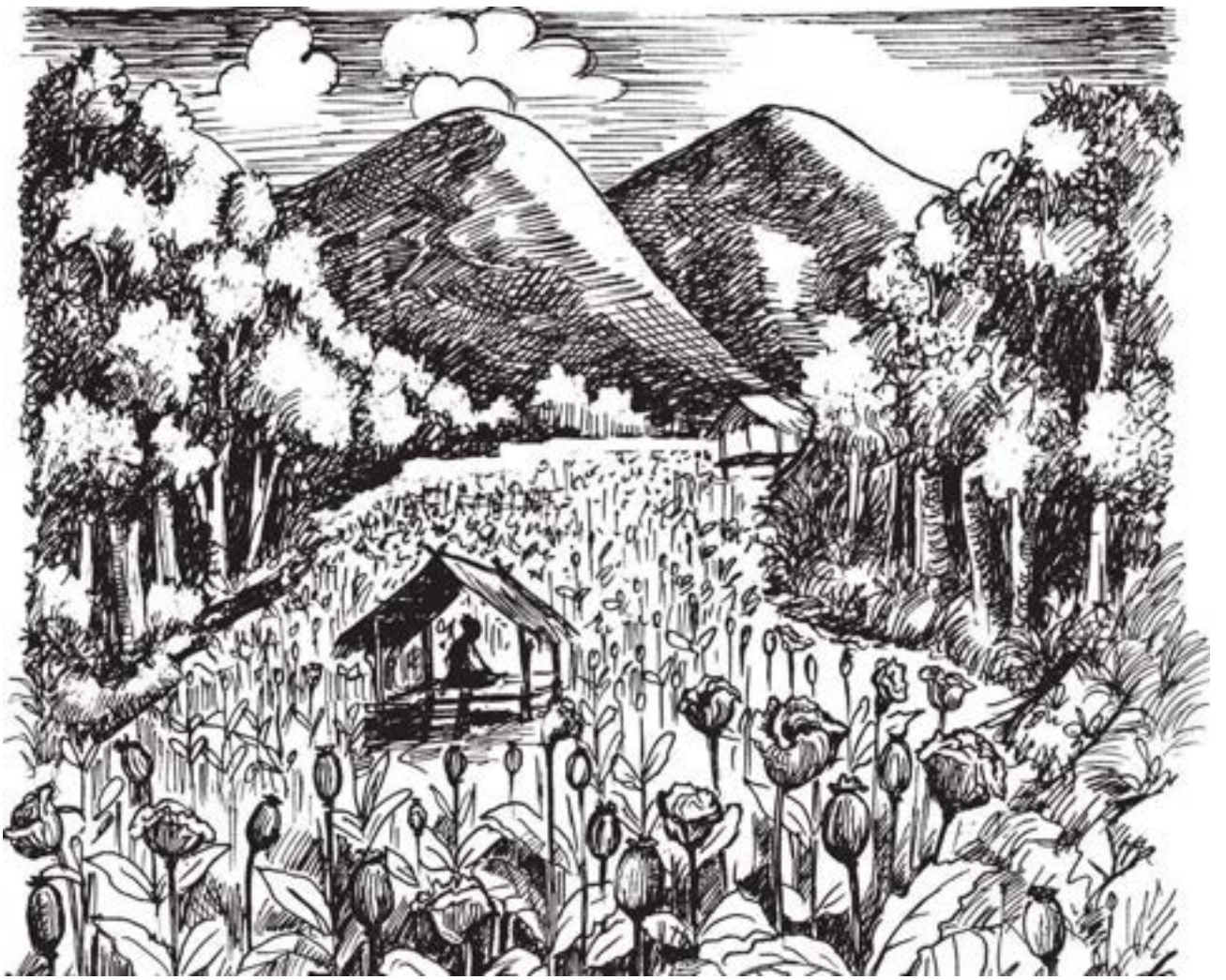
The Role for Alternative Development Strategies in Opium Eradication



Elimination of opium poppy cultivation, shifting cultivation and poverty are ranked as national priorities. Laos is presently the third largest producer of illicit opium in the world. Committed to national policies as well as international conventions, the government is determined to eliminate illicit opium poppy cultivation by 2006. Opium as part of the shifting cultivation system is mostly grown by ethnic minorities in some of the most remote, poorest and least accessible regions of northern Laos. The national programme strategy to eliminate opium balances three key components: *alternative development* (AD), *demand reduction*, and *law enforcement*.

Of the 47 poorest districts identified under the National Growth and Poverty Eradication Strategy (NGPES), more than two-thirds (32) grow opium poppy.

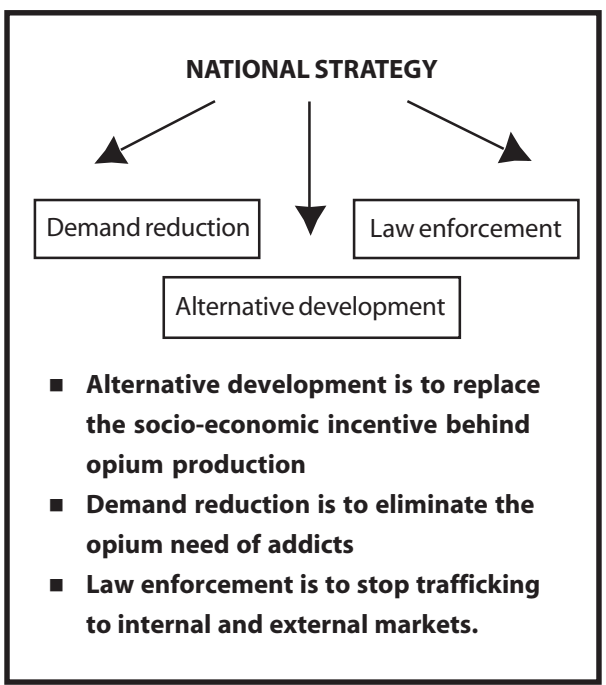
In Laos, opium is mostly produced by ethnic minorities as their main cash crop. The product is a way of life, providing more than cash to buy rice and other basic essentials. In the absence of health services it is used as a medicine to provide relief from aches, pains and respiratory ailments. It is also used for recreational and traditional ceremonial purposes but, in many cases, frequent use leads to addiction: Laos has the second highest opiate consumption rate worldwide. Opium addiction is closely associated with household social and economic problems and increasing poverty. High rates of addiction deprive highland communities of otherwise productive members.

Opium poppy is cultivated in some of the most remote, isolated and least accessible regions of northern Laos. These regions have some of the highest levels of poverty in the country, lacking the socio-economic and physical infrastructure needed for development: villages often have no roads and reaching them requires days of walking; there is a lack of access to health, education, and water; many ethnic group families have a poor understanding of the Lao language, while women especially have heavy workloads; families can be rice deficient for up to four months of the year and livestock also suffer from poor health and nutrition.

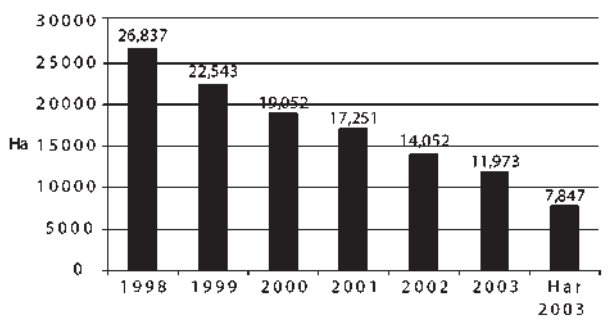
AD strategies

National strategy is to eliminate the causes of opium production by balancing three key components: AD, demand reduction, and law enforcement. The National Drug Control Programme, launched in 1994, calls for a gradual and balanced approach to eliminating poppy cultivation with emphasis on AD. The National Programme Strategy, "The Balanced Approach to Opium Elimination in the Lao PDR", was prepared in 1999 in response to an agreement between the government and UNODC to eliminate opium in six years through an accelerated rural development programme in major opium producing districts (UNODC 2000).

Various appropriate approaches and technologies have been developed to improve socio-economic infrastructure, with communities constructing access roads, educational and health facilities and village water supplies. Appropriate technologies are used to improve the marketability of produce and this work needs to be continued so that farmers can receive a decent income from their efforts.



- **Alternative development is to replace the socio-economic incentive behind opium production**
- **Demand reduction is to eliminate the opium need of addicts**
- **Law enforcement is to stop trafficking to internal and external markets.**



Opium Poppy Cultivation in the Lao PDR

In 1998, 26,837 hectares were under opium poppy cultivation in Laos. By 2003, mostly due to the committed efforts of the government, this figure had been reduced to 11,973 hectares with only 7,847 hectares *actually harvested*.This represents a reduction of some 70% in six years. It is important to ensure that opium elimination efforts do not outpace the provision of sufficient alternative development and demand reduction interventions.

The approach

Considering the diverse and complex socio-economic, cultural and environmental conditions found in upland opium growing areas, there is no 'one solution fits all' approach to AD. AD project strategies include many approaches and an integrated mix of interventions, including:

- Community strengthening.
- Use of appropriate technology.
- Income generation.
- Financial services.
- Infrastructure.
- Natural resource management.
- Good governance.

The importance of a market-driven approach instead of a product-driven one is a lesson sometimes learned the hard way. Some projects have promoted trials to produce crops and commodities and only then started to look for markets. It is better to conduct market studies first and then involve the private sector in efforts to increase village income opportunities. AD projects have tried to introduce and provide access to micro credit, some with more success than others. Village revolving funds that are managed by the community and are not cash based but have interest paid back in kind have been more successful in remote areas.

The combination of government policy, science and technology, investment and finance must be used to augment what locals already do well and the assets they already have. It is important to work both with livelihood systems at the micro level and with the policies that affect them at the macro level. Sustainable human development is a process of enlarging people's choices, the most critical of which are: to lead a healthy life, to be educated, and to enjoy a decent standard of living with freedom, self respect and respect of others.

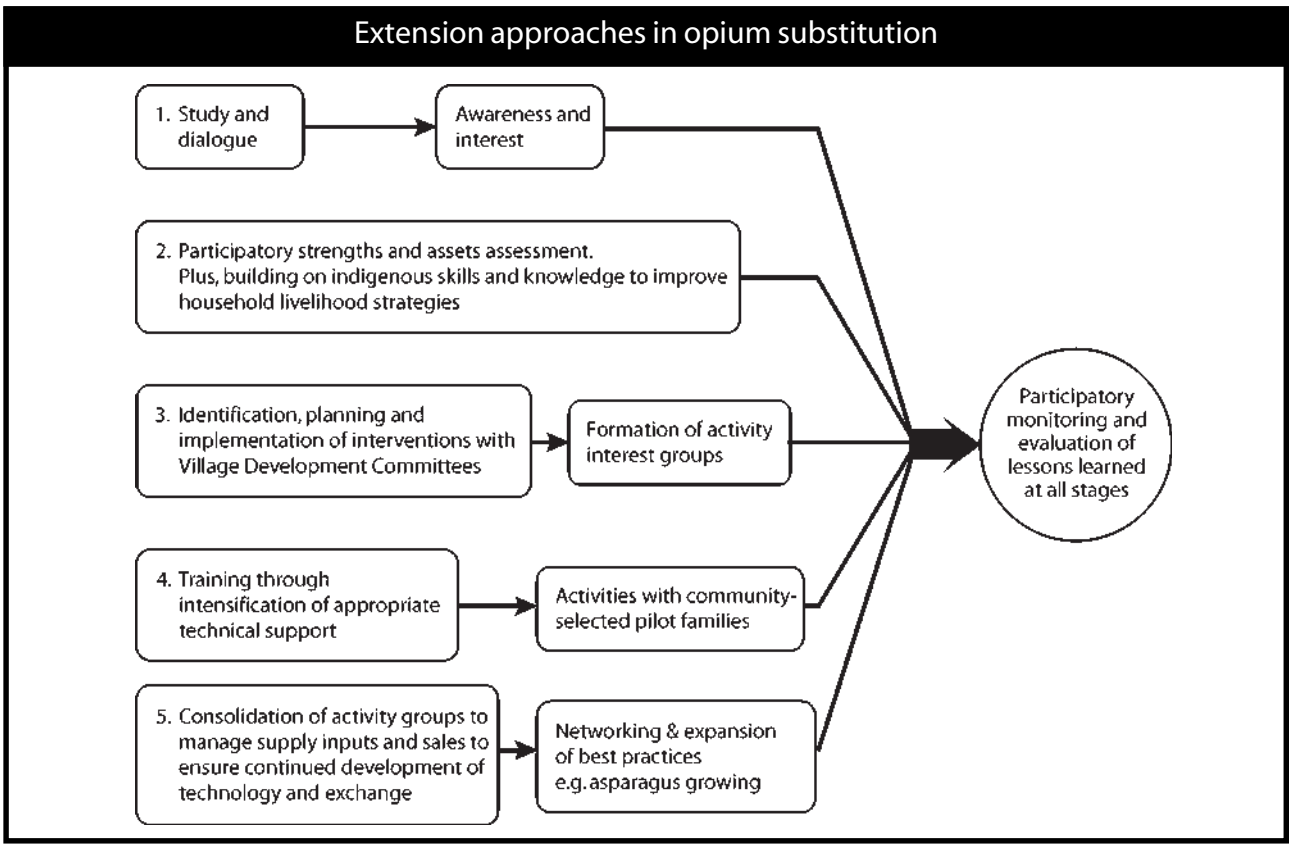
Six districts were declared opium free in 2003, including Beng District in Oudomxay Province, where UNODC operated an AD project from 1999-2001. In Beng, farmers' coping strategies to counter the loss of opium income included increasing rice and maize production, and using their project-learned skills for disease prevention and livestock husbandry to increase pig production. The pigs were then sold to traders who visited the villages using newly-constructed access roads. Farmers reported that the income received was comparable with that received from opium (Boonwaat et al. 2003).

The annual national opium poppy cultivation survey of 2003 estimated that the average opium farmer earned 46%, or US$92, of his/her annual income of about $205 from opium poppy cultivation (UNODC 2003). This is roughly equivalent to the income that could be generated from the sale of a cow or a small buffalo, one tonne of rice, a couple of pigs, five goats, fifty chickens or two pieces of woven silk (Boonwaat 2003).

Lessons learned from AD projects:

- A community-based participatory approach to identification, planning, implementation and monitoring, gives a higher rate of community ownership, success and sustainability.
- Build on community strengths and assets (Boonwaat 2003)
- AD must be geared with treatment and rehabilitation of opium addicts and enforcement of community laws and rules.
- Use special AD programmes to target isolated opium producing areas. When these areas have reached a certain level of development, they can be reintegrated into the normal national development process.
- Gender mainstreaming is important. Set up and work with activity interest groups, rather than focusing on individual households.
- Mobilise and involve the masses in drug control and prevention.
- Ensure community contribution to and ownership of infrastructure schemes.
- Better success is achieved by improving existing livelihoods rather than introducing new ones.
- Use a market-driven rather than product-driven approach
- Rice banks and livestock banks are more successful than cash-based micro-credit.

Promoting the use of group extension and training methods ensures women's participation. Women might feel shy working at an individual level with predominantly male project staff, but have no problem in group activities (Boonwaat 2003b).



Conclusion

There is no one-step answer. A variety of economic options and programmes should be promoted, some of which will work better than others. To achieve success will take time, commitment and money, and will require a long-term approach that focuses on building up local capacity, based on self help, and aimed at the sustained elimination of opium production and consumption and poverty.

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The Rights and Duties of Villages to Land and Forest Resources

Since the Lao PDR passed its Constitution (1991) it has enacted over 50 laws and numerous implementing decrees and orders. However, many of these laws are only seen or understood by a small percentage of the government and urban population. Villagers have limited access to information and little opportunity to learn about their rights and duties concerning management of land and forest resources within their village boundary. The problem is not a lack of legislation, but a lack of implementation at the local level, especially in upland villages. Increasing extension at the village level on land and natural resource management will improve the link between national policies and local practice and increase consistency of implementation across provinces.

Legal guidebook on land and natural resource rights and duties at village level

The legal guidebook summarises key elements of legislation on the rights and duties of villagers in management of the land and natural resources within village boundaries. The book guides district and provincial agriculture and forestry staff, and other local authorities, in land-use planning and forest resource policies at the village level.

The guidebook was drafted by a team including district and provincial agriculture and forestry staff from Saravane Province, village chiefs and representatives from Ta Oi District, and Village Focus International staff. In addition, a participatory working group has been established at the Department of Forestry to guide development of the booklet and related extension materials with the involvement of various stakeholders. The guidebook will be made available by VFI in 2005.

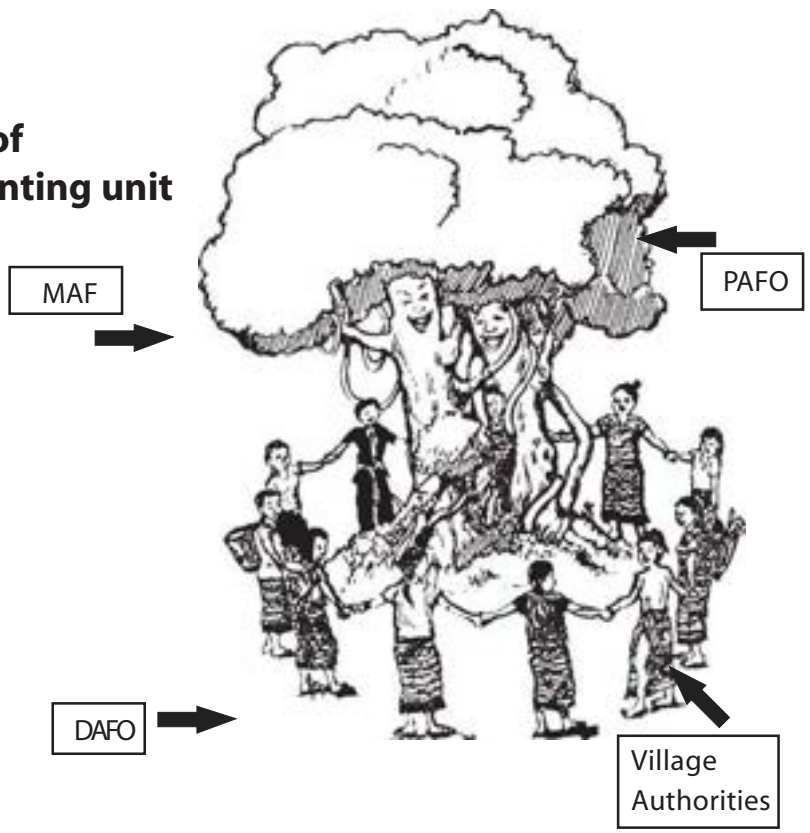
Scope of village rights and duties

Although villages throughout Laos have distinct traditions, cultures and land management systems, their legal rights and duties can be analysed by a standard method based on the following six categories:

- Village authorities are one of four levels of forest management organisations authorised to enact rules and implement GOL policy in the forestry sector.
- Villages have the right and duty to establish village forest units to assist local authorities and to implement forest management in the village boundary.

1. Rights and duties of village as implementing unit of government

The Lao PDR, unlike many other countries in Southeast Asia, recognises the village as a legal entity and formal unit of the government with rights and duties. Villages can form associations, implement policy and enact rules, especially in the forestry sector.



'Enact rules and implement policy'

- Villages also have the right and duty to establish village forest management organisations for participation in production forest management. These organisations can receive monetary reward for their participation in production forest management in addition to wages paid for their labour.
- Village authorities and management organisations have the right and duty to enact village rules to regulate land and forest resource use within the village boundaries.
- Villages have the right to establish associations and organisations that do not conflict with government policies (i.e. NTFP harvest-and-sell groups).

2. Rights and duties on ownership of land and forest resources

- Historically, villages have a system of traditional ownership of the land and forest resources within village boundaries. According to the law, land and forest resources are owned by the State on behalf of the national community and may be allocated to individuals, villages or organisations to use sustainably.
- Local authorities, together with DAFO, have the right and duty to allocate land and forest land to individuals and organisations within the village boundary;
- Each household in a village is eligible for allocation of the following amount of degraded land for each labourer in the family: fish and paddy rice (1 ha), fruit trees (3 ha), tree planting (3ha), upland crops (3ha) and livestock grazing (15ha).
- The concept of ownership covers a range of rights. Full ownership of property provides the following six rights: (1) right to use, (2) right to benefit and collateral, (3) right to transfer, lease (4) right to protect, (5) right to inherit and (6) right to compensation if taken by the State.
- These rights may or may not apply depending on the classification of land in the village: (1) permanent agriculture, (2) temporary production land, (3) land for tree planting, (4) reserved land and (5) forest land (including watershed protection forest, village conservation forest and production forest)
- A forest management agreement between DAFO and a village should guarantee three of the six rights: use, protect, and inherit.
- Villagers have a duty to use land according to the law, and to pay taxes that may apply.
- The land owner receives an official document to identify ownership, stating type of land, amount of land, and term for use of the land as described in table1.

Table 1: Types of land documents, rights, type of land and user			
Land document	**Rights**	**Type of land**	**User**
1. Land titling Valid in perpetuity	1. Use 2. Transfer 3. Protect 4. Inherit 5. Compensation	▪ Construction land ▪ Fixed production land: paddy, garden ▪ Non-forest land or as classified by the government ▪ No title issued in forest	Lao citizen
2. Temporary land use certificate Three year validity; after that the land owner must ask for land titling document	1. Use 2. Protect 3. Inherit 4. Compensation Village family may get 'x' hectares for each labour use: • Grazing (15 ha) • Rice/Fish (1 ha) • Fruit tree propagation (3 ha) • Upland cropping (3 ha) • Tree planting (3 ha)	▪ Agriculture land suitable for conversion to grass for livestock, fish, crop or fruit tree production ▪ Temporary production land: for upland rice ▪ Land for tree plantation ▪ No TLUC issued in forest	Lao citizen
3. Village forestry contract	1. Use 2. Protect 3. Inherit	▪ Forest area within village boundary	Villages
4. Lease Valid for 20 to 75 years	1. Possess 2. Commercial use 3. Co-management	▪ Production forest, degraded forest and degraded land	Individual, household, village, Lao or foreign investor

3. Customary use rights of land and forest resources

- The State legally recognises the customary user rights of villages based on their traditions within the village boundary.
- The customary user rights of a village apply within village boundaries as approved by the district officials and include the following: (1) 5 m^3 of wood per year for housing and fences, (2) collection, use and sale of non-protected NTFPs, (3) aquatic and wildlife hunting of non-protected species, (4) use of degraded forest for agriculture, planting, grazing, etc.
- Villagers have the right to own and use trees that they plant with their own labour and within their village boundary as approved by district officials.
- Village authorities have the right and duty to enact local rules tailored to specific traditions and customary use, and have the right and duty to regulate land use within the village boundary.
- Customary user rights may apply or be restricted based on the following forest categories:

  (1) Production,

  (2) Protection,

  (3) Conservation,

  (4) Degraded and

  (5) Regeneration.

Table 2: Customary forest resource use rights				
Forest category	**Logging right**	**NTFP collection**	**Hunting**	**Reference law**
1. Village Production forest	Maximum 5 m per household for construction of house. Non-prohibited species	Only non-prohibited species	Only non-prohibited species, in season	Forest law PM Decree 59 Regulation 535 Regulation 822
2. Village Protection forest	None	Only non prohibited species	Only non-prohibited species, in season	Forest law Regulation 535 Regulation 822
3. Village conservation forest (spirit forest)	None	Can collect but based on village tradition	None	Forest law Regulation 535 Regulation 822
4. Village degraded forest	None	Can collect	Only non-prohibited species, in season and with legal gear	Forest law Regulation 535 Regulation 822
5. NBCA, Prohibit ed areas	None	None	None	Decree 64 Regulation 524
6. NBCA, Management areas	Only for household use	Only non-prohibited species	None	Decree 64 Regulation 524
7. Provinces and Districts Conservation forest	None	Can collect but refer to local authority	Can hunt but refer to local authority	No regulation at the national level

4. Rights and duties on village management of land and forest resources

- Village authorities are the fourth level of forest management with rights and duties to manage forest resources and activities within the village boundary pursuant to a forest agreement with DAFO
- Village authorities have three main rights and duties to co-manage with the State:
  - Duty and right to make a forest management plan with DAFO;
  - Duty and right to regulate amount of customary use of forest resources;
  - Duty and right to participate in decision making with DAFO on use of forest resources.

- Village authority has the duty and right to establish a village forest organisation to participate in management of all categories of forest, including production, within their boundary according to agreement with DAFO
- Village authorities have the right and duty to enact village rules to cover traditional management of forest land and resources within their boundary.

5. Rights and duties to monitor, control and enforce land and forest resources

- Village authorities, as the fourth level of forest management organisation, have the right and duty to control, monitor and enforce activities and use of forest resources within their village boundary.
- Village authorities have the right and duty to monitor and enforce national and local legislation and village rules on land and forest management within their boundary.
- Each member of the village has the right and duty to protect the forest resources within the village boundary and assist the government in enforcing forest legislation.
- Village regulations apply to all villagers, village activities and to outsiders and all activities that occur within the village boundary.
- Village regulations may be stricter than the national and provincial legislation, but not in conflict with it.

6. Rights and duties for conflict resolution of land and forest resource disputes

- Villagers and Lao citizens have the right and duty to make a complaint, petition and statement to the government to protect individual and collective rights
- Village authorities have the right and duty to educate, mediate and resolve conflicts regarding land and forest resources and activities within the village boundary prior to appealing to the higher authorities or People's Court

Table 3: Enforcement authority for villages and local authorities						
POSITION	**Report**	**Cease**	**Warn**	**Seize**	**Fine**	**Detain**
1. Village Chief	✓	✓	✓	✓	✓	✓
2. Village Forest Unit	✓	✓	✓	✓	✓	✓
3. DAFO, PAFO staff	✓	✓	✓	✓	✓	
4. Village Militia	✓	✓		✓		✓
5. Citizens, Villagers	✓					

- In general, conflicts within a village can divided in the following three types:
  1) Conflict between individual residents of a village.
  2) Conflict between a village and an outsider or neighbouring village.
  3) Conflict between a villager or village and a decision of the government or an official.
- Villages have two main options to attempt to resolve conflicts on land and forest resources and activities in the village boundary:
  1) Submit to government for mediation.
  2) Submit to court to resolve conflict.
- Villages and Lao citizens have the right to file a complaint or petition to the various levels of court to resolve disputes of land and forest resources through the following steps:
  1) Mediation at the village level according to customary rules and tradition of the village, but if they are not able to resolve, then they can petition the court.
  2) File petition with the court of first instance at either the district or provincial level depending on the value of the dispute.
  3) File petition to Appeals Court for review if not satisfied with the decision of the Court of first instance.
  4) File petition to the Supreme Court for review if not satisfied with the decision of the Court of Appeals. This would be a final decision.

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Upland Poor in the Lao PDR: A Profile

People

Among the 4.2 million rural people of the Lao PDR (2000), representing 80% of the total population of 5.2 million, about 40% (approximately 2 million people) are estimated to live in poverty. Comprising some 300,000 households in more than 6,300 villages, they are largely upland farmers who depend on insecure livelihoods and live in remote and diverse environments. The majority of these rural poor belong to the country's many ethnic minorities. The breakdown by ethno-linguistic grouping is 56% Mon-Khmer, 15% Hmong-Mien, 13% Tai-Thay, 9% Tibeto-Burmese and 7% Lao.

Livelihoods

Most live in upland forested areas and practice slash-and-burn shifting cultivation to produce upland rice and other crops. They also raise

livestock. Some lowland poor have moved from upland areas where they were better-off. To compensate for rice shortages, they generate income by selling NTFPs, wildlife, small livestock, vegetables and handicraft products, and by hiring out family labour to wealthier farmers in their own or different villages.

Local perspectives

The agro-ecosystems of the poor are low-input rice-based agricultural systems already stressed by external factors. Family labour is the main input. They see their major poverty indicators as being a lack of rice and livestock but do not consider their lack of integration into the market economy as a sign of poverty. Poverty in the Lao PDR does not necessarily mean hunger: there are various coping mechanisms in a country with low population density and relatively abundant natural resources. Rather, a spiritual interpretation of poverty and other disruptive life events matter to the poor, who try to correct these disruptions through specific ethnic rituals.

Constraints and potential

Poor rural villages have 50 to 200 inhabitants. Within these villages, the poorest are never found on village committees and have less contact with the local administration than the better-off. A lack of assets, including labour, prevents them from contributing actively to development initiatives. However, they usually have a wealth of traditional knowledge about their environment. Poor rural women and children are often severely malnourished and the poorest rural women are normally overburdened by household and farming tasks. Because most rural poor do not have access to safe drinking water, they regularly suffer from diarrhoea, malaria and respiratory infections. Lack of access to appropriate medical services is common in most poor villages. Infant mortality is high, while education and literacy levels in the Lao language are low.

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Poverty dynamics

Rural poverty in Laos is a recent phenomenon and not endemic. Several poor people said they became poor because of land access restrictions or resettlement. Some suffered from pest infestations, natural disasters and war-related stress. Most upland villages practise shifting cultivation and have been forced to reduce fallow periods. With the relocation of several ethnic minority villages, substantial numbers of rural poor have been resettled in the lowlands or near main roads where they are encouraged to produce wetland rice along with permanent upland agriculture. Data from the National Statistical Centre in 2004 shows that poverty is decreasing in Laos.

Source: UNDP. 2001. *National Human Development Report for Lao PDR.* Vientiane.

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Important Gender and Development Concepts

Gender and development

The main objectives of a Gender and Development approach (GAD) are to strengthen the effectiveness of development work in improving the situation of both women and men, and achieving progress towards social and gender equality. The focus is on social and gender equality as an objective, rather than women as a target group.

GAD focuses on the relationship between men and women in the community and on the unequal relations of power between them. The GAD approach aims for development that changes gender relations in order to enable women to participate and benefit on an equal basis with men. It is not a new approach but builds on the efforts and experience gained over the last three decades in development

work to understand and improve the position of women and disadvantaged groups in the community.

Gender refers to social attributes learned when growing up as a member of a community.

Based on this experience there has been:

- A shift in understanding of gender equality.
- Recognition that gender equality is integral to development goals.
- Realisation that previous approaches were not really changing the position of women or improving gender equality.

This means:

- Ensuring that forestry and agricultural extension work not only responds to differences in needs and interests of women and men but seeks to increase gender equality, by empowering women (where women are at a disadvantage).
- Gender differences relevant to an initiative should be identified, not only to improve efficiency but also to identify the inequalities that constrain women from participating and benefiting on an equal basis with men.

Discrimination and the constitution

Article 24 in the Constitution adopted by the National Assembly in 1991 is very clear on gender discrimination and states that: 'Discrimination is interpreted as any distinction, exclusion or restriction, made on the basis of sex, which has the effect or purpose of impairing the recognition of rights and freedoms in the political, economic, social, cultural or other field.'

The Lao Women's Union (LWU)

The LWU is a mass organisation for women in the Lao political system. It has an organisational network from the central level down to the grass roots level, serving as a bridge between the party and the government and Lao women of various ethnic groups and social strata. It has a long history rooted in political mobilisation and, rural development and is now also taking on gender advocacy.

Changes in gender identity and gender relations

Gender roles and characteristics in almost all societies have undergone many recent adjustments and changes in response to development, technological change and globalisation, which have led to massive economic and social changes in all parts of the world. Changes in gender roles and relations often meet resistance, particularly in the form of tradition.

Social and gender analysis can demonstrate that change in certain aspects of social roles and relations between women and men can improve the quality and conditions of life for everyone.

Social and gender analysis

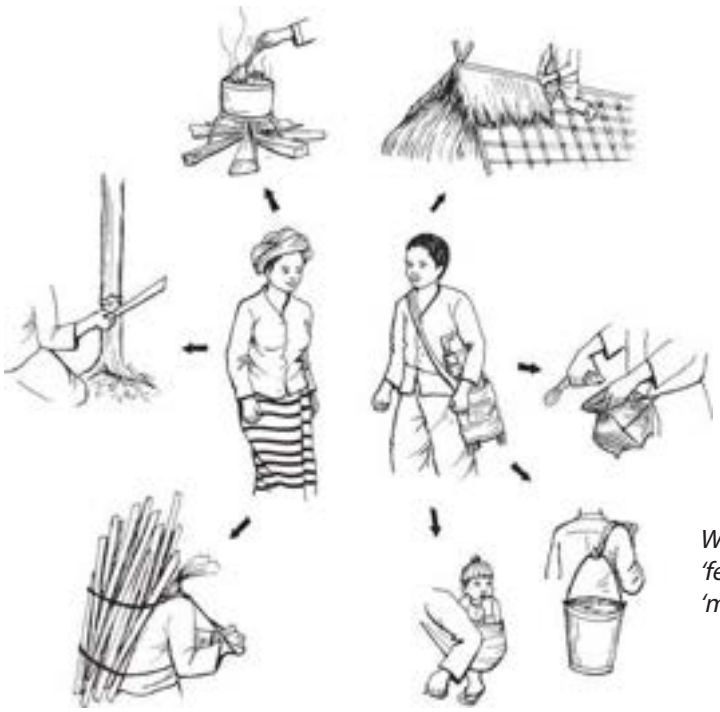
Social and gender analysis attempts to understand the roles of different social groups, (including women and men) in relation to what they do in the village and in relation to the resources they have. There is also a need to understand gender relations: how women and men relate to one another and who makes decisions over which resources.

Social and gender analysis identifies the roles, relations, responsibilities, access to and control over resources, decision-making and power, as well as the needs and potentials of different social groups of both women and men. Social and gender analysis is not limited only to the social sectors, but can also be used at all levels and areas of village development.

Sex and gender

Sex refers to the biological differences between men and women, which are universal and do not change. Gender refers to social attributes that are learned when growing up as a member of a community. Because these attributes are learned behaviours, they can and do change over time. In addition, they vary between different cultures and ethnic groups. Gender therefore refers to the socially given attributes, roles, activities, responsibilities and needs connected to being men (masculine) and women (feminine) in a given society at a given time. Women's and men's gender identity determines how they are perceived and how they are expected to think and act as men and women. Gender is one of the variables (along with ethnicity, age and class) used in the distribution of privilege, prestige, power and a range of social and economic resources.

> While carrying out social and gender analysis increases knowledge of social and gender roles, inequalities and different impacts, this alone will not automatically bring about change. The results of social and gender analysis should be used to bring about necessary changes in relation to planning, priorities, choice of methods, division of labour and implementation of activities.



Sexual division of labour

In all communities, tasks and responsibilities are typically undertaken by either women or men. This allocation of activities on the basis of sex is known as the sexual division of labour, and is learned and clearly understood by all members of that community.

Why are some jobs considered 'feminine' and others 'masculine'?

■ **Productive work**

This is work that produces items for consumption by the household and goods and services for exchange in the market place. Both men and women contribute to family income with various forms of productive work, although men usually dominate in productive work.

■ **Reproductive work**

This work involves all the tasks associated with supporting the immediate and extended family, young and old. It includes childcare, food preparation, care for the sick or old, socialisation of the young, and so on. Reproductive work is the basis of productive work. Women of all ages are mainly responsible for this work, which is usually unpaid.

■ **Community work**

This work involves activities for the village - usually voluntary unpaid work, such as organising festivals or ceremonies, receiving visitors, or maintaining a village resource, such as a well.

Access and control over resources

When examining how resources are allocated between women and men, it is important to distinguish between *access* to resources (e.g. land, labour, credit, income) and *control* over them. Access gives a person the use of a resource, e.g. land to grow crops. Control allows a person to make decisions about who uses the resource or to dispose of the resource, for instance by selling the land.

Practical gender needs and interests

Women and men have different roles and responsibilities and therefore have different needs and interests.

Practical gender needs and interests relate to living conditions. Women may identify safe water, food security, health care and cash income as immediate needs which they must meet. Meeting these practical needs is essential to improving living conditions, but does not in itself change the position women have in the village.

Strategic gender needs and interests

Strategic gender interests relate to issues of power and control and the division of labour. They may include:

- Changes in the division of labour (women to take on work not traditionally seen as women's work, men take more responsibility for child care and domestic work).
- Legal rights.
- An end to domestic violence.
- Equal wages.
- Women's control over their own bodies (family planning).

They are not as easily identified as the practical needs and interests, therefore specific support and opportunities to do so may have to be provided and facilitated from outside.

In most cases, the empowerment of women requires change in the division of labour and transformation of society.

Gender equity

Gender equity is concerned with promoting personal, social, cultural, political and economic equality for all. Traditions and discriminatory practices have resulted in the systematic devaluation of attitudes, activities and abilities attributed to, and associated with, girls and women. The consequences of these discriminatory practices negatively affect men

Empowerment

Empowerment is about women or men developing their ability to:

- Collectively and individually take control over their own lives.
- Identify their needs and agendas.
- Demand support from their communities and the state to see that their interests are responded to.

as well as women. Initially however, gender equity initiatives will place greater emphasis on improving conditions and attitudes as they affect girls and women. In the long-term, these initiatives will also improve the situation for boys and men.

For more information regarding tools for carrying out Social and Gender Analysis please refer to "Field Guide Gender and Development", Lao-Swedish Forestry Programme, June 2001. NAFRI/Ministry of Agriculture and Forestry. Vientiane.

Extracted from:
Lao-Swedish Forestry Programme. 2001. *Field Guide Gender and Development*. Ministry of Agriculture and Forestry. Vientiane.

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Shifting Cultivation Systems and Practices in the Lao PDR

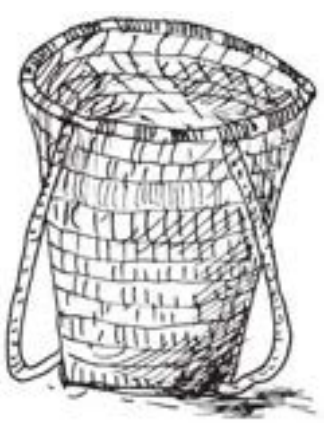
When applying a participatory approach in helping shifting cultivators convert their shifting systems into more sedentary systems it is very useful to first understand their traditional practices. The main objective of this brief overview is to provide those who have to deal with the challenging task of shifting cultivation stabilisation with a general understanding of the complexity and diversity of the systems and practices used in Lao shifting cultivation. The emphasis here is on describing crop production activities under slash-and-burn agriculture. In addition, other activities such as livestock, agroforestry and NTFP collection are also briefly presented due to their importance in the livelihoods of shifting cultivators.

Description and principles of shifting cultivation

Shifting cultivation is known as *hai* in Lao, as 'slash-and-burn agriculture', 'swidden cultivation' or 'swidden' in English, and *essartage*, *agriculture itinérante*, *défriche-brûlis* or *abattis-brûlis* in French. In Laos, as in other countries where it is practised, it basically consists of cutting the natural vegetation, leaving it to dry and then burning it for temporary cropping of the land. The burning of vegetation cover and soil organic matter accelerates decomposition and releases useful nutrients for crop production. Burning also kills weeds and pests. Another important principle is the regeneration of soil fertility through plant regrowth after harvest. To rebuild the soil fertility after growing crops on a shifting cultivation plot farmers 'abandon' that plot and allow vegetation to regrow for a number of years. This is called the 'fallow period'. In the meantime, they grow crops on other new plots.

The duration of the fallow period is an important element for this cyclic form of agriculture where cultivation is shifted from one location to another. In principle, the longer the duration of the fallow period, the better the crop. For a given piece of land a shifting cultivation cycle can thus be characterised by two phases:

(1) The cropping phase (usually one year, but sometimes two or three).
(2) The fallow phase (several years).



During the cropping phase the farmer's main objective is to produce what he needs for food, feed and income. During the fallow phase the main objective is to regenerate the soil's fertility by allowing the vegetation to regrow while exploiting some of the fallow resources (e.g. animal husbandry, hunting, NTFP and timber collection).

Shifting cultivation systems: diversity and complexity

There is significant diversity in the shifting cultivation systems of the Lao PDR. Diversity factors include soil category, topography, altitude, rainfall, natural vegetation type, land tenure system, level of integration into the market economy, dietary habits, ethnic beliefs and traditions, local technical knowledge, level of conversion from shifting agriculture to sedentary agriculture, level of crop-livestock integration, and so on. The heterogeneity is also high at field plot level. All this means that most of these systems function under location-specific management and thus require loca-

Land tenure, land-use planning and land allocation

Traditionally, Lao swidden farmers used their usufruct rights to exploit the forest land surrounding their villages. Nowadays, a government-sponsored land-use planning and land allocation programme is underway throughout the country and has accomplished variable degrees of achievement. Land-use planning and land allocation has been used as a tool to reduce and stabilise shifting cultivation in Laos. It regulates villagers' access to local natural resources and generally results in shorter fallow periods.

tion-specific alternatives for those willing to modify their systems.

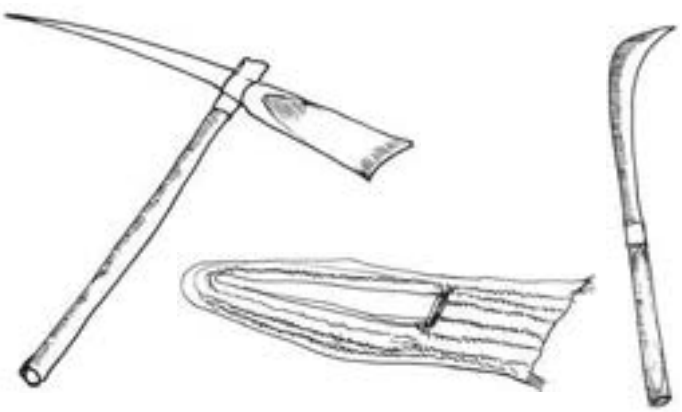
There are various ways of categorising shifting cultivation systems, depending on the criteria used. Two types of shifting cultivation systems are often distinguished in Laos:

(1) Rotational, and
(2) Pioneering.

In rotational shifting cultivation, the most common type in Laos, 'established' swiddeners keep their villages in the same place but shift their cultivated plots according to a crop/fallow cycle that depends upon several factors. In pioneering shifting cultivation systems, 'pioneer' swiddeners move their whole village settlements from one site to another after several years, mainly because the nearby forest has become exhausted.

Swiddening is more than cropping

A shifting cultivation system is not only about crop production. Animal husbandry, fishing, hunting and gathering NTFPs are also important activities for Lao shifting cultivators. In every shifting cultivation village these activities are closely interrelated with the crop/fallow cycle. For instance, fallow land is important for livestock grazing and cultivated plots must be fenced to protect them from domestic animals. The fallow area is also a major source of biodiversity and as a result, longer fallow periods generally enable the collection of more NTFPs.



An overall perspective on shifting agriculture in Laos (Roder 2001)

"In most countries, slash-and-burn agriculture has regional importance only, but for the Lao PDR it is a major land-use practice involving more than 150,000 households or 25% of the rural population. If all the fallow land is included, shifting cultivation may use up to 80% of the soils used in agriculture. Low population densities, low incomes, and low access to inputs in the past made slash-and-burn agriculture the best land-use option for the rural population in the hilly regions of the country".

"Today, increasing population pressure, increasing degradation of the resource base, global awareness of off-site effects, and an increasing interdependence between lowland and hill farmers have changed the situation and demand a new approach. It is thus not surprising that the government has given high priority to transforming this perceived harmful system to other agricultural systems. Information on the production system and improved technologies available for extension are limited, mainly because past research and development efforts concentrated on lowland rice production systems. Furthermore, the wide diversity of biophysical and socio-economic environments provides a major challenge for the research and development process".

"An in-depth understanding of the existing production system is required to formulate recommendations for changes. Quantitative data on soil, water, plants, and other biophysical factors of the systems remain limited. It must also be emphasised that long-term solutions to the problems faced by Lao slash-and-burn farmers cannot be found by focusing on their production systems in isolation. The problem can only be solved by a holistic approach that takes into consideration the entire economy and social fabric of the country and its neighbours. Interdependencies and linkages in the national economy, especially employment opportunities, market opportunities, access to social institutions, and rules regulating off-site effects, need to be recognised and exploited to optimise benefits for the households that now depend on slash-and-burn agriculture".

Forestry, agro-forestry and NTFPs

Traditionally, shifting cultivators perceive three major types of forest: the village forest immediately surrounding the village, the forest fallows used for cultivation and the primary forest. Being 'forest farmers' they usually have a good knowledge of the forests. Upland villagers use many agro-forestry practices, ranging from the traditional to the more modern. Some are also involved in timber plantations (mainly teak). NTFPs are widely collected by Lao shifting cultivators and are managed in different ways.

The fallow vegetation type can also be used as a criterion to differentiate swidden systems: forest or savannah. Forest fallow (mainly secondary forest) is more common than savannah in Laos. Swidden farmers are also categorised into 'integral' or 'partial' swiddeners. Integral shifting cultivators are those for whom swiddening has traditionally been of primary importance in their livelihoods, while partial swiddeners are sedentary lowland farmers who also do some swiddening to complement their needs.

Evolution of shifting cultivation systems in the Lao PDR

The Lao government objective of reducing and stabilising shifting cultivation is well known throughout the country and is certainly the major reason for the decrease and other changes recently observed in shifting cultivation areas throughout Laos. However, there are other factors that influence swidden systems and practices such as population increase, growing market opportunities, and changes of attitude among shifting cultivators. Although many Lao farmers have already reconverted their shifting cultivation systems into sedentary agricultural systems, there are still many farmers who cannot completely reconvert their systems due to various constraints including limited availability of flat land, limited family manpower for more intensified forms of agriculture, limited technical know-how for growing wetland rice, ethnic traditions revolving around the rice cycle, and limited knowledge of crop science.

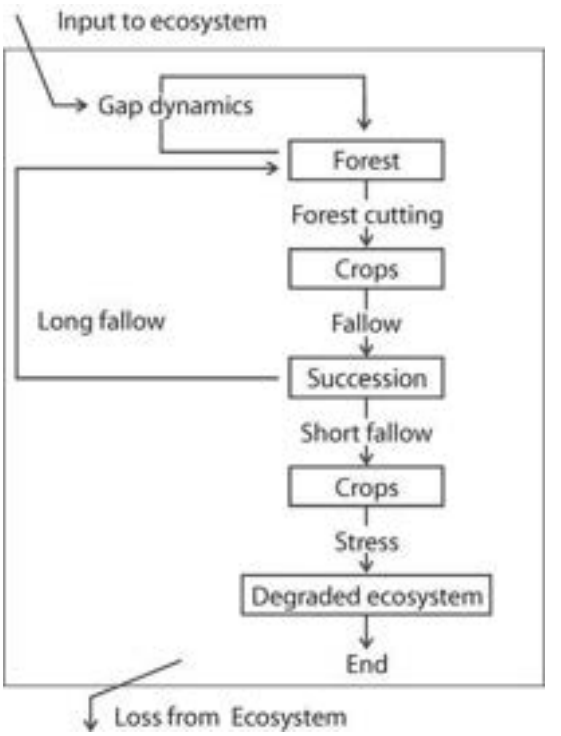
The fallow phase and period

The duration of the fallow period is very important when trying to understand the functioning of a given shifting cultivation system and envision the possible alternatives. Traditionally, Lao shifting cultivators have tended to apply a fallow period of between ten and twenty years to allow the forest to regenerate. This is not practical anymore though, due to population increase, limitations of geography, and government policy. In many villages the fallow period has dropped to three to five years, especially near roads and in areas with higher population density. However, there are still a few remote villages where the fallow period is over five years and can even be ten years or more.

Fertility decline, weed infestation, forest destruction, and loss of biodiversity are all associated with the shortening of fallow periods. For a shifting cultivation system to remain balanced without additional inputs, it is generally considered that the fallow period should be about eight to twelve years, depending on the soil and natural vegetation types. When the fallow period is shortened there is a need to compensate for the fertility decline. The impact of the shortening fallow period is the main constraint agronomists have to address when developing technology options to stabilise shifting cultivation systems in Laos.

NTFPs represent an important source of income for shifting cultivators and for the country, and fallow management plays a very important role in their availability. Several NTFPs require a relatively long fallow period while the level of biodiversity is also generally higher in fallows of long duration.

Forest ecosystem dynamics with shifting cultivation (Warner 1991)

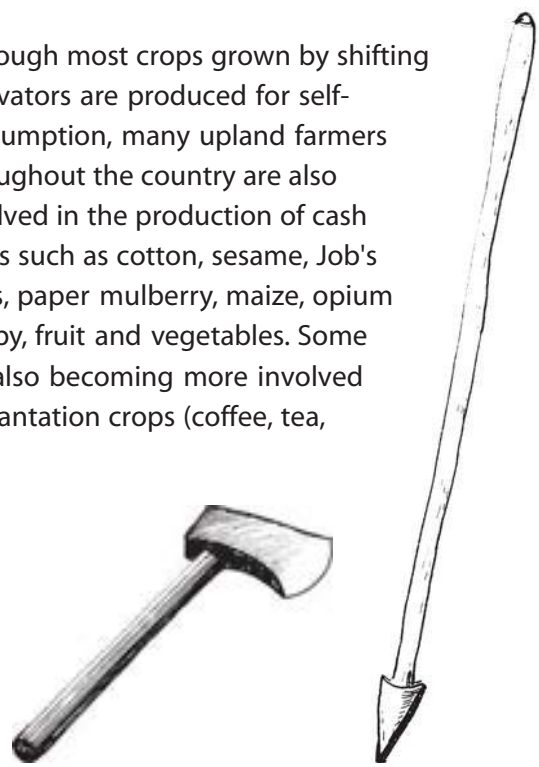


The cropping phase and systems

The main cropping period for shifting cultivators is the wet season. A shifting cultivation plot is generally cultivated for one year without tillage but sometimes the same plots are planted for two or three consecutive years. When this happens, tools are then used for tillage before sowing.

Upland rice is the main crop grown by Lao shifting cultivators. In addition, several other crops are grown in smaller quantity, either in the same or in adjacent plots: cassava, maize, cotton, yam, cucurbits, chillies, sesame, Job's tears and sweet potato. Shifting cultivators generally practice mixed or multiple cropping and agricultural diversity tends to be higher in shifting cultivation systems than on the sedentary farms of the lowlands.

Although most crops grown by shifting cultivators are produced for self-consumption, many upland farmers throughout the country are also involved in the production of cash crops such as cotton, sesame, Job's tears, paper mulberry, maize, opium poppy, fruit and vegetables. Some are also becoming more involved in plantation crops (coffee, tea,



Cropping calendars and farming practices

Main field operations managed by shifting cultivators throughout cropping phase	
Activity	**Period ***
Site selection	December.
Tool preparation	December-January
Slashing	January-February
Main burning	March-April
Clearing and second burning	March-April
Building field house	April-May
Sowing	March-April-May
Fencing	April-May
Weeding	May-August
Collecting NTFPs	May-September
Harvesting	August-November
Threshing and transport	September-November

**These operations do not necessarily strictly follow each other and actually often overlap. Throughout the country, variations exist in techniques and timing of the operations. For example, fencing often happens before sowing.*

rubber, cardamom) or timber (teak). Domestic animals and NTFPs are often sold by shifting cultivators, while nowadays most Lao upland farmers are connected to the market economy even if they still often practice barter trade.

Production inputs: labour and tools

Compared to more modern sedentary lowland farmers, shifting cultivators generally use much fewer purchased inputs. The main inputs are family labour, hand tools, seeds and animals. Purchased fertilisers are never used on sloping land (they would be washed away by the rain anyway). A small number of mountain villagers use commercial herbicides to reduce the need for weeding upland rice, but Lao shifting cultivators rarely use insecticides.

Big tractors and hand tractors are not used on sloping land under shifting cultivation. Even buffalo ploughing is not used in shifting cultivation, with the exception of some Ho in Phongsaly province who plough grassland fallows.

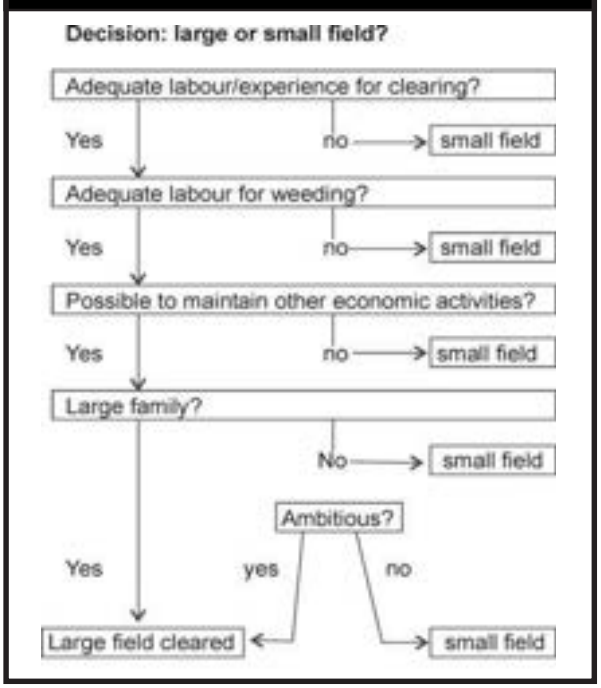
The tools used by Lao shifting cultivators are generally locally-made traditional implements but market-bought tools such as hoes, knapsack sprayers and modern axes are now reaching some remote upland villages. Tools used for cutting the vegetation include various types of axes and knives or machetes. Planting or 'dibbling sticks' are used for sowing. Locally-made small weeding tools are used everywhere, sometimes alongside bigger hoes that are purchased for land preparation. Not all upland farmers use sickles to harvest rice: many farmers strip the grain straight from the panicles into their baskets. Various types of such local basket are used to carry seeds, agricultural products, firewood and other NTFPs.

When shifting cultivators reconvert themselves into sedentary farmers they have to learn how to use new tools and techniques never used before on sloping land including buffalo ploughing, tractor ploughing and wetland rice cultivation. The learning curve can be long and difficult.

Site selection

The village community chooses where the fields for the coming season will be established. In most cases, several groups of families will have their plots adjacent to each other on the selected sites. The size of each family plot depends on the availability of workforce in the family. There are various indicators used for site selection: forest cover, soil type, plant species, presence of leaches, field orientation, distance to village, and so on. Primary forest with too many tall trees is not often selected for cropping because it requires more work to slash the vegetation: secondary forest is often preferred. Long-established shifting cultivators generally have an intimate knowledge of their environment.

Size of field: decision making process (Warner 1991)



Slashing standing vegetation

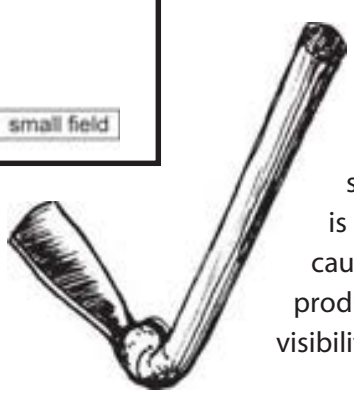
Slashing the bush vegetation is a community activity practised across Laos. The duration of slashing operations depends on the biomass to be cut, varying from 100 hours per hectare for a herbaceous to bushy fallow (fallow period of two or three years) to 500 hours for an older fallow of ten years with trees. Machetes are widely used for cutting the vegetation but bigger trees are cut with axes and sometimes saws.

Drying slashed vegetation

This operation simply requires leaving the slashed vegetation to dry in the sun for about three to four weeks. This creates a humic natural mulch that covers the soil and protects it against the sun and the impact of violent tropical rains. The degrading organic matter not only preserves the structure of the soil but also stimulates microbial fauna. The combined effects are good for seed germination.

Main burning of dry vegetation

The day for burning is carefully chosen since it is a delicate activity. All family plots must be burnt the same day and as quickly as possible to ensure the maximum consumption of organic matter. Burning generally takes place during the hottest sunny hours of the day but If the risk of village fire is high, burning takes place at night as it is then easier to spot accidental fires. The main burning is a spectacular and noisy operation, causing huge flames on the hills and producing heavy smoke that reduces visibility and pollutes the atmosphere. The



burning quickly decomposes vegetation and soil organic matter into plant nutrients that are readily available for the crops. It reduces soil acidity, increases the availability of phosphorus, and also kills weed seeds and parasites.

Clearance and second burning

Depending on the quality of the main burning, a second burning may be required before trunks and debris are removed from the field. This clearance is a family activity (husband and wife) performed at the level of each individual family plot, but systems of mutual assistance or labour exchange are used if there are high volumes to be removed. The activity requires between 50 and 250 hours, depending on the volume of organic matter to be reburnt or removed from the field. Burning stacks of debris results in spots with higher concentrations of ashes that are often used for planting some associated crops.

Land preparation, tillage and weeding

Before sowing there is generally no tillage in shifting cultivation fields. In a few cases however, especially under short fallows or when a field is used for a second or third consecutive year, tillage and weeding are performed using a small hoe. This long and exhausting activity is mainly executed by women and takes about 100 hours per hectare. Stumps are not removed unless the field is progressively being converted into a permanent field. Termite mounds are kept and never levelled. A swidden field presents a lot of micro-site heterogeneity. The lack of tillage on sloping land and the presence of much debris in the field drastically reduce soil erosion during the first weeks of the cropping period.

Sowing

Sowing is a very important family activity in shifting cultivation with traditional religious, social and economic connotations. Rituals are generally performed before and during sowing. Men make holes using a dibbling stick while women follow with seed bags and throw the seeds in the holes. Rice is the main crop sown but rice seeds can be mixed with other crop seeds. The time for sowing varies between 70 and 150 hours per hectare, according to the experience of the team. In fields where tillage is performed (as in the case of second- and third-year fields) rice seeds can be broadcast instead of being planted in the holes made by planting sticks.

Fencing and field houses

Fencing takes place before or after sowing, using wood and bamboo or sometimes even by digging trenches around the swidden field. The fence protects the field against buffalo, cattle, horses, goats, pigs and also wild animals (wild boars and deer in particular). The time required for fencing varies from 50 to 120 hours per hectare according to its quality. It is generally an activity performed by men. A field house is also built to shelter family members, for cooking and eating, for keeping tools and for storing harvested products.

Weed management

Weeding is the most labour-consuming and tedious activity of the cropping cycle. Weed infestation is particularly problematic under short fallow periods: in general, the shorter the fallow period, the more weeds affects crop yields. Weeding is performed almost continuously from May to October, most often by women and children, using small hoes and machetes. In three-year fallow fields it takes 400 to 1,000 hours per hectare to remove weeds. Weeding may account for up to 50% of the labour inputs of a cropping cycle and is perceived by many Lao shifting cultivators as the major constraint to upland rice production (ahead of pests, insufficient rain, and land availability) .

Harvesting

Rice harvesting techniques vary widely according to ethnicity. Mon-Khmer groups such as the Khamu, Katang, and Mankong prefer to strip the grain from the panicles in the field using bare hands, and put it straight into baskets. No threshing is required and the grain can immediately be stored in granaries. Others, such as the Tai-Lao, Hmong and Yao, prefer to use sickles for cutting stems and leave the sheaves to dry in the field before collecting and threshing them. It takes more than 150 hours per hectare for the manual stripping method and about 100 hours per hectare for the sickle method. Associated crops are generally harvested before rice. Upland rice yields vary from between 0.8 and 2.5 tonnes per hectare, depending on fallow length, seasonal rainfall, soil type, pest incidence and weed infestation.

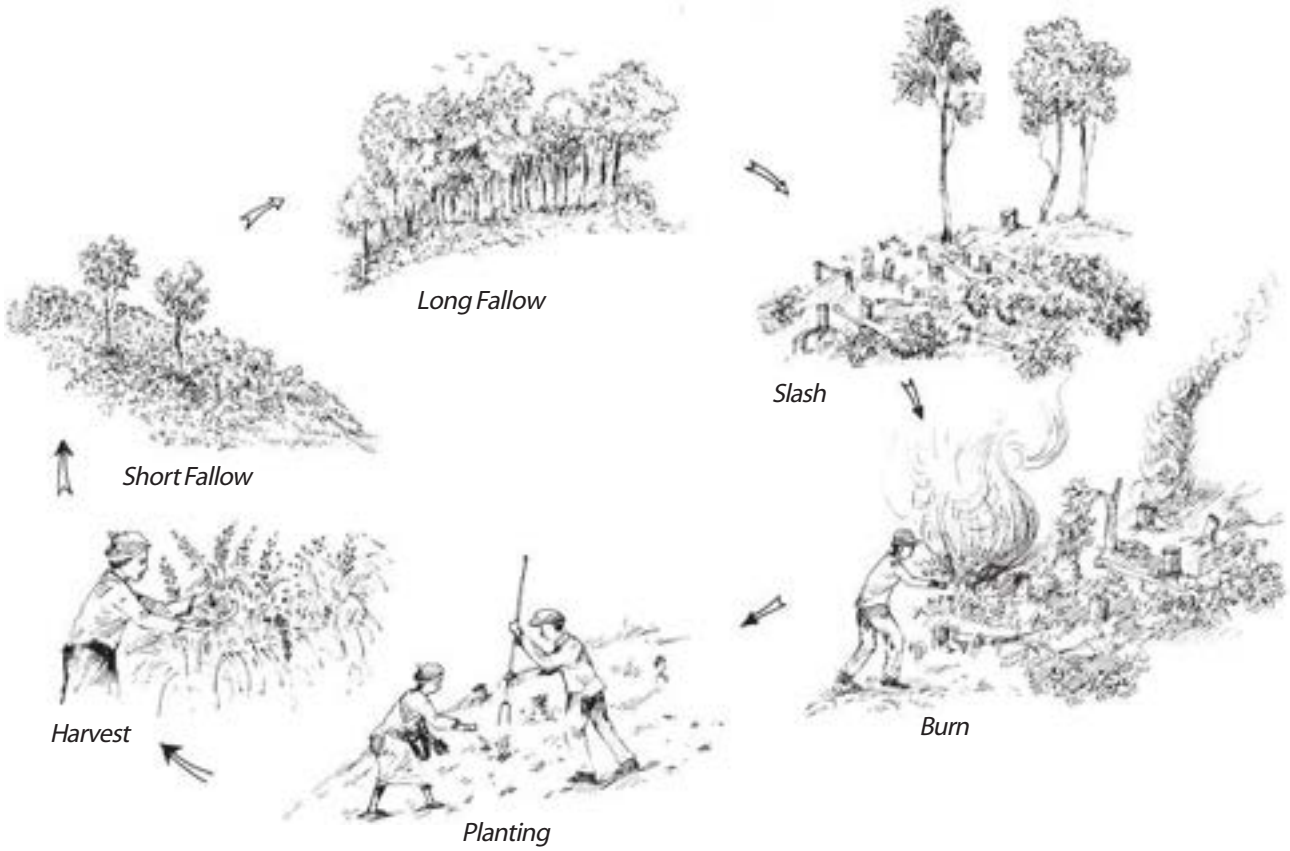
Livestock and fisheries

All Lao shifting cultivators also raise animals. Livestock represents a major source of income and is also used in rituals. Most families have small livestock: poultry, pigs and goats. More affluent families also have large livestock: cattle, buffaloes and horses. Forest fallows, shrubby fallows and harvested fields are used as free grazing areas for cattle, buffaloes and goats. Poultry and pigs are often fed with maize, rice bran and other feed. Livestock development plays a major role in villages where shifting cultivation is being reduced and stabilised.

Although fish is less important than livestock, fishing and fishculture can be significant for some shifting cultivation communities, depending on their access to streams and water bodies. Bee keeping is also practised in several shifting cultivation villages.

Transport and storage

Transporting the harvest to storage systems can be tedious when fields are far away, so horses and buffalo are sometimes used to carry the crops. A number of different storage systems exist: bamboo granaries on stilts, bamboo jars, storages under houses, and sophisticated wooden granaries. In Khamu villages rice granaries are located away from the house to protect them in case of accidental fire. When the harvesting is finished, the rice is transported to storage locations immediately.



Rice milling

Rice milling is traditionally performed either by using a foot-operated rice pound or by using hand-operated wooden utensils. More and more small engine-powered rice mills are now being used throughout the country, even in villages located several hours away from the road.

Conclusion: key points about shifting cultivation systems in the Lao PDR

Important aspects of shifting cultivation with implications on strategies for developing potential alternatives include the following:

- Shifting cultivation systems and farming practices are diverse in the Lao PDR and are most common in the uplands.
- Lao swidden systems are not static: most of them are progressively evolving into more sedentary forms of agriculture.
- Government policy, population increase, social change and market integration are major factors for change.
- Fallow periods are generally becoming shorter.
- Slash-and-burn agriculture is practiced by all ethnic groups and has an important socio-cultural dimension.
- Upland rice is still the major crop grown by Lao shifting cultivators, in association with several other crops, including some cash crops.

- Besides crop production, Lao swiddeners are also involved in livestock and NTFP collection, which generally represent their major source of income.
- The majority of Lao shifting cultivators belong to the poorest section of society and are presently the focus of most rural development programmes.
- Lao integral shifting cultivators possess an intimate knowledge of their biophysical environment. Their indigenous knowledge can be combined with scientific experience to develop sustainable alternatives to swiddening.
- The most criticised aspects of shifting cultivation include cutting trees, use of devastating and polluting fire, lack of 'modernity', use of large amounts of land, and lack of sustainability under high population density.
- The most attractive aspects of long-fallow shifting cultivation include adaptation to forest farming, suitability for highly heterogeneous environments, low incidence of pests and diseases, independence from purchased inputs and maintenance of agricultural biodiversity.

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Shifting Cultivation Practices in the Nam Nan Watershed

Upland communities have been practising shifting cultivation for centuries. Shifting cultivation is not only an agricultural system, but also has a special significance in the guiding beliefs of the societies that practise it. The social relationships, cultural values and mythical beliefs of such societies are directly linked with the practise of shifting cultivation.

Shifting cultivation is an extensive type of agriculture suited to the mountainous terrain of Northern Laos. However, it lacks the long-term stability of intensive irrigated cultivation, which is capable of supporting a much larger and more stable population. Thus, while shifting cultivation may give a higher yield per hectare when new, it can support only a relatively sparse population because of its declining fertility. Shifting cultivation practices change over time in response to various factors, including availability and type of land, population dynamics, climate, availability of labour, need for cash, market access, past practices, food preferences, ethnic group and government policies.

Policy framework

Land management and land-forest allocation is currently one of the key policies and programmes of the government of Lao. Land tenure in shifting cultivation areas is traditionally acquired by bringing unclaimed land under cultivation. This system allows farmers to clear land not already claimed by other families. Land-use rights are kept during the following fallow periods but may be handed over to other families at the discretion of the original owner. With the decreasing length of fallow periods, most land under shifting cultivation is used for several cycles of alternating cultivation and fallow, in a more or less fixed rotation.

With increasing population pressure and competing land-use objectives (especially forestry, irrigation and hydropower generation), the authorities have decided to regulate the acquisition of land. This is done through village-based land allocation schemes. The government has outlined a range of strategies for improving land management, planning and allocation. Land-use planning and forest allocation is considered a key national strategy for eradicating poverty in rural areas as well as a way of improving community-based natural resource management.

Where fallow periods are sufficiently long, shifting cultivation may limit soil degradation, weed competition and pest damage. In practice, longer fallows have been replaced by shorter bush fallow systems of agriculture. Fallows are shortening but the length of the cropping periods may remain the same or even increase. This leads to declining productivity and may make the land unsuitable for further cultivation for many years: re-establishment of secondary forest fallow vegetation is made slower or totally impossible, some areas become bare, and soil erosion begins .

Shifting cultivation in the Nam Nan watershed

In the Nam Nan watershed in Nan District of Luangprabang Province, shifting cultivation is the dominant farming system in terms of area, rice production and general crop production. The system followed by most farmers is based on one year of cultivation, alternating with three to seven years of fallow. Shifting cultiv- ation in the Nam Nan watershed consists of complex farming systems that vary according to the ethnic group involved. The three ethnic groups (Khamu, Hmong and Lao Loum) disc-ussed in this article generally live in areas that differ in slope and elevation. This in turn affects their dependence on shifting cultivation.

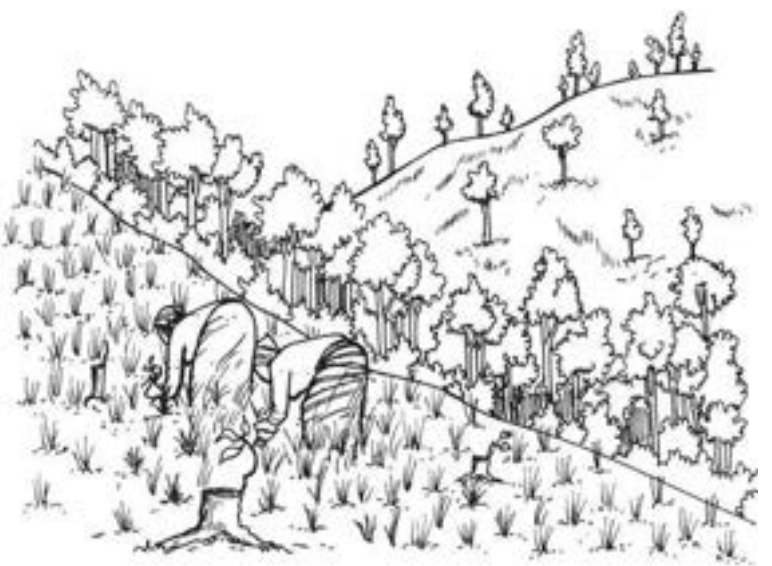


Table 1: Variation in farming practices among different ethnic groups
(Source: village survey, July 1999)

	Lao	Khamu	Hmong
Elevation	Low	Middle	High
Reliance on shifting cultivation	Supplementary, often near to paddy	Greater reliance on shifting cultivation	Rely on shifting cultivation, often far from the village
Weeding tools used	Weeding knife	Weeding knife	Small hoe
Harvesting	Cut straw with a sickle	Strip heads by hand (for short term rice)	Cut straw with a sickle
Post harvest	Dry for 3 days in the field, thresh, carry to the village	No drying, store in field and carry as needed	Collect and make pile, dry and thresh in the field, store in field or village depending on distance
Cropping pattern for upland rice	Intercropped	Intercropped	More single crop
Field pattern	Often individual plots	Household groups (5 to 10)	Large household groups
Rice varieties	Glutinous	Glutinous	Non-glutinous/glutinous
Livestock	More buffalo	Fewer livestock	More cattle and pigs
Home garden and fruit	More trees, garden area and cash crops	Less	Less

Lao Loum farming experience and practices are developed for lowland glutinous rice cultivation along the river and in the mountain valleys. In recent years, as a result of poor management and increased demand for land, Lao farmers are beginning to move up the hillsides. The Lao generally plant corn on the lower slopes and establish agroforestry systems that include mango, pineapple, banana, sesame, upland rice and Job's tears.

Khamu people normally carry out shifting cultivation where they live, at medium altitude on mountains. Khamu traditionally practice rotational cultivation, with fallow periods of three to six years, depending on soil condition and land availability. Regeneration does not reach the same proportions of biomass and nutrient availability as highly regenerated forest, but compensating for this is the fact that the land can be used again after a relatively short fallow period. The Khamu here do not own paddy fields but are totally dependent on mountain rice fields.

Some Khamu families cannot meet year-round subsistence needs without supplementary resources. Rice supplies often run out before harvest, when maize and food other than rice provide some relief. This is apt to occur around July, and it is at this time, when weeding requirements also begin to lessen, that many Khamu men look for wage labour, which has become extremely important to Khamu people. The weeding is then continued by the women.

Hmong prefer to establish shifting cultivation areas in primary forest because the rice yield per labour expended is better. The forest is vital for continuing the way of life of the Hmong as shifting cultivators. The Hmong live in the uplands, approximately 1,000m above sea level. Some cultivate poppy as a cash crop or to pay for weeding labour. Rice, maize and vegetables are also cultivated as subsistence crops.

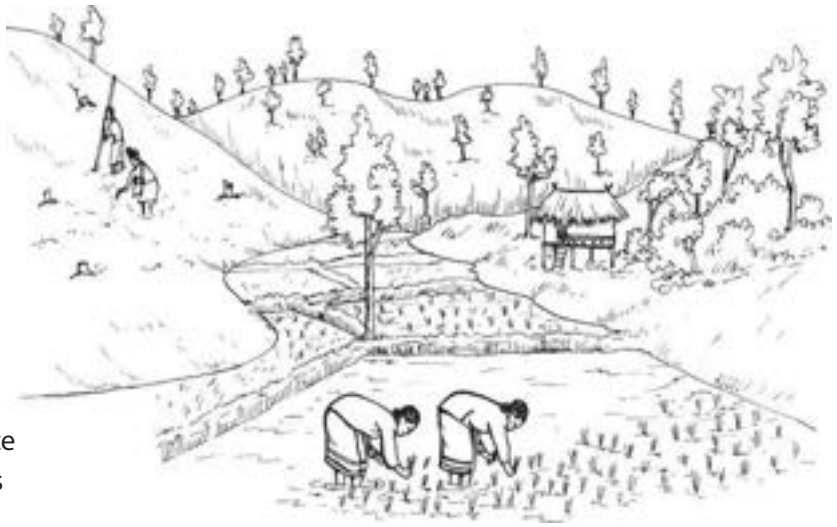


Table 2: Average labour requirements for shifting cultivation (man days per plot)

Activity	Lao	Khamu	Hmong
Site selection	1	1	1
Slashing	60	45	30
Burning	1	2	1
Clearing and re-burning	10	20	46
Sowing	32	25	40
Fencing	5	5	10
Guarding	1	1	2
Weeding (3 times)	130	145	109
Harvesting	30	25	40
Threshing	20	20	52
Transporting	30	15	10
Total	**320**	**304**	**341**

Crop production

Shifting cultivators in the watershed area practise a subsistence-orientated agriculture economy. The primary goal of every household is to produce enough rice for their own consumption during the year plus some for livestock, entertaining guests, making liquor, and so on. Rice is intimately involved in the culture as well as in the food and economy. It is the main crop produced by secondary forest.

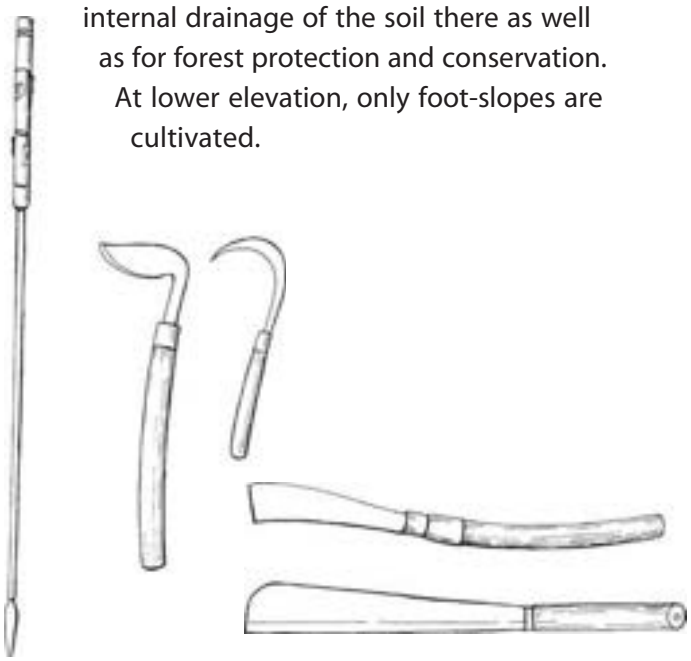
Different methods of site selection	
Hmong	**Lao and Khamu**
Hmong are very careful in choosing the site to be cultivated, considering the physical characteristics of the site, the type of soil and its vegetation. Plots chosen are mostly former swidden fields of six or seven years fallow	The Lao and Khamu have farmed sites over and over in the past and judge 'site readiness' by regeneration and re-establishment of woody, broadleaf vegetation from the fourth year of fallow.

Period of cultivation

For the Lao people, a season of shifting cultivation starts in early February and ends in mid December (i.e. ten months). For Khamu and Hmong, the cycle starts in early January and ends in late November/early December (i.e. eleven months).

Site selection

Site selection begins in January and is extremely important. In general, shifting cultivators seek out areas with the best soil available or the soil most suitable to the particular crop. If the top soil is not dark or black then it is considered to be an old soil that is already eroded. Hilltops and ridges are usually left uncultivated due both to rapid internal drainage of the soil there as well as for forest protection and conservation. At lower elevation, only foot-slopes are cultivated.



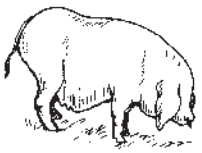
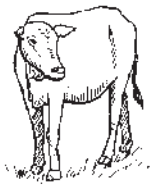
Tool preparation

Khamu and Lao shifting cultivators start preparing their tools and materials from early January. Some people buy tools directly from the market in town, while others exchange products for tools with local traders. Heads of families prepare chopping knives, weeding hoes, digging hoes and slashing knives.

Hmong cultivators usually make their own tools; usually each administrative group of five to seven families will have an iron works of their own. In early February the head of the family collects firewood to make charcoal for the iron-works and each family will start making tools in late February.

Animal husbandry

Livestock production by shifting cultivators is relatively common among the wealthy and mid-income level households. Poorer households have fewer animals due to a lack of capital.

	Consumed in the house (meat and eggs) also used by Hmong and Khamu in many ceremonies.
	Very important part of Hmong farming system, intensive pig production based on maize feed. All families, except very destitute families, raise pigs. Khamu pig production is smaller, with pigs raised in a free-range system allowed to scavenge in village and forest areas.
	Kept as pack animals but not used to transport people.
	Are only kept by people with paddy land for ploughing and puddling paddy fields.
	Are raised by Hmong due to availability of large grazing areas. They are sold for additional income and are regarded as a way of investing surplus capital.

Slashing

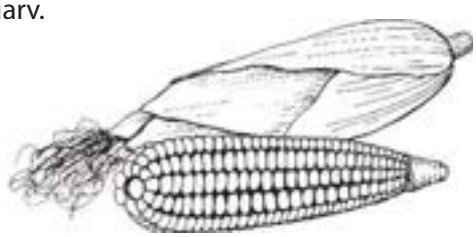
The husband and wife of each family work to slash the vegetation on the family plot. This generally starts in February, though the specific timing depends on the kind of vegetation and the availability of household labour. Two days after slashing starts, the heads of the families organise groups for labour exchange with groups ranging in size from ten to fifteen people. Slashing activities normally finish by late March.

For Khamu and Lao, the first day of the slashing season is in mid-February. The head of the family will sacrifice a chicken and pray to the spirits to ask permission to slash the selected area. The Khamu always respect the spirits of the forest and the bigger trees, believing that these spirits are the true owners of the land and all wild animals and trees. Slashing activities for the whole village usually take about 45 days. For the Hmong, slashing usually occurs in March as conditions are different higher up in the mountains.

Maize production

Maize is produced primarily for pig fodder but small quantities are eaten as young cobs and popcorn. Poor families may eat maize mixed with rice in the month before the rice harvest. Maize fields are usually larger than rice fields and average one or two hectares per family. Slashing for both upland rice and maize is completed in March. Fields are then left to dry before they are burnt.

Hmong farmers clear land (usually second year fallow) for planting maize after finishing the slashing for upland rice cultivation. The Khamu and Lao select their maize sites around January and Februarv.



Burning

Once the slashed vegetation is dry, all groups in the watershed will make a firebreak about three metres wide around the area to be burnt to prevent forest fires. If shifting cultivation fields are located close to each other then the owners will usually try to agree on the burning day to ensure that the fire does not spread to fields that are not yet dry enough. The burning season generally begins around the end of March or in early April. It normally takes about ten days to complete burning for a whole village.

Fields are burnt in order to:

- Get rid of the slashed vegetation
- Reduce weeds
- 'Cook' the soil
- Produce fertiliser from the ash

When areas are ready for burning, sacrifices are first made to the spirit of the fire and a few bamboo *taleo* (traditional no-entry signs) are placed at the shifting cultivation area boundaries. Fires are then started at the bottom of fields and are only allowed to spread little by little. To help control the fire, burning on windy days is avoided. Women and children do not attend the burning as it is very dangerous.

Cleaning and fencing

Three days after burning, usually in late April, farmers will start cleaning their plots. Any remaining debris left after the initial burning is collected and re-burned. Clearing shifting cultivation areas is primarily the responsibility of individual families and is carried out by both men and women. Although the amount of time spent on cleaning varies according to how successful the initial burning was, activities generally last for about 20 days. While women are cleaning and burning, men construct a hut on the site. This temporary structure will only last for a few years and is usually made from bamboo with a thatched roof of *Imperata* grass. The hut is used for:

- Shelter during heavy rains or strong sun.
- Preparing sacrificial meals.
- Overnight shelter when guarding fields just before and during harvesting.
- Temporary storage of rice during harvest time.

Generally, Lao shifting cultivators do not stay overnight in the fields as the distance to the village is short. However, Hmong and Khamu stay overnight because the walk from the village to their fields can take four to five hours.

Khamu and Lao fields are marked with logs running up and down the slope and a row of sorghum, Job's tears or maize. Fences, usually about 3 metres away from the border of the rice field, have to be completed before sowing. Unburned trees with diameters of 10 - 30 cm are often kept for fencing. Hmong shifting cultivators leave their fields open and unfenced as their fields are far away from the village and there is not the same concern about livestock coming to the fields.

Sowing maize and rice

Maize

The first crop sown is drought resistant maize, a local variety which often performs well on very little soil moisture. This is sown at the beginning of the rainy season after the Lao New Year in mid-April and needs no cultivation of the soil or weeding.

Rice

The Lao only sow rice once the rainy season is well established, usually in early June. Before sowing the head of the family will kill a chicken to pray to the spirits. Groups of fifteen to twenty people organise themselves on a labour exchange basis. Each group sows one plot per day. Men use dibbling sticks to make the holes which women then fill with five to ten rice seeds. Materials used for sowing are: seeding sticks, seed bags, rice seeds, and bamboo baskets or cotton bags for holding the seeds.

The Khamu have many different traditional ways of planting rice. Sowing starts at the end of April (if it rains regularly) or after the Lao New Year. Days of the week are often chosen for starting sowing according to whether or not they have been 'lucky' days in previous years.

Rice for sowing is carried to the field in big baskets from the rice barn. Seeding and dibbling takes one day per plot. If the rains are good then the seed will start to germinate within five days after seeding. Tools used for dibbling and seeding by Khamu are dibbles, bamboo baskets and hand bags.

Most Hmong shifting cultivators disturb, loosen and move surface soil as part of the planting process. Sowing starts in May or later, depending on the rains. The tools used for sowing are similar to the Khamu. In general, it normally takes about 15 days to complete the dibbling and seeding activities for a whole village.

Rice varieties

Glutinous rice is the primary crop for the Lao and Khamu people. Usually one or more varieties of glutinous rice are planted and can be grown without irrigation. Each variety has a different name which indicates properties such as its colour or whether it is an early variety or not.

Hmong shifting cultivators prefer to grow non-glutinous rice, although some glutinous is also grown. In times of crop failure the Hmong turn to maize as a major food source.

Home gardens

Most Khamu and Hmong families have a small chilli pepper nursery, usually close to the hut. Chillies are planted at home in old pots of cans and then transplanted to the shifting cultivation fields early in the rainy season. They are grown primarily for home consumption. Hmong and Khamu families produce most of their vegetables, root and tuber crops in their shifting cultivation fields: only the Lao practice gardening in household compounds.

Weeding

The first weeding, using knives and a blade knife, starts when the rice reaches the height of a finger span (about 15 cm).

The second weeding is normally carried out in early July which is also the flowering time for rice plants. This is more difficult than the first weeding due to the high density of rice plants. Some shifting cultivators are forced to hire extra labour to do the weeding., which is performed using a blade knife.

The third weeding normally starts in August, with each family doing it themselves. Great care is taken, as short-term varieties have already started to produce seed. The tool used is a knife.

Hmong cultivators sometimes weed four times, doing an extra weeding before harvesting. They do this because they only cut the panicle of the rice. Traditionally weeding is done by women, but sometimes the men also join in.

Harvesting

The harvest season starts anywhere between September and November. There are three harvests according to rice variety: short, medium and long term.

Short-term rice variety harvesting
The Khamu start harvesting in early September. They are afraid that the previous year's supply will not be sufficient. In addition, the early varieties have a type of rice grain that drops easily when ripe. It must therefore be harvested quickly and is not grown in large quantities. The rice is not cut but is harvested with bare hands. Farmers carry bamboo baskets and walk

around the field pulling the rice from the stem to the top end by hand. The harvested rice is spread on bamboo to dry in the sun for about three days. Lao cultivators harvest at the same time but use a sickle.

The Hmong start to harvest short-term rice varieties in mid-September, often without using labour exchange. The harvesting tool is called a *nong*. Rice is dried in the sun for three days, then piled and kept in the house.

Medium-term harvesting

For Lao and Khamu cultivators, medium-term harvesting normally starts in October and is finished within a week. Yields are higher than those of short-term varieties. Bunches of rice plants are cut using sickles and dried in the field for three days. After this, they are gathered in huge piles in the middle of the field. To protect the rice from animals and unexpected rain, a special method of piling the rice is used, with the top end of the sheaf of rice placed inside the pile. Hmong cultivators do not plant medium-term rice.

Long-term harvesting

For all groups, the harvest of long-term rice varieties starts between late November and early December, taking between seven and ten days. Yields are much higher than those of the early and medium varieties. Harvesting is performed individually without hiring extra labour. The tool used is the sickle.

Advantages of hand-harvesting: not so many steps (no pilling and threshing) and thus no rice loss

Disadvantages: time-consuming and can cause injuries to the hands

After harvesting is complete, the farmers will let the field become fallow and different species of vegetation will subsequently appear, including *nga falang* (*Chlomolaena odorata*), *nga khai* (*Pgonatherum crinitum*), and *mai khom* (*Muntigia calabura*).

Threshing

Threshing begins in early December in the fields. The piles of rice are kept in the middle of the rice field for two or three months before threshing, depending on weather conditions. Rice is threshed using a pair of sticks joined with a rope. The sheaf is then hit against some boards placed on bamboo mats. The impact removes the grain from the stalk. To make sure all the grain comes away, the sheaf is cut and hit again by a stick which curves at one end.

When threshing is completed the grain is fanned to remove any empty husks. In general all three groups use labour exchange, which means that each family has their harvest threshed in turn.

Transport

Transporting the harvest to the village is a tedious job but labour exchange is not often used because the rice goes to each individual family. Materials used for carrying upland rice are various kinds of bamboo baskets and bags. Rice is transported by both men and women, who carry rice baskets which hold between 10 - 30 kg of upland rice. The Hmong may use horses for transport and some Lao use buffalo. If the harvest is good then it may take two to three weeks or more to carry all the rice back to the village.

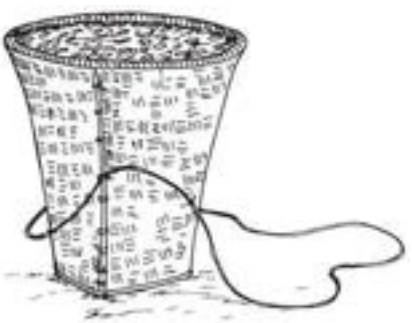
Post-harvest pests

To protect seed material, maize, sesame, Job's tears and chilli seeds are often stored under the eaves of the house where smoke from the fire place helps protect from damage by rats and weevils.

Storage

After threshing is finished, the main grain is taken out of the fields and kept in a temporary storehouse. Seed for next year's sowing is stored in special bamboo baskets in the barn.

Hmong families do not store grain in their houses but build granaries some distance away. This is to protect the rice should the house burn down. Khamu and Lao families store grain in their houses. Usually two or more family members sleep in the temporary store to guard the rice against animals and thieves until it can be carried to the village.



Changes in shifting cultivation in the Nam Nan watershed

The dynamics of the shifting cultivation production system in the watershed are changing. These changes are due to:

- Increasing problems with weeds (seen by shifting cultivators in the watershed as the most important factor limiting yields).
- A lack of soil moisture and decline in amount of humus in the soil.
- Soil erosion in the cultivated fields leading to declining soil fertility.
- The importance of fallow species for building materials, food, fodder and income generation.
- Shortage of labour.
- A need for technologies that can help increase production per unit area.

Table 3: Summary of the reasons for and inputs of shifting cultivation

Activity	Effects
Slashing and burning the vegetation	• Plant nutrients are made easily available in the ash. • Increased insulation leads to higher soil temperatures and rapid mineralization of humus. • Fire removes plant material from the soil surface and may kill pests, weeds and weed seeds.
Cultivation	• Plant nutrients are lost through crop harvest, accelerated leaching and erosion. • Soil structure may degrade due to the loss of organic material, compaction and erosion. • Weed species adapted to open field conditions proliferate. • Crop pests may build up.
Fallowing	• Plant nutrients accumulate in the vegetation and in the soil. • Soil structure is improved through biological processes. • Potential weed species are suppressed by shading. • Many crop pests are suppressed by the lack of host plants and the change in environment.

This paper is extracted from the author's Masters Thesis: *Shifting Cultivation Practices by Hmong, Khamu and Lao ethnic categories in the Nam Nan Watershed, Nan District, Luang Prabang Province, Lao PDR*. Swedish University of Agricultural Sciences, Department of Rural Development Studies, Uppsala, 1999.

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Shifting Cultivation: The Phunoy Traditional Management System

Properly managed swidden systems can lead to a balanced and productive environment. When traditional fallow periods are kept, forest regenerates into a harvestable resource.

Shifting cultivation is often described as 'traditional', inflexible and outdated, in contrast with 'modern', mechanised and chemical agriculture. That belief overlooks farmer know-how, which is accumulated over generations to exploit natural resources while adapting itself to the physical, social and economic environment. Research conducted in Phongsaly provides an idea about how complex and consistent a slash-and-burn farming system can be, and how farmers optimise family labour but also limit their risks.

Economic study of Phunoy shifting cultivation

Forty rural villages, mainly from the Phunoy ethnic group, were studied between 2002 and 2004 in Phongsaly District. In each of the villages, interviews with elderly farmers made it possible to reconstruct the historical evolution of the village, while farm surveys made it possible to characterise current agricultural practices and the differences between villages and families. The study surveyed family farming practices and their results over the past five years, as well as other economic activities like gathering, fishing, hunting, handicrafts and trade.

Phongsaly district is hilly and uneven, with some twenty peaks over 1,500 metres high. The valleys are very steep, limiting the potential for agricultural hydraulic projects. The altitude and latitude temper the tropical influences here, providing a cool dry season and a milder rainy season. The very high variability in rainfall (980-1,860 mm per year) strongly contributes to the success of farming activities. Evergreen mountainous rain forest dominates at altitudes over 800 m, with tropical rain forest at lower elevations. These forests have great biodiversity and are very productive.

To lowlanders, images of recently slashed-and-burned fields are traumatising. However, in traditional Phunoy farming, fallow soon returns to a healthy ecosystem.

Zoned agricultural production

Village agricultural production is traditionally based on land use in three distinct zones:

- **Village gardens:** small vegetable garden near the house, with tubers and fruit trees for household use. Poultry also wander among the houses, looking for waste food.
- **Sacred crown:** the village, generally located near hilltops, is surrounded by a forest crown, which acts as a water reservoir. Free-range pigs forage for food and are also given supplements.
- **Slash-and-burn zone:** swidden farming occupies most of the village land. Some is recently cleared and planted but 60% to 94% is left fallow in landscapes ranging from grassland to secondary forest.
- **Crop technique:** Villages along the road-side or near Phongsaly town do substantial trade with city people and are close to administrative services; that is the case for 16 out of 40 villages. In the forest zone, over two hours' walk from town, trade is lower and public services less forthcoming.

Slash-and-burn fields

In the village of Samlang, following the clearing and burning of a strip of forest, plots are planted for one year, sometimes two. In year one, glutinous rice dominates, with many secondary crops (maize, tubers and roots, curcurbits, cruciferae, peppers, sunflower and groundnuts). In the second crop year, rice is sown alone - the farmer simplifies in order to preserve his priority crop. Farming stops on a plot after one or two years because of fertility and weeding problems. The bottleneck in this system is the weeding, requiring 75 days per active worker each year. It must be done according to a specific, restrictive schedule, or

else weeds damage the yields of rice and other crops. In June, July and August, weeding monopolises the entire workforce. After the second crop year, the plot is freed for forest regrowth, with a 13-year fallow period that makes the land fertile for the next cycle (Ramakrishnan 1992). The fallow land is also the pasture area for cattle and water buffalo.

Active management

Due to low population, labour is the major constraint to production. There are more potentially farmable areas than are actually farmed. Even if families have time to clear more land, they limit their area due to the overload of weeding in the middle of the rainy season.

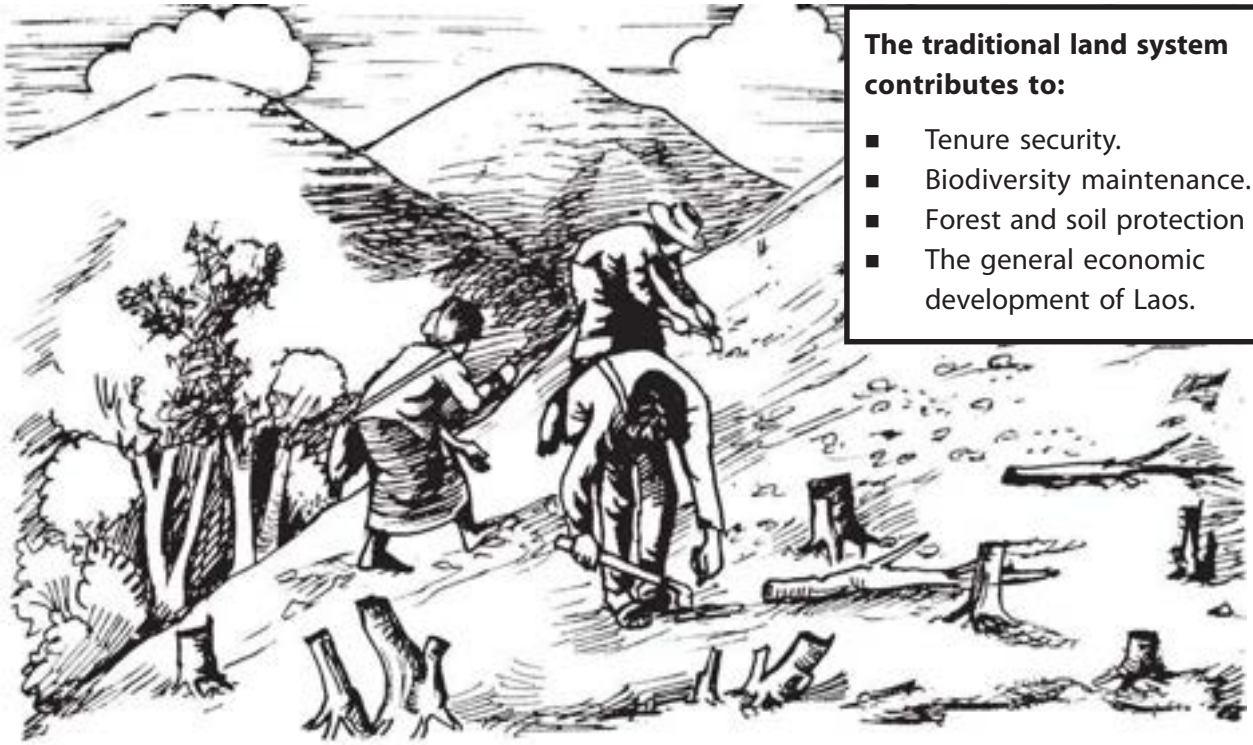
The fallow period is important due to many factors: letting the forest grow back does more than just make the soil more fertile. In addition to the build-up of vegetation for mineral enrichment and soil structure, there is also pest control. The density of harmful insects and weeds in a slash-and-burn field decreases rapidly when longer fallow periods are used (Van Keer 2003). If there are short fallow periods and rapid crop rotations, soil erosion is also greater, damaging future production (De Rouw et al. 2002).

Yield constraints in slash-and-burn fields: order of importance according to farmers in three different studies

	Northern Thailand (Van Keer 2003)	Laos (Roder et al. 1997)	Samlang (Ducourtieux 2003)
1	Number of successive crop years	Weeds	Drought once every three years
2	Climatic hazards	Rodents	Root parasites
3	Topographical position of the plot	Inadequate rainfall	Rodents
4	Weeds and predators		

Animal raising

Livestock plays an important role in the family economy, especially as a means for saving and capitalisation. Water buffalo graze freely year-round on fallow land. Raising of cattle has been limited by food restrictions: cattle eat only grass, whereas water buffalo graze indiscriminately on grassy and shrubby fallow.



The traditional land system contributes to:

- Tenure security.
- Biodiversity maintenance.
- Forest and soil protection
- The general economic development of Laos.

However, a new incentive policy and strong urban markets are now encouraging people to raise cattle in the easiest-to-reach villages.

Animal raising can be economically hazardous: Small species are affected by recurrent epidemics of Newcastle disease and cholera among poultry, and swine fever among pigs. For buffalo and cattle there are fewer problems, but accidental mortality is high, with predators accounting for 75% of losses.

Secure family tenure

Agricultural production is a nuclear family activity, but clearing is regulated at the village level. Every year the active workers slash a single strip on the village land. In the strip, each family farms its own plot, of which it is the owner: the field is always planted by the same farmer and the plot is inherited by the children. With population growth, there is a trend towards splitting up plots from one generation to the next. Regulating this sub-division of surface area is complex, based on four successive mechanisms: loan of land between families; possible lengthening of crop period from one to two years; departure of part of the population; acceleration of rotations as a last resort.

In many other slash-and-burn farming systems villagers decrease the fallow period in response to population growth. Phunoy management favours keeping fertility and satisfactory production levels: a fraction of the village population, essentially the younger generation,

Swidden Field Actions	Factors Affecting Decisions
What surface area to clear? Calculating the ideal dimensions	• Topography of the plot • Previous years harvest • Current stock or shortages • Distance from the village • Potential fertility- based on past crops and soil texture or colour observations
The sowing plan: choosing the varieties and their distribution on the plot Crop varieties enable precise adaptation to the farmers strategy	• Length of the cycle • Risk limitation (by multiplying the number of cultivars) • Adaptation to the soil and altitude • Crop technique • Rice required
Sowing the plot	• Based on farmers experience in using all the environments resources • Precise scale for each square metre sowing density depends on the slope • Tubers planted in large heaps of ashes • Maize in the wettest part
Family labour	• When the village clears several zones, workers first allocated to the most fertile plot. • Distribution of labour can evolve over the year • If a plot is substantially damaged labour transferred to other plots to limit risks of production drop

moves out to other places. This system, which gives land security to each family, is unique in shifting forest agriculture. Farmers can plan on investing in their plots so as to increase productivity. With its social control, Phongsaly's traditional land system allows farmers to:

- **Invest in their land**
  Nearly 12% of families have developed terraced rice fields, a remarkable investment of labour and capital for forest agriculture with low population density. The farmers also invest in market gardens and plantations of cash crops, such as cardamom or teak.

- **Maintain long fallow periods**
  Where traditional land management endures, rotation varies from eight to sixteen years.

- **Finance development of other economic sectors through transfer of capital from agriculture**
  The Phongsaly agrarian system thus exports manpower and capital to other regions and other activity sectors on a regular basis.

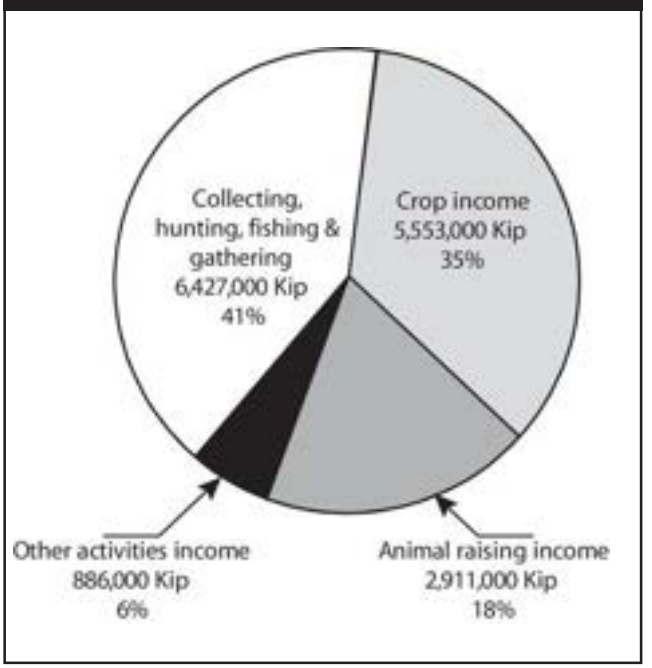
Adaptation to environmental variations and uncertainties

Swidden farming in Phongsaly is not a practice that follows a set standard. On the contrary, each family is constantly adapting its actions based on the natural (climate, soil, slope, etc.) and socio-economic (manpower, tools, markets, consumer needs, etc.) environment. During the crop cycle, farmers elaborate a unique technical itinerary, which differs from the

previous year and from the other families' methods (Sébillotte 1990). Shifting cultivation evolves: cotton and tobacco have practically vanished from the fields since the end of the 1960s, when low-cost manufactured products from China arrived on the local market. Poppy has also progressively disappeared under the administration's pressure. Meanwhile, some villages are now growing maize or white rice for the distillation and trade of alcoholic spirits.

Resources that are limited, such as workforce, or fragile like soil, forest, water and biodiversity, are individually managed by each family as part of their livelihood strategy. Associating crops maximises work productivity and income per area but, above all, limits the risks for the farmer. Crop failure from a particular situation does not jeopardise the family's survival if they can count on other harvests and activities. Dynamic and evolving allocation of the workforce and diversification of activities are two aspects of the strategy used for limiting risks and maximising family income.

Components of yearly total family income



There are other rescue strategies, such as sowing a plot again where growth is deficient due to lack of rain in April-May, or, when problems arise too late, sowing sesame as a main crop to replace rice.

Economic performance

The average family income in the forest zone village is over 15.6 million Kip (US$1,490) per year, including the market value of self-consumed produce. Cash income, at 2.1 million Kip ($200), is only 13% of the total income: the Phunoy farming system is focused on fulfilling a family's direct needs. Families conduct many activities to reach this income. Swidden farming ranks second, behind collecting (hunting, fishing, and gathering), which procures over 40% of the family income in forest villages. This is in line with the country average (Douangsavanh, Bouahom et al. 2002).

The farmers' strategy of diversification optimises use of labour and maximises income while limiting risks. Furthermore, the wide range of products in a self-consumption economy contributes to the balance of family nutrition.

The Phunoy system is just one example of knowledge accumulated over generations to exploit natural resources. Shifting cultivation is not an archaic and rudimentary practice, but a complex economic activity managed by farmers who adapt to changing conditions. They optimise the use of resources with practices that are based on neither chance nor inflexible norm, but on the know-how and experience acquired from one generation to the next. This precise and detailed use of resources leads to a generally forested landscape, dotted with small areas of crops.

Projects and policies that aim to improve livelihoods by converting farming practices sometimes overlook how diversified slash-and-burn agriculture is. Oversimplifying farming systems can impoverish people and expose them to natural and economic risks.

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Weed Control in Shifting Cultivation

Slash-and-burn, also called shifting cultivation, involves clearing and farming land and then letting it lie fallow. Practised in rural areas of Laos, from the lowlands to the highlands and by all ethnic groups, it is the primary means of food production. Shifting cultivation has been practised for generations, with upland rice being the principal crop grown in the highlands. It is subsistence-based, providing food, fibre, medicine and other needs from cropped, fallow and forested land.

Until recently, shifting cultivation practices remained relatively unchanged because of low population densities, little opportunity for trade, as well as minimal migration. The combined effects of increased population density, the government policy of limiting farmers' access to forested land, and the rugged mountainous terrain have all contributed to shorter fallow periods. As a consequence, widespread problems of weed infestation, soil erosion and declining yields are emerging.

Moreover, since rotational slash-and-burn agriculture requires an abundant supply of forested land for cropping, forested areas have been reduced to less than 30% in northern and central Laos (Phommasack et al. 2001).

For weed control, one of the most effective farming systems is long-cycle shifting cultivation using a combination of at least three techniques:

1. Weeding
2. Fallowing
3. Burning

Shifting cultivation has low productivity but gives high returns in terms of labour since it requires very little external input, provided a long fallow period is maintained. The burning of vegetation before one or two cropping seasons allows the soil to self-fertilise thus reducing the need for weeding and tillage. This is an important advantage since of all the major food crops, rice is the most sensitive to weeds and poor weeding is the principal cause of low yields in dry rice cultivation. Even a moderate cover of weeds in its early growth can reduce final yields by 75%.

The fallow as a weed break

The fallow period operates as a weed break because the overhead shade that forms suppresses the arable weeds, which need strong light.

Two phases can be distinguished in the process of weed suppression:

1) After the harvest many weeds persist into the first stage of forest re-growth. Progressively, shrubs, lianas and trees suppress the weeds. This first phase takes one to six years depending on the vigour of the woody component of the fallow vegetation.

2) The second phase is the period the land is allowed to remain under continuous canopy cover in order to reduce the number of viable weed seeds in the soil. It may require ten years to reduce the weed seed bank to tolerable levels.

Shifting cultivators use shade as a tool against the general build up of weed infestation: creating shade at the appropriate moment and maintaining it as long as necessary. Overhead shade can only be employed at the end of the cropping cycle because almost all food crops are strongly heliophytic (sun loving).

Using shade to control weeds is cheap and effective; however it requires a lot of land. Under shorter rotations, fields are likely to become infested by weeds because the shade-producing plants, the trees and lianas, get eliminated from the field by repeated slashing and burning.

Long cycles versus short cycles:
The main difference between longer cycles of ten to twenty years and shorter cycles of four- to six-year rotations is the build-up of an enormous weed seed bank. Due to frequent slashing and burning trees are progressively eliminated from the site because they cannot complete their life-cycle in between successive cropping periods. As a result the natural fallow vegetation degenerates to thickets and grassy shrub lands. In these cases the weed break no longer functions as there is no shade to interrupt the continuous re-seeding of the land.

Weed cover: *Chromolaena* versus grasses

Nya falang, or *Chromolaena odorata,* is a common thicket-forming plant that sprouts in fallow fields after harvesting. It makes a desirable fallow plant, providing high biomass and suppressing arable weeds by shading. However, if the same site is repeatedly cropped in two to four year cycles, the position of *Chromolaena* weakens as aggressive grasses that drive out other species. The most common grasses include *Imperata cylindrica* (*nya kha*), *Saccharum spontaneum* (*nya lao*) and *Microstegium ciliatum* (*nyang nyung*). These are troublesome because they resist fire and are able to regenerate from rootstocks or stems, particularly if they have been disturbed by operations such as tillage.

Introducing planted species in fallow fields

To improve fallow systems, some forage and edible plant species have been deliberately introduced to provide faster and more versatile fallows with similar ecological benefits to woody natural fallows. Planted fallows can help close the canopy and suppress weeds along with spontaneous vegetation. Lao-IRRI observations and experiments indicate that the shading effect of a natural fallow of *Chromolaena odorata* was quicker to establish and more effective than that of a planted legume species tested (Roder 2001). However, in some areas, the quality of the natural fallow has declined through frequent cropping and often grasses have replaced the sub-woody species. In these situations a planted legume fallow may contribute to the canopy cover and help suppress weeds under short-cycle conditions.

For planted fallow species to be effective, the methods must be cheap, practical and easy to establish. The introduced species must:

- Provide rapid plant cover after rice harvest.
- Produce a large amount of biomass.
- Mobilise plant nutrients from lower soil surface.
- Decompose quickly to accelerate nutrient cycling.
- Suppress weeds.
- Ensure fodder availability.
- Improve soil/water conservation.

Nya falang or *Chromolaena odorata*

Ngang ngung or *Microstegium ciliatum*

Nya lao or *Saccharum spontaneum*

Nya kha or *Imperata cylindrica*

Burning

Burning is often seen in shifting cultivation since it is the most practical means of clearing the land of debris before cropping. In addition, burning destroys a proportion of weed seeds, permitting farmers to begin cropping with a comparatively weed-free seedbed. Depending on the type of fallow vegetation, estimates of biomass at the time of clearing range from four to twenty tonnes/hectare (t/ha) dry weight. It has been demonstrated that the burning of 2.3 t/ha of dry weight reduces weed biomass in the rice crop by 14-60%. Moreover, grain yields are improved by 3-78% when compared to not burning and leaving all the debris on the soil surface to decay. Farmers are therefore likely to continue burning even when very little biomass is available (Roder & Maniphone 1998).

Weeding: hand-pulling and cutting stems

In long-cycle rotations, there are fewer weeds than in short cycles. Two principal methods of weeding include hand-pulling and cutting stems with a knife.

- In longer cycles, hand pulling or using a knife gives satisfactory results provided that weeds are not too numerous.
- Pulling weeds by hand results in 'residual' weeding leaving approximately 20% of weed biomass.
- Experiments show that more thorough or 'clean' weeding does not improve rice yields.
- Clean weeding may not be desirable because if all the weeds are destroyed, they may be replaced by aggressive grasses that are more difficult to eradicate.

It has been demonstrated in Laos and other countries that pulling weeds by hand or cutting stems at the soil surface results in low levels of weed pressure when the following factors are in place:

(1) A single rice crop with fallow periods over 10 years.
(2) Absence of grasses.
(3) Late and residual weeding.

- Another advantage to leaving residual weeds is that they help hold the soil in place, particularly on steep slopes

Herbicides in weed control

In shifting cultivation, herbicides are uncommon for many reasons:

- Relatively high costs, plus specific know-how is required.
- Weed control achieved almost exclusively by chemicals can be very unstable as dependence on herbicides encourages the spread of resistant weeds.
- A lot of weed flora consists of regenerating plants that are not killed by herbicides: when wood, sub-woody and weedy perennials contribute to weed biomass, spraying is less effective and repeated slashing is required.
- Health and environmental issues.

Consequently, the transition from a fallow system to a cropping system with herbicide use is not immediately successful. However, in slash-and-burn systems not yet invaded by coarse grasses, one application of herbicides prior to planting may be an option worth considering as this would allow early and timely planting making the crop more competitive.

Tillage and weed dispersal

Tillage can support the dispersal of weed seeds; therefore farmers avoid it where possible. In most cases, the seed falls from the parent plant to the ground and although it may be scattered by the wind, it generally does not move very far. However, it has been found that repeated tillage buries the seeds, which later cause more serious problems than leaving the seeds on the surface of the soil. As a result, repeated tillage is not considered feasible for eradication of weed seeds.

- Seeds that fall to the ground and stay on the soil surface are easily destroyed by fire, washed away or eaten by small animals.
- Tillage brings buried seeds up closer to the surface permitting dormancy and subsequent germination of seeds.
- Repeated tillage triggers new germination.
- Repeated tillage does not eradicate weeds but can continue to bring up seeds since weeds have large seed banks and a high degree of dormancy.
- Tillage contributes to soil erosion.
- Tillage aids self-replicating plants such as *Imperata cylindrica* because the fragmentation of plant parts produces new individuals.

Curved weeding tools are used to scrape the soil to uproot tiny seedlings too small and numerous to pick individually. Using a curved weeding tool is associated with rotations of one rice crop and six to ten years of fallow. The fallow consists of broad-leaved plants rather than grasses mixed with secondary forest and two or three weeding rounds are necessary.

Medium-sized hoes are used when deeper tillage is necessary in fields invaded by coarse grasses. Such a situation is not sustainable since weeding inputs tend to increase with each rotation: plots infested by grasses such as *Imperata* are generally lost for rice cultivation until a long-term fallow is implemented.

A variety of knives, hoes and ploughs are used at altitudes above 1,000 metres since farmers need to practice deeper and more frequent tillage. It seems that crops at higher altitudes are more easily infested by grasses. Seed is broadcast (scattered) after land preparation and additional tillage is therefore required to cover the grains.

Soil loss due to tillage

In upland rice cultivation, cleaning fields infested with weeds requires additional labour, resulting in a cycle of negative effects:

- Steep slopes induce tillage erosion.
- Top soil is disturbed by agricultural tools and thus 'mobilised' soil is easily washed down and lost during subsequent rainstorms.
- Tillage erosion is not as noticeable as water erosion but may produce similar rates of soil losses as demonstrated in northern Laos (Dupin et al. 2002).

As it has been observed that rice crops are prone to weeds, farmers have been experimenting with Job's tears, maize, sesame or cassava, as well as mixtures of these sturdier crops in order to limit the work lost in weeding. An added advantage is that it has been found that most of them also provide better ground cover over the rainy season (de Rouw et al. 2002).

Lessons learned

In many parts of Laos, shifting cultivation has developed from long-term fallowing with virtually no tilling into short-fallow systems that depend heavily on tillage for weed control. During this process, 'new' (the curved hoe is used for other work outside of the tillage system) tools have been introduced and the number of rounds of weeding and tillage has increased. This is resulting in more erosion, especially on steep slopes. At the watershed scale, tillage erosion has increased markedly because steeper slopes are now cultivated more frequently.

Growing populations and limited access to forested land result in shorter fallow periods, which in turn lead to increased weed pressure and soil erosion. All of these contributing factors have caused a noticeable decline in rice yields and in the land available for cropping. It is clear that longer cycles are more desirable overall because there is less weed pressure and they allow the land to revert to forest before another crop is planted. However, as times have changed, shorter fallow periods have become more common. To deal with the effect of shorter cycles, planted species, such as legumes, have been deliberately introduced to suppress weeds and supply shade cover. Soil erosion due to tillage, especially on steep slopes is also a contributing factor in diminished yields. In addition to planted fallows, farmers are trying out sturdier alternatives to upland rice such as Jobs' tears, maize, sesame or cassava which are less prone to weeds and thus do not require much tillage.

Field experiment

Experiments were conducted at a farm in 2001, 2002 and 2004 in the Houay Pano catchment, in Luangprabang District. Farmers cultivated upland rice and Jobs' tears after a one to three year fallow period without additional labour. Tillage erosion was assessed in two categories: (1) land preparation with a medium-sized hand hoe on nine classes of slope gradient; (2) weeding operations on seven classes of slope gradient. Downhill soil movement was then calculated taking into account the crop, slope, mean depth of tillage, bulk density of the soil, and various rates of crop and weed cover.

Regression analysis of the data produced the following conclusions:

- Firstly, soil losses increased exponentially with the slope, whatever the tool used.
- Secondly, tillage erosion depended on the type of operation: clearing with the medium-sized hand hoe works the soil down to 1-2 cm and generates more soil loss than weeding with the small curved hoe, which scrapes the topsoil to a mere depth of 1-2 mm.
- Thirdly, soil losses due to tillage depended on the actual moment in time in the growing season. As the rainy season advances, the crop covers more of the soil and so increase the chance of the growing rice plants trapping loose soil particles that otherwise may have slid down the slope (de Rouw et al. 2002).

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Diversity in the Uplands of the Lao PDR

Upland farming systems diversity

The Lao PDR in general, and its upland farming systems in particular, are characterised by a high level of diversity. This diversity depends on several factors that can be grouped under two broad categories: (i) bio-physical factors, and (ii) socio-economic factors.

Biophysical factors, also termed agro-ecological conditions by agriculturists, include landforms, soils, climate, altitude, topography, flora and fauna.

Socio-economic factors are more related to humans and human activities including ethnicity, culture, local history, population density, land tenure system, land use system, physical accessibility, marketing opportunities, access to government services, access to banking services, availability of research and extension services, and presence of development projects. This diversity has important implications for shifting cultivation stabilisation and poverty eradication in the Lao PDR.

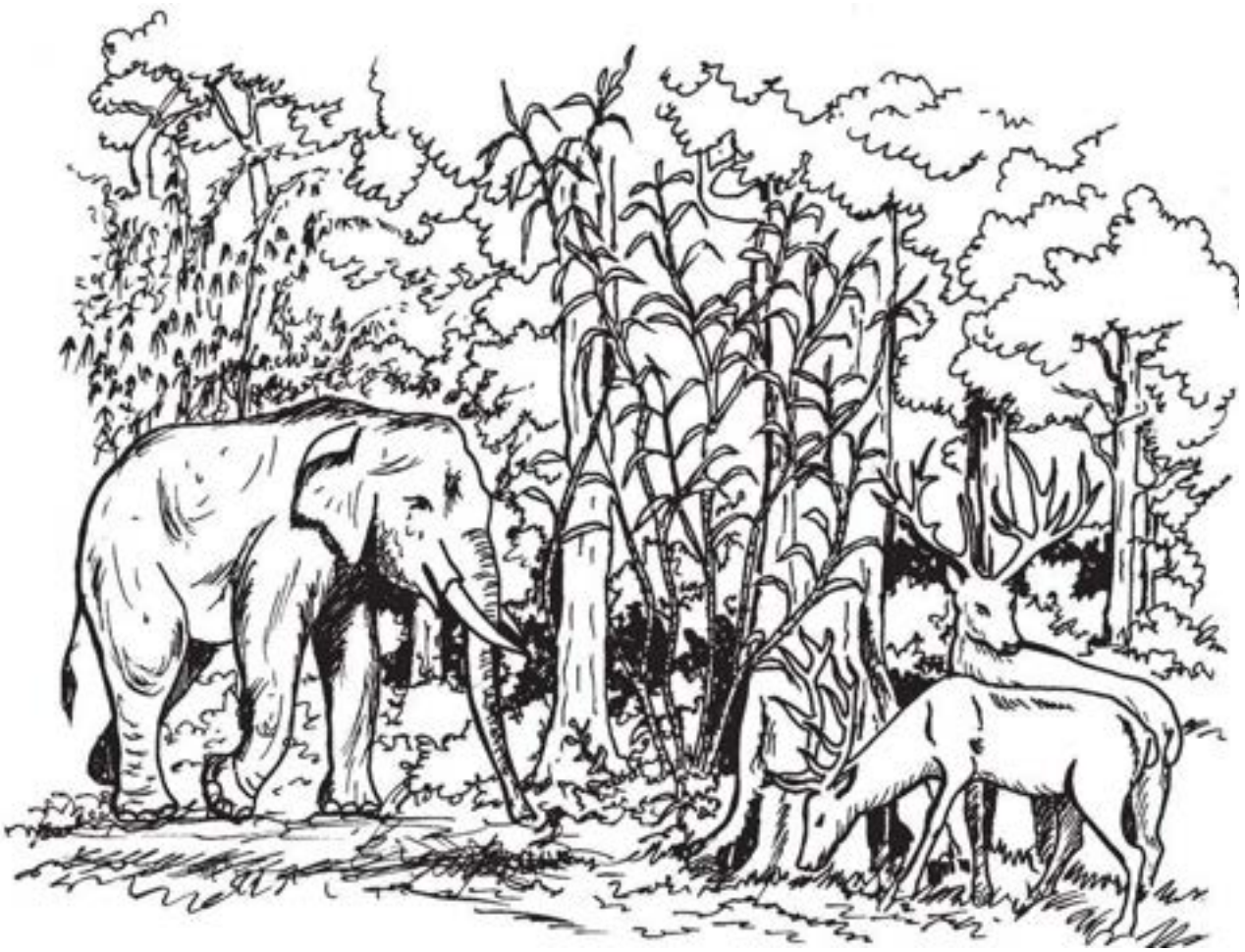
Biophysical diversity

Landforms

Upland areas account for 80% of the Lao PDR. Upland landscapes are often characterised by rugged and dissected terrain, with steep slopes and narrow valleys providing very heterogeneous conditions for agriculture. Landforms and topography are important determinants for technological options chosen by farmers. For instance, tractors can only be used on plateaux, valleys and hills with gentle slopes. In addition, wetland rice cultivation is often limited by the scarcity of flat land.

Soils

The depth, colour, and chemical and physical properties of soils are all variable according to site. Farmers and scientists alike recognise the diversity of soils in the Lao PDR. Lao scientists have identified, analysed, des-cribed and mapped the various soils of the country to assess their suitability and capacities for agriculture. Farmers also distinguish several soil types in their village territory ('sandy soils', 'red soils', 'black soils' and so on) and relate them to their fertility potential. The nature and properties of soils determine the evolution of an upland farming system. For example, hill farmers in southern Xayabury have been able to intensify their cropping systems thanks to good soils.



Climates

From north to south, east to west and from lowlands to highlands, Laos shows a variety of climatic conditions, ranging from monsoonal tropical to sub-tropical. While annual rainfall is only 1,000 mm in some regions, such as southern Xayabury, it can reach 3,000 mm in others, such as the Bolaven Plateau. Elevation also varies greatly. The air of lower regions is often hot and humid while at higher elevations it is cooler and drier. Upland villages and swidden fields are located at different altitudes, ranging from about 200 to about 1,800 metres. In addition, from valley bottoms to mountain-tops, upland village territories show micro-climatic variations which determine farming systems options. Various niches exist and are exploited. For example, tea and cardamom generally grow better at higher elevation than teak and paper mulberry.

Flora and fauna

Variations in flora and fauna, or biodiversity, are also important. Botanists distinguish various groups of vegetation cover that are generally influenced by soil, water, temperature, topography, altitude and human activity. Vegetation types include evergreen forests, deciduous forests, open dipterocarp forests, pine forests, bamboo forests, savannah, and so on. Important local variations exist in the composition of the flora and fauna: bamboo forests are not everywhere, wild cardamom is localised, etc. Rice diversity is enormous. Some species of mammals, fishes, birds and reptiles are only found in specific areas of the country. Prevailing insect pests and disease differ: mosquitoes are more numerous at lower elevation, the maize downy mildew - a fungal disease - is absent at higher elevation, and the composition of the weed flora shows significant variations in upland rice fields.

Socio-economic diversity

Ethnicity and culture

The ethnic diversity of the Lao uplands provides different socio-cultural contexts. Four different ethno-linguistic families are repre-

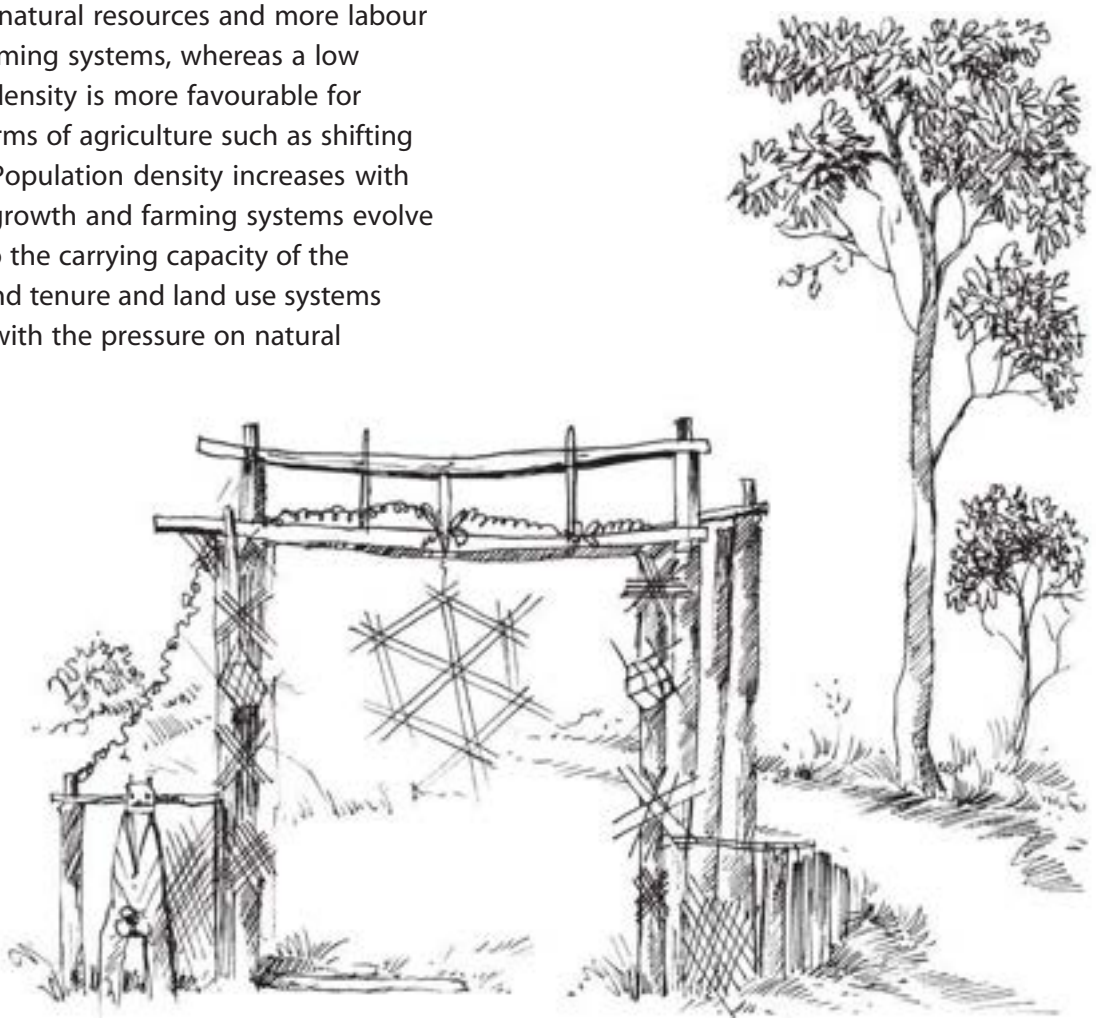
sented: the Lao-Tai, the Mon-Khmer, the Hmong-Yao and the Tibeto-Burman. Farming techniques, crop preferences, diets, tools and agrarian rituals are often influenced by ethnicity and culture. Some ethnic groups are integral swiddeners by tradition, while others are partial swiddeners. Some groups prefer glutinous rice and other non-glutinous rice. Harvesting rice by stripping is favoured by some groups, while others cut the panicles.

Population density, land tenure and land use systems

Population density varies from district to district, from only seven people/km^2 in Phongsaly Province to more than 25 people/km^2 in Luangprabang Province. Higher population density often results in more pressure on natural resources and more labour intensive farming systems, whereas a low population density is more favourable for extensive forms of agriculture such as shifting cultivation. Population density increases with population growth and farming systems evolve in relation to the carrying capacity of the territory. Land tenure and land use systems also evolve with the pressure on natural resources.

Access to markets, banking services, research and extension services

Access to markets generally depends on the road and communication network, which is relatively undeveloped in many rural areas. Some villages are accessible by road, some by river and some by track. Banking services are not available in most rural areas. Many upland villages do not receive any extension support. Villages benefiting more from research and extension are generally the most accessible ones, located near plains, roads or along the Thai border.



Local history and development projects
Districts and villages follow different local historical paths. Farming systems evolve according to how villages were established and how villages change due to migration. Road-side effects can also be a determinant. The presence of donor-assisted projects is also variable in upland areas. Some villages benefit more from projects while others are not influenced by outside assistance. Projects have various kinds of positive and adverse impacts on the evolution of upland farming systems and livelihoods.

Implications of upland diversity

As partly illustrated above, major biophysical differences and socio-economic disparities occur throughout the Lao uplands. This diversity exists at regional, village, farm, field and herd levels. Important considerations for research and development work in the uplands include the following:

- Upland farmers have learnt to cope with the heterogeneity of their environment, and they rationally exploit various niches according to their objectives.
- Research and development methodologies must be based on exploiting the hetero-geneity encountered in the uplands and must combine scientific knowledge with farmers' knowledge.
- In extension work, what is a solution for one site is not necessarily a solution for another. It is therefore essential to explore and propose a wide range of options for farmers as potential alternatives to shifting cultivation.
- More diversity results in more complexity. It requires systems approaches, location-specific on-farm research programmes, more cultural sensitivity, more time, more multi-disciplinary work and more people. For each farming system, research and extension work must start by characterising its key elements and understanding its functioning, even if this is time-consuming.

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Key Concepts of Food Security

In Laos the concept of food security is primarily concerned with people having an adequate supply of foodstuffs. Since the dominant food item is rice, a sufficient quantity of rice year round is key to achieving food security. Even in the lowlands, where rice production is in surplus, the food supply has not yet been secured. The food regime at the household level is very poor in terms of protein, fat and micronutrients. Many experts suggest that diversification of household food production can ensure a better balanced diet, especially for protein intake (Khemmatath 2002).

> The Lao definition of food security is "to assure enough food and foodstuffs for every person at any time, both in material and economic aspects, with increasing demand on nutritional quality, hygiene and balance so as to improve health and enable normal development and efficient work" (NAPP 2000).

Food security is a complex concept that involves economic, social, cultural, environmental and political aspects. In order to really understand the food situation and the causes of food insecurity, it is important to understand the fundamental notion of food security.

The Lao PDR has been self-sufficient in rice since the end of the 1990s. In 2003 the self-sufficiency rate for rice (RSR) was 116%, meaning there was a surplus of 16%. Due to problems of distribution and poor road access though, this surplus cannot be transported to rice-deficient areas. Consequently, there are still ten provinces in the north and northeast that do not have enough rice (Table 1).

Source: Lao National Statistical Centre (2003)

Table 1: Rice sufficiency by province

Province	RSR (%)
Xayabury	96
Xiengkhuang	73
Luangnamtha	70
Sekong	70
Huaphanh	69
Xaysomboon SR	60
Luangprabang	52
Phongsaly	47
Oudomxay	46

Food availability

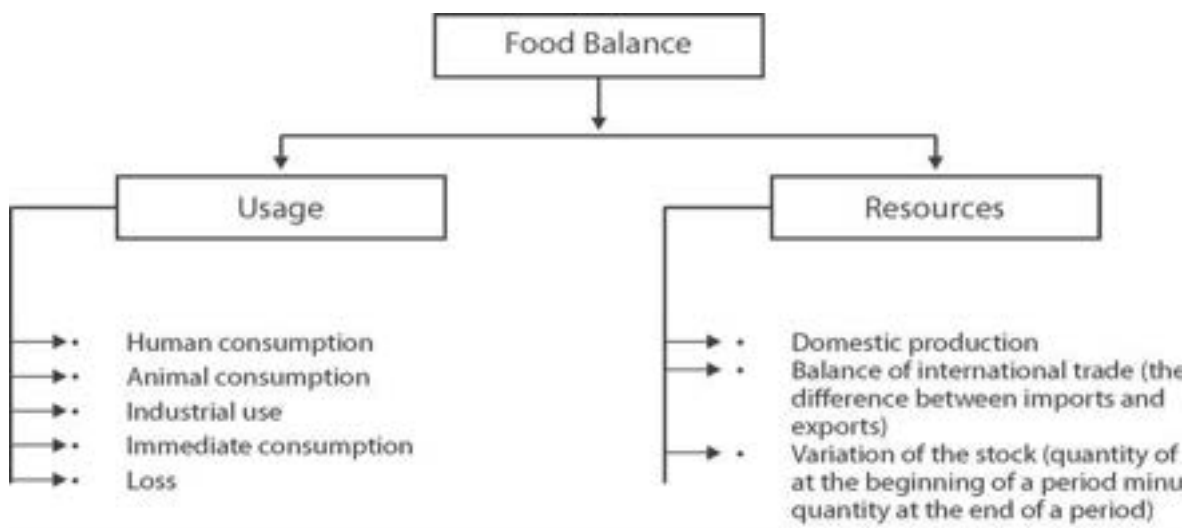
Food is available when there are adequate quantities of good quality foodstuffs so as to provide the nourishing elements and calories necessary. Total availability combines both foods available from production and from imports. At the national level, food balance consists of two parts:

- Usage
- Resource, also called Net Domestic Availability (NDA) (Figure 1).

Food security depends on four key factors:

- Food availability;
- Access to sufficient food;
- Stability of food stocks;
- Utilisation of food, which is related to cultural practices.

Figure 1: The food balance



At the household level the 'resource' part of the food balance changes so that:

- Domestic production means food produced and/or acquired by means of physical efforts by household members. This can be from crop production, animal production, fishing, or hunting and gathering of NTFPs that are then consumed by household members.
- Food can be acquired by means of exchange in the form of barter or market exchange. Some food items acquired by household members are in surplus and are traded for other ones that are in shortage or not available at all, or exchanged for cash. Cash income can also be generated from economic activities like working as a labourer for other farms, small commerce, service activities (transport), processing, and making handicrafts.
- The surplus of food produced or acquired may be processed for preservation so that it can be stocked for consumption during periods of shortage. For example, a household can stock dried rice for a year. The amount of rice at the beginning of the period minus the amount of rice at the end equals the variation of the stock. This is the amount of rice consumed during that period.

In the 'usage' part, the NDA is composed of products for food use (human and animal) and non-food use (processing at household level).

To evaluate food availability, the per-capita annual food availability (PCAFA) ratio is used: the ratio between the net domestic availability and the total resident population. Food availability can also be expressed in per-capita daily food availability by dividing the PCAFA by the number of days in a year.

Food accessibility

Accessibility is an important element because, even though food is in sufficient quantity, all individuals and families need to have access to food both physically and economically.

All stages of the food chain supply system have some influence on physical accessibility, particularly transportation, storage, transformation and marketing of these food commodities. As for the economic accessibility, or purchasing power, household income is considered the most important factor affecting people's accessibility to healthy and nourishing foods.

Stability of supply

When the food supply is irregular because of drought, flooding, fluctuation of prices, or seasonal unemployment, poor people are the most vulnerable. The stability of provision is dependent on:

- The capacity of storage and saving at the household level.
- The stability of the market, which depends on the balance between supply and demand.
- The role of the state as the regulating instrument of intervention.
- The government's capacity to react in an emergency.

The price of rice goes up during the usual period of rice shortage (from August to the end of October) in many markets, even in Vientiane. The price drops again right after the harvest.

At some major markets, prices go up by 30% as the period of shortage approaches coming down again in December (Table 2). Lettuce is hard to grow during the wet season: then the price goes up by 32% and comes down in December when it is more available. Pork prices fluctuate because of feed availability (rice bran), which changes with volume of rice supplied.

Cultural acceptability

The distribution of food inside the household is not always related to an individual's food needs. In some ethnic groups, certain foods and food practices are governed by religious taboos. For example, in the first week after giving birth, Lao Loum mothers living in many parts of the country are only allowed to eat baked rice and salt. For some months thereafter they can only eat selected fish species, chicken, black buffalo meat, and some vegetables.

Table 2: Price change of popular commodities (2003)

Some basic food items	Price(Kip)			Price index		
	January	July	December	January	July	December
White rice(glutinous)	1,983	2,584	2,475	100	130	125
Cat fish	18,156	19,344	19,061	100	107	105
Pork	18,250	18,688	17,719	100	102	97
Lettuce	5,547	7,344	5,652	100	132	102

Source: NSC 2003

Method of evaluating food security at household level (see figure 2)

This method is based on information about income, in the form of food and cash that will assure the food security of a household. The products for food consumption come from:

- Inside the zone (on farm): agricultural production (crops and animal raising), products from nature (hunting, gathering and fishing).
- Outside the zone (off farm): working as a labourer outside the farm, making handicrafts, processing of agricultural products, small commerce and service. Products from outside the zone can also be in the form of foodstuffs or cash income. Foodstuffs from outside the zone can be in the form of food aid from the state or international organisations, usually in response to natural disasters such as drought or flooding.

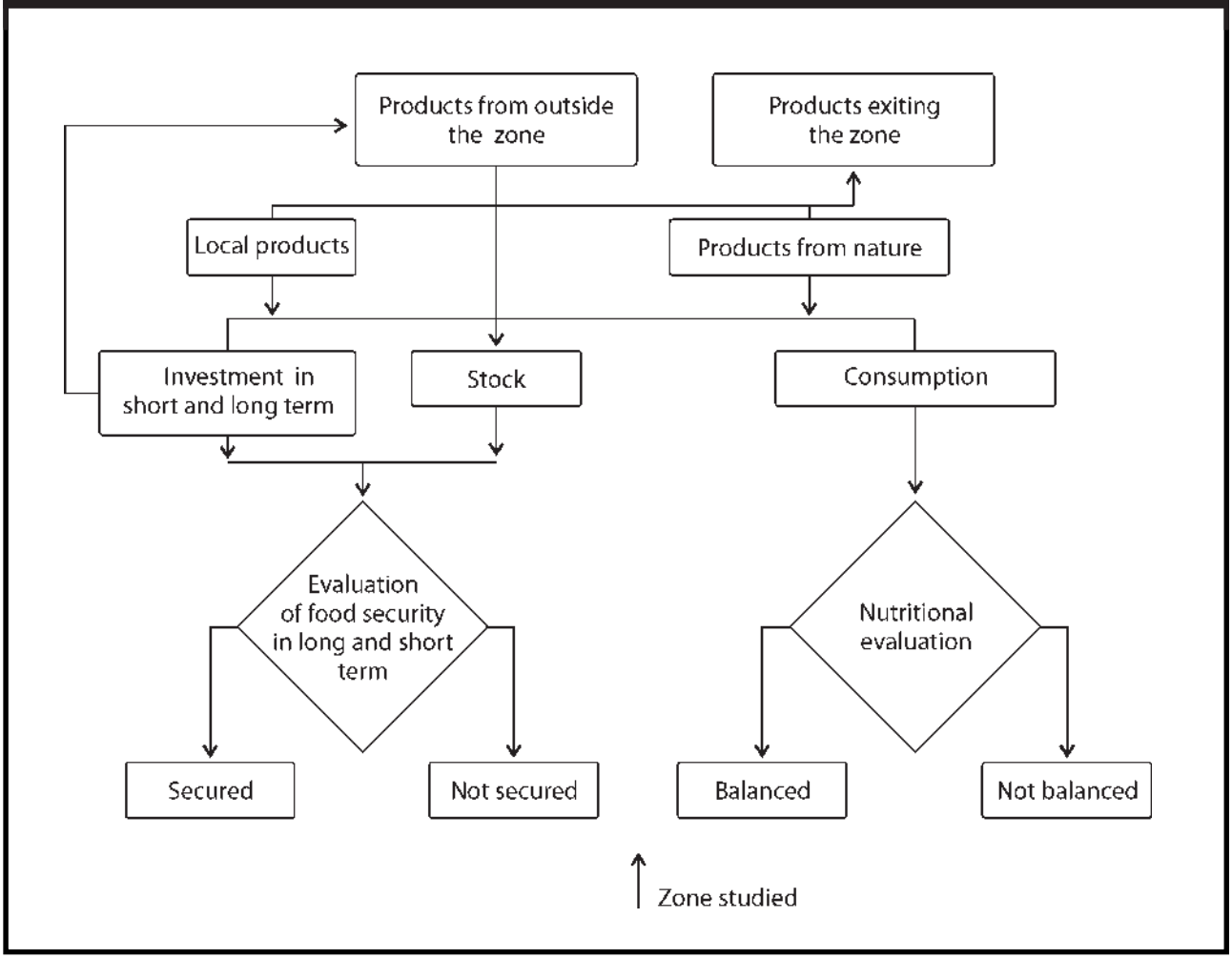
Products that come from inside or outside the zone are used in a number of different ways:

- Consumed directly.
- Stocked through living products (buffalo or cattle), processed products (post-harvest rice), or savings (after a new harvest the surplus from the last harvest may be transformed into cash).
- Used for long- or short-term investments.
- Exported from the zone, in the case of excess production.

Investments are usually made for:

- Improvements to productivity - soil fertilisation, labour-saving devices such as hand tractors, irrigation pumps, threshers or rice mills.
- Human resource development, thus raising opportunities for labour.
- Diversification of production.

Figure 2: Framework for evaluating food security



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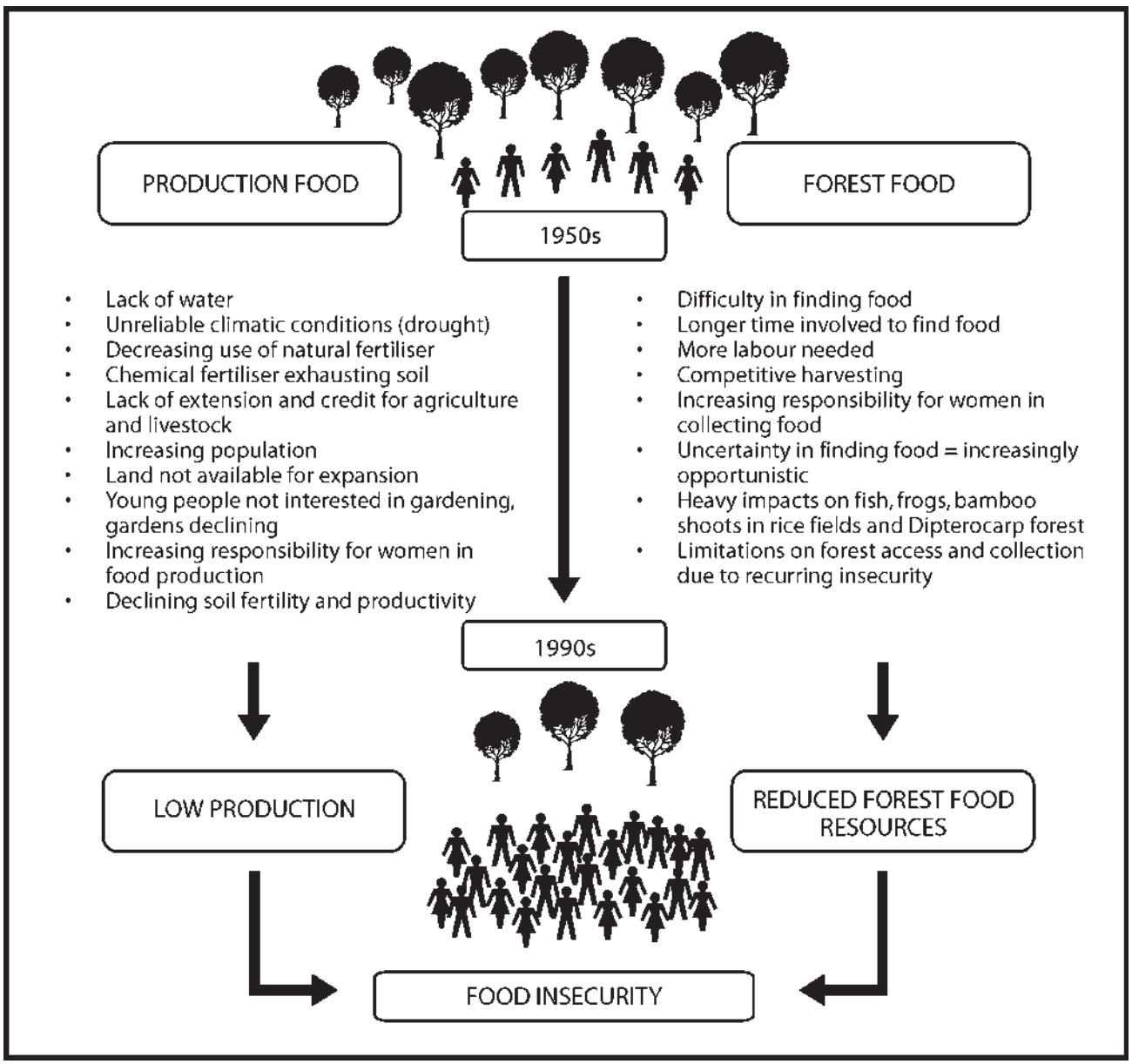
Community Perceptions of Forest Food Resource Management

Forest food resources occupy a central place in the food system of the Lao people. Fish, frogs, bamboo shoots, plants, tree leaves, insects, wild meat and mushrooms are essential components of the diet for forest dwellers and upland shifting cultivators. There is also a growing market for forest foods amongst lowland farmers and urban communities who no longer have access to productive forests. Considering the high cultural and economic value Lao people place on forest foods, it would seem that these resources have been overlooked and undervalued. The clear linkage between food security and resource conservation demonstrated by this study clearly shows the need to support community forestry management in order to sustain both people and forests.

Forest foods are central to the Lao diet

Rural communities who are most vulnerable to food insecurity traditionally obtain food from natural forests, fallow swiddens, agroforests, rice fields and associated aquatic environments. Because they provide food year round and can also be sold and exchanged to obtain rice during times of drought, flood-induced crop failure and economic hardship,

This study was conducted in Khamteuy, Nongthe, and Konglunoi villages on the edge of the Xe Bang Nouan National Biodiversity Conservation Area (NBCA) in Saravane. The study was conducted in 1997 as part of the IUCN/NAFRI NTFP project. As part of this study, villagers identified problems relating to food resource management and initiated the design of sustainable harvest and management systems.



forest foods make a vital contribution to the otherwise nutritionally poor and bland diets of rural households. At the same time, the cultural significance of traditional foods for daily meals in the home, on ceremonial occasions and as sought-after delicacies in restaurants, has generated a strong market amongst the growing urban population and lowland farmers. Thus, directly through consumption and indirectly through sale and barter, forest foods make a significant contribution to household food security in both rural and urban areas.

Forest foods are major NTFPs

As alternative resources are limited, forest dependency continues to be the livelihood base of Lao subsistence communities.

NTFPs serve a wide range of subsistence needs, as well as providing an opportunity for earning cash incomes. Used primarily for home consumption, but also for sale and exchange, forest foods constitute the major proportion of the large number of NTFPs harvested, in terms of both species and value. Although villagers report a marked trend of resource decline since the 1980s, particularly with regard to forest animals, fish and bamboo shoots, continuing dependence on traditional forest foods reflects the social and economic significance of these resources.

Villagers review traditional resource sharing

Village elders recount how traditional sharing operated in the past, when resources were abundant and gathering was for family consumption only. Aware of their own contribution to resource decline, villagers acknowledge that over-harvesting has exceeded the replacement capacity of key food species. Traditional methods of fishing and hunting have given way to more expedient but destructive practices, including the use of guns,

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

fine mesh nylon nets, poison, explosives and battery torches. These practices encourage indiscriminate collection of undersize fish and tadpoles, and large quantities of frogs. There is also concern about destructive methods and high harvesting levels of bamboo and *Pandanus*. Previously recognised rights of use to certain sites and resources are being ignored. These infringements represent a loss of livelihood resources as well as a potential source of conflict.

Villagers agree that greater control over resources is needed in order to reduce the impact of competitive and destructive harvesting. Clearly defined village boundaries should help in this respect, but due to a strong cultural sense of sharing, established patterns of open access sharing still influence resource use.

Land and forest allocation

Since land and forest allocation was carried out in 1998, Khamteuy and Nongthe villages have accepted responsibility and formal use rights for demarcated sections of the NBCA. Although they acknowledge the potential benefits of land and forest allocation, villagers report ongoing hunting, tree cutting, destructive harvesting and forest fires. Penalties do not serve as deterrents due to lack of villager awareness and low levels of enforcement. There is inadequate cooperation amongst villages, and management is difficult due to fear of conflict. But even when village boundaries are clearly defined, and land and forest allocation takes effect, available resources must still be shared. Therefore, the traditional system continues to have relevance, forming the basis of future resource management.

Sustainable management of key food resources

The key food resources identified by villagers, based on ecological status, importance for subsistence use, and potential for income generation, were fish, frogs and bamboo shoots. Based on this a number of key management decisions were made by the villagers themselves:

- Based on the need to protect the breeding stock and under-sized fish, the villagers recommended introducing sustainable harvesting cycles and management rules for fish and frogs by establishing reserve areas and regulating harvesting.

- Strategies for the sustainable use of bamboo were based on reducing destructive over-harvesting and increasing availability by individual planting around family rice fields, and for shared use on village land. Planting fodder species (*mei du* for cattle and *kabuk* for pigs) was also recommended.

- Considering the difficulty in finding even enough to eat, villagers recommended that forest food resources should not be used for sale and exchange until productivity is increased through sustainable management.

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

Factors affecting household dependency on forest foods

Although household economic level influences dependency, the general lack of clear differentiation amongst the study households suggests that forest food use is associated not only with economic level and food production capacity, but that other factors are operating as well:

- Household harvesting capacity, as determined by the ratio of dependent to active working members, and according to household structure and stage in the family cycle, was found to be a factor.

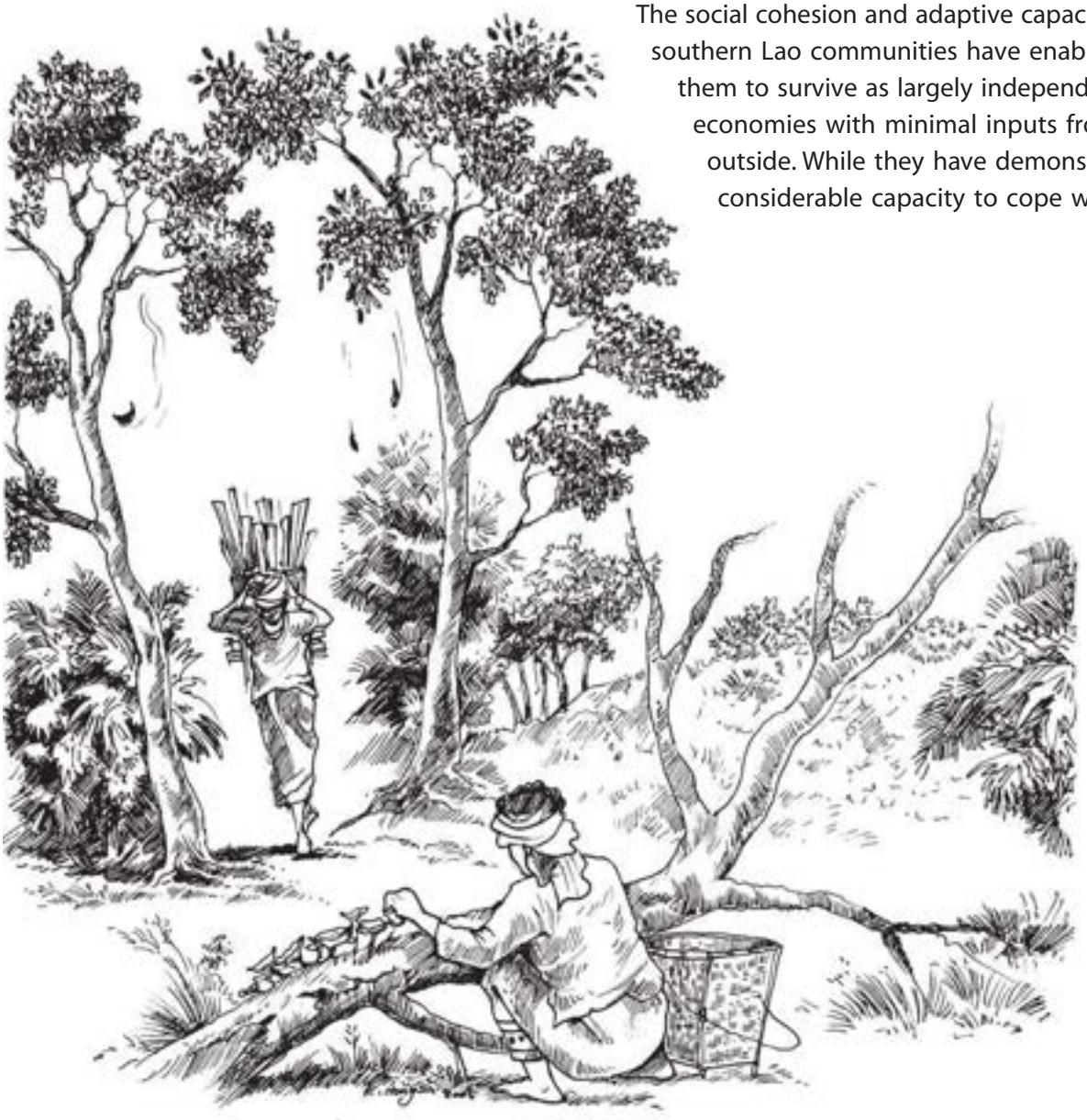
- Mothers of young families in small households reported less opportunity for gathering, compared with women in larger families where older children share gathering responsibility.
- There appears to be a stronger preference for traditional foods in some households, which may explain why some families value forest foods more highly than others.

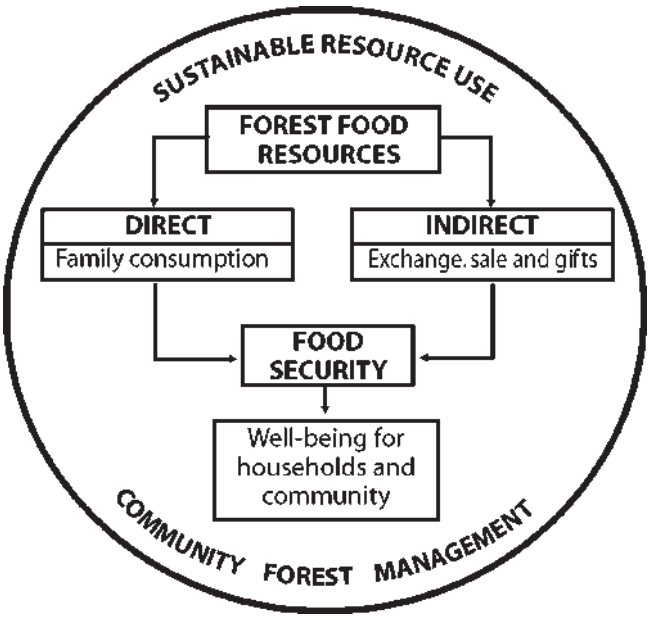
What are the implications for resource management?

People count in conservation

Recalling the dense forest and rich biodiversity of the past, villagers describe forest depletion accompanied by the virtual disappearance of many wildlife species. Inadequate attention is often paid to ecological dependencies, the importance of forest products in upland diets, and the use of forest products to offset rice deficiencies.

The social cohesion and adaptive capacity of southern Lao communities have enabled them to survive as largely independent economies with minimal inputs from outside. While they have demonstrated considerable capacity to cope with





changing circumstances, both natural and imposed, dependency on the forest for food and other products continues to be a critical aspect of their livelihood. As marginalised communities living in difficult conditions, their future depends on sustaining the natural resource base and strengthening the linkages in the livelihood system. Therefore, promoting self-reliance based on community management of locally available resources offers a vitally important conservation and development opportunity.

Resource management for food security

Rice alone cannot solve the problem of food insecurity, but as the staple energy source, it is the most important item in the food system. However, limited land, declining soil fertility and unreliable rainfall mean that short of a dramatic shift in rice cultivation techniques, there is little scope for increasing either yields or production. While rice banks have alleviated seasonal rice shortages, hunger and debt, there is a clear need to increase the supply of other foods to provide a balanced diet with adequate micronutrient intake. Substituting cultivated fruit and vegetables for forest products is limited by lack of water in the dry season, and without technical support, domestic livestock are susceptible to disease.

There is, therefore, important potential for incorporating existing reliance on forest resources into strategies to improve food security, particularly among the poorest communities. The forests were a dependable source of food, but at current levels of harvesting, the traditional system of open access sharing is breaking down. Forest depletion and resource decline threaten to undermine the vital contribution that forest resources make to household food security and community well being. In terms of sustainability of both the forest and local livelihoods, it is encouraging therefore that villagers themselves are committed to improving food security by securing their use of forest food resources through improved natural resource management, agricultural production and the development of alternative sources of income.

Conclusion

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

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

Improving livelihoods and food security

"Protection of resources is to promote resource availability for our use."
Villagers identified potential solutions to their livelihood problems, focusing on overcoming debt and increasing self-sufficiency by:

- Increasing rice availability through improved production using natural fertiliser.
- Decreasing expenditure and exchange of rice for chilli and tobacco by improving garden production.
- Generating income from NTFPs, handicrafts, livestock and gardens by selling rather than exchange.
- Managing forest resources for greater productivity for subsistence and trade.

This paper is derived from: Clendon, K. 2001. *The role of forest food resources in village livelihood systems: a study of three villages in Salavan Province, Lao PDR*. NAFRI, IUCN-NTFP Project.

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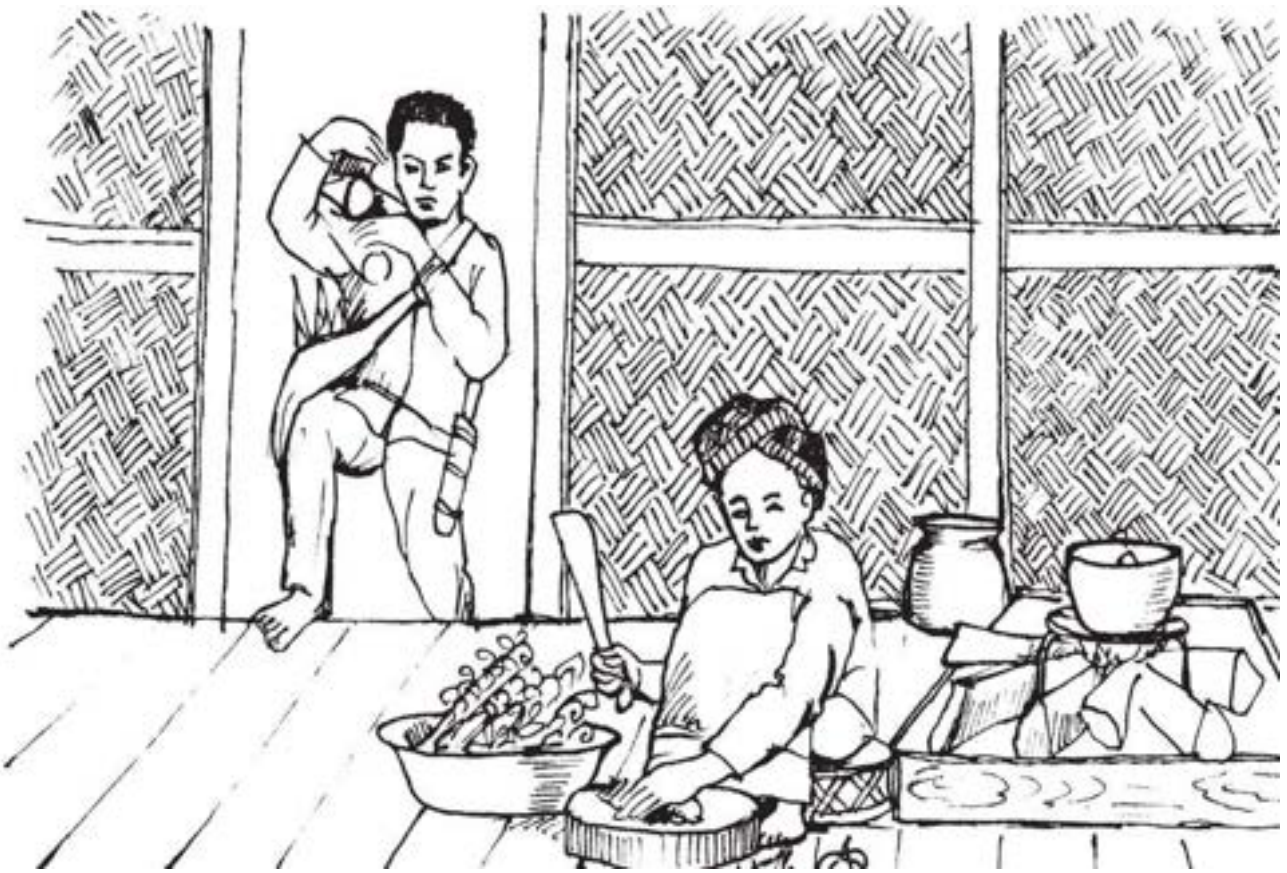
Upland Food Security and Nutritional Diversity



Diversity of upland diets

Laos is a rich centre of tropical evolution and biodiversity, especially in the mountainous areas inhabited by ethnic groups. These groups have varying attitudes to food: selecting plants and animals as edible is a highly cultural affair.

While garden crops such as eggplants, pumpkins, beans, cucumbers and chillies form a big share of vegetable foods, most ethnic groups frequently collect a wide variety of forest products like leaves, shoots, sprouts, mushrooms, flowers, weeds and herbs. Forest fruits were of stronger importance in the past, but still today a wide variety of fruit and nuts are collected. Garden fruits are increasingly planted, particularly the banana (Krahn 2003). In most upland cultures, livestock plays a significant role in yearly rituals, especially the buffalo (Kirsch 1973). Its consumption, however, has always been limited. Among the Katu, wildlife, including fish, mammals and birds, provides a far greater share of meat. In the past there was generally a significantly higher consumption of big mammals than now (Krahn 2003). WCS has observed that in Luangnamtha, small animals from the nearby forest now form the main share of

Table 1: Important key nutrients of traditional upland non-rice foods		
FOOD GROUP	**EXAMPLES**	**KEY NUTRIENTS**
Roots and tubers	Cassava, taro, yams, sweet potato, potato, etc.	Carbohydrates, Vitamins C, beta-carotene, potassium, Vit B_1 and Vit B_2
Leaves, stems, sprouts	Cassava, leaves, pennywort, mustard greens, ferns, bamboo, rattan, etc.	Carbohydrates, beta-carotene, iron, zinc, calcium - if pickled Vit B_{12}
Seeds and nuts	Almond, sesame, peanut, pumpkin seed, cucumber, jackfruit, etc.	Fat, Vit E, calcium, protein, iron, copper
Mushrooms	*Polyporaceae* and *Russulaceae* species, etc.	Calcium, iron, protein
Gums, nectars and saps	Sugarcane, Palm species, vine species**, etc.	Vit C, iron, and other minerals
Flowers	Sesbania (yellow) sp, squash, pumpkin, etc.	Niacin, beta-carotene, iron
Fruits	Mango, pineapple, guava, melon, fig, mangosteen, vine fruits, etc.	Water soluble vitamins such as Vit C, B Vitamins, iron and special enzymes
Freshwater fish	*Cyprinidae* and *Cobitidae* species, etc.	Protein, fat, niacin, calcium*
Frogs, snake, lizards	*Ranidae* and *Bufonidae* species, ratsnakes, *Scincidae* species, etc.	Protein, fat, calcium*, zinc
Freshwater snail, crab, shrimp	*Thiara asperata*	Protein, fat, calcium, iron, Vit E,
Domestic animals	Pig, chicken, goat, buffalo	Protein, fat, iron, Vit B_1 and Vit B_2
Wild animals	Deer, wild boar, monkey, civet, rat, etc	Protein, fat, iron, zinc, Vit B_1 and Vit B_2
Wild birds	Partridge, wild pigeon, peafowl, wild chicken, hornbill	Protein, fat, iron, zinc, calcium*, Vit B_2
Insects	Termites, dung and longhorn beetles	Protein, fat, (PUFAs)***, calcium, iron, niacin

** If cooked with bones.*
*** When in the deep forest, many villagers use vines as thirst quenchers.*
**** Poly-unsaturated fatty acids, such as for instance gamma-linonelic acid.*

wildlife in local diets, while bigger mammals are hunted less frequently in more distant forests (Johnson et al. 2004). Naturally abundant small animals, including insects, are nowadays the most important species for subsistence consumption.

Food security strategy

'Food security' is the term used to describe the concept of producing enough food for the whole household to live healthily, whatever the weather or situation.

Unfortunately, development supporters have not yet broken into the pool of upland food cultures. Understanding is lacking in existing ways of food acquisition, preservation, storage, and local cuisine, including recipes, cooking methods and eating practices. What is known is that poverty in Laos is inextricably related to culture and ethnicity and that its locus is with the highlanders.

As yet, there is no really clear vision of food security for the Lao uplands. In national development policies (GoL 2004), food security is understood mainly as rice sufficiency. In the Lao uplands however, people are often rice insecure. Some are automatically designated as food deficient, without careful analysis of their livelihood and diet. For instance, a farmer might own many buffalos, pigs, goats and chickens, and have a garden rich in vegetable and fruit species. He may also have a stable income from selling NTFPs and be skilful in trapping and fishing. However, if his family's staple was cassava, corn or other tubers, the household would be classified as food insecure.

Making people suddenly move their diet and livelihood towards rice can lead to inadequate

Staples

Besides rice, corn plus roots and tubers from garden and forest, make up a great share of the bulky foods. In times of shortage, bamboo shoots, green leafy vegetables, ferns, mushrooms, wild stems and bulbs, bananas, jackfruit and so on are eaten in greater amounts as filling foods. The ratio of rice to non-rice staples, which always changes with season, has altered considerably over the last few years. Traditionally, cassava and maize consumption was significantly higher than rice consumption in some mountainous areas. The Katu save rice for guests, festivals and special occasions (Krahn 2005).

In upland development trends, the intended nutritional outcome can be broken down into seven elements:

1) higher rice consumption
2) diversified diet
3) decreased wildlife consumption
4) higher consumption of domestic animals
5) higher consumption of market foods
6) better health and nutritional status
7) better hygiene and higher food quality

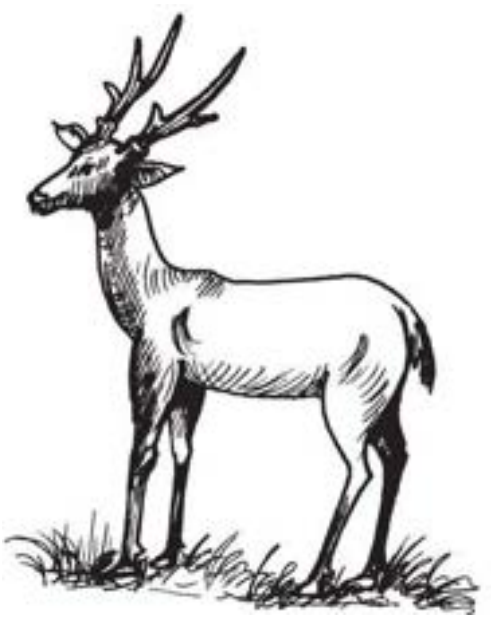
Many food security efforts are currently directed to rice production, but for genuine positive dietary improvement to occur, the concept of food security has to be expanded.

nutrition intake. Many upland cultures are now faced with a decrease of traditional foods, especially wildlife and fish. Yet with no new viable foodways, how can upland people improve their livelihoods, integrate into the national economy and maintain a delicious and healthy diet?

The basic principles of food security are rapidly changing. While traditional foods are decreasing and disappearing (e.g. millet, wild roots and tubers), new food items are finding their way into upland kitchens (new fish species in fish ponds, fruits like tamarind, guava, insects, occasionally sweets and snacks). In some areas positive dietary change appears to be occurring, but in many places unexpected negative dietary change is apparent (Krahn 2005). Traditional diets rich in meat, vegetables and fruit while low in cereal staples appear to be nutritionally adequate. Increased consumption of rice with a reduction in meat intake seems to be the greatest nutritional challenge for Lao uplands. Now some upland people are forced into an inadequate diet: contemporary meals often comprise only glutinous rice, eaten together with a simple *cheo* of chilli, salt and monosodium glutamate.

Traditional Nutrition

Many forest foods have a very high nutrition density and are often of higher nutritional value than domestic animals or garden foods (FAO 1996). Chemical analysis of some traditional Katu foods corroborates this (Krahn 2005): many wild plants and animals provide foods with greater nutrient densities than alternative foods imported through market networks in remote mountain areas. In some areas of Laos moreover, market food supply is highly restricted, with many days when even bananas are not available.



Bringing nutrition into the strategy

From a nutritional point of view, there is high potential in the Lao uplands. For better food security results, local conditions have to be acknowledged when policies and projects are being planned. The following table responds to the shortcomings identified by this article. It should be acknowledged that production is not equal to consumption, and at the same time, problems with food procurement should be truly identified. Here, the importance of foods derived from forest areas is crucial. Exploring and using local cuisines holds tremendous potential for continuing the rich Lao heritage with a balanced input of external techniques. Defining food security is like defining a recipe for *khao piak* (rice soup). Various cooks have their own secret ingredients and ways of preparation, and they might all be delicious. Food security should be more understood as a recipe, in which all ethnic groups can actively participate by referring to their own knowledge, capacity and aspirations. How many recipes consist of rice alone? Upland interventions that aim to improve food security must look at the nutritional status of highland cultures, and be careful not to upset nutritional balance.

Correcting the rice bias	
Vision	• Integrate all food groups in the vision of food security • Apply a holistic approach • Understand dietary change as a cultural affair • Expand attention to basic causes of food insecurity • Include food security in all forest issues
Assessment	• Threat analysis of wild foods • Record culture-specific local knowledge • Explore the local perspective of change • Nutritional analysis of Lao foods (especially wild foods)
Planning	• Identify alternative proteins for wildlife • Start co-operation between all relevant disciplines relevant for food security • Stronger reflection of current policies and strategies
Funding	• Fund research on underlying and basic causes of food insecurity • Fund research for validation check of local knowledge • Establish more qualitative reporting
Implementation	• Expand time frame • Establish taste and cooking trials for new introduced foods • Use external knowledge only after local solutions tested for failure
Monitoring and Evaluation	• Anthropometric analysis before and after implementation • Dietary intake analysis • Constant constraint analysis

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This paper is extracted from an article published in *Juth Pakai*:
Krahn, J."Cooking Up - Dietary Change in Lao Upland Kitchens". *Juth Pakai* 1: 3-13.

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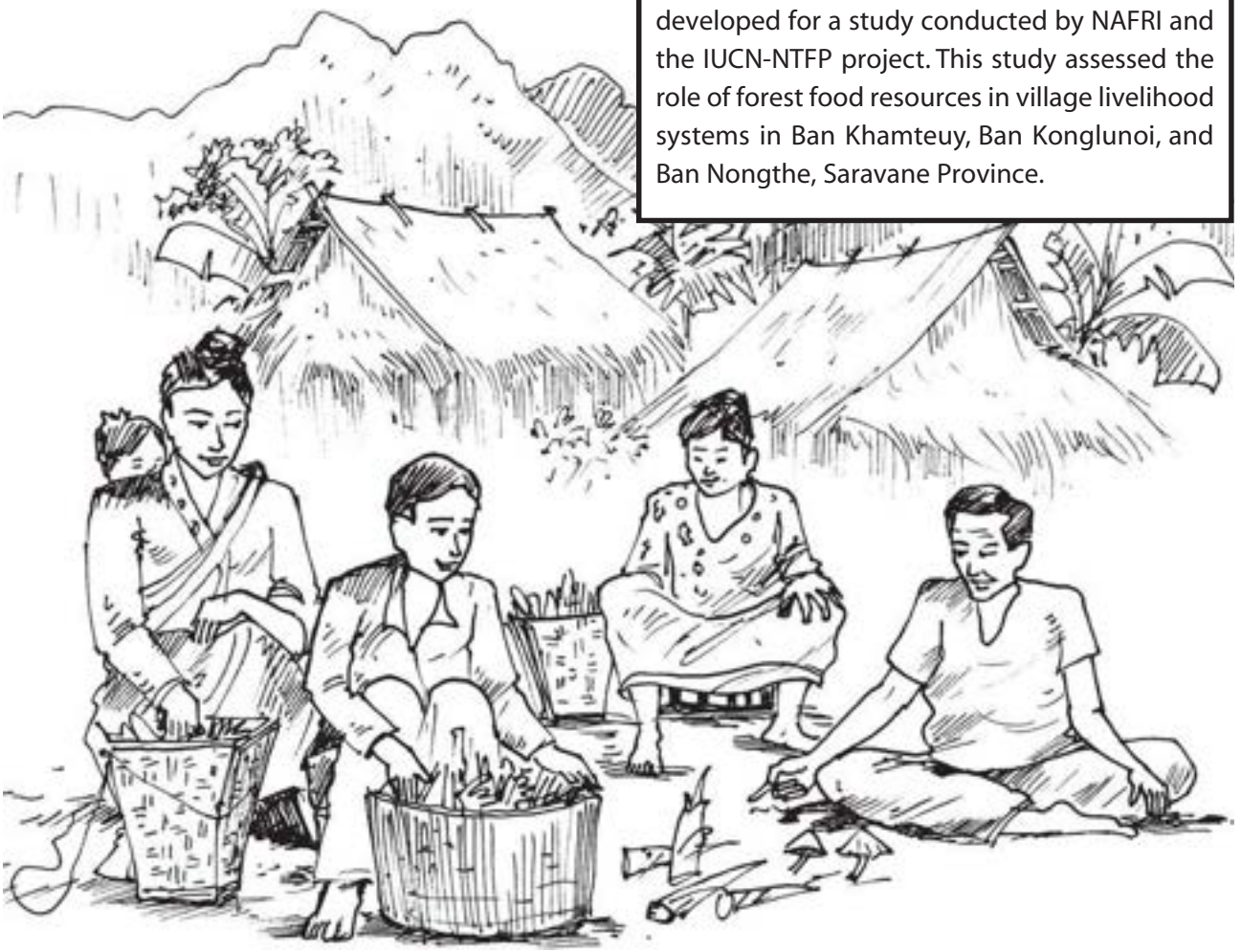
A Participatory Methodology for Assessing the Role of Forest Food Resources

The methodology outlined in this paper was developed for a study conducted by NAFRI and the IUCN-NTFP project. This study assessed the role of forest food resources in village livelihood systems in Ban Khamteuy, Ban Konglunoi, and Ban Nongthe, Saravane Province.



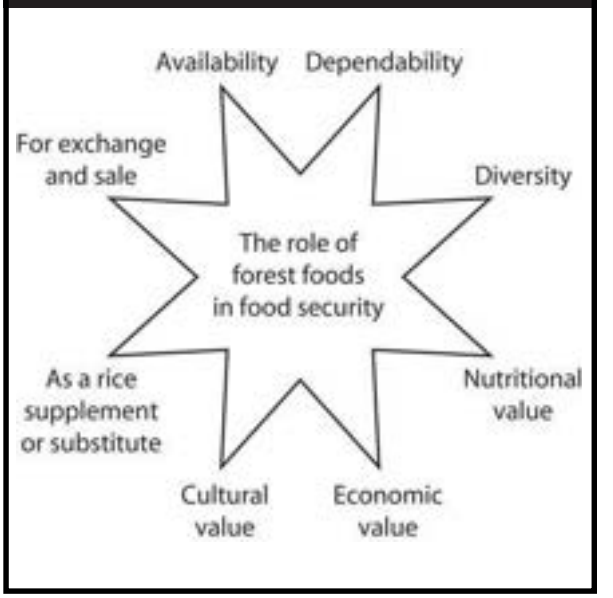
It is important to understand the strong links that exist between food security, forest foods, and resource conservation and to incorporate this understanding into sustainable village forest management strategies. Promoting sustainable use and community management of forest food resources provides an opportunity to integrate forest management with improved food security. A participatory research methodology is well suited to understanding the role of forest foods in local livelihoods. By enabling local people to take an active role in research, the participatory process empowers them and helps them to understand their problems and identify their own solutions.

In order to assess the role of forest food resources a food-based approach should be used. This approach encompasses food availability, food diversity, the cultural context in which foods are obtained/produced and eaten, and the ecological setting of the food system.

Data should be collected in the dry and rainy seasons in order to account for seasonal differences in resource availability, harvesting and patterns of use. Figure 1 shows the factors that the role of forest foods in food security depends on.

Forest foods can be defined as edible wild animal and plant resources obtained from the broader forest ecosystem, i.e. from old and second growth forest, agroforest, fallow and aquatic habitats including rivers, streams, channels, ponds and rice fields.

Figure 1: The role of forest foods in food security depends on:



Village level research and planning

Table 1 outlines useful questions and participatory tools that can be used in assessing the role of forest foods at the village level.

Household case studies

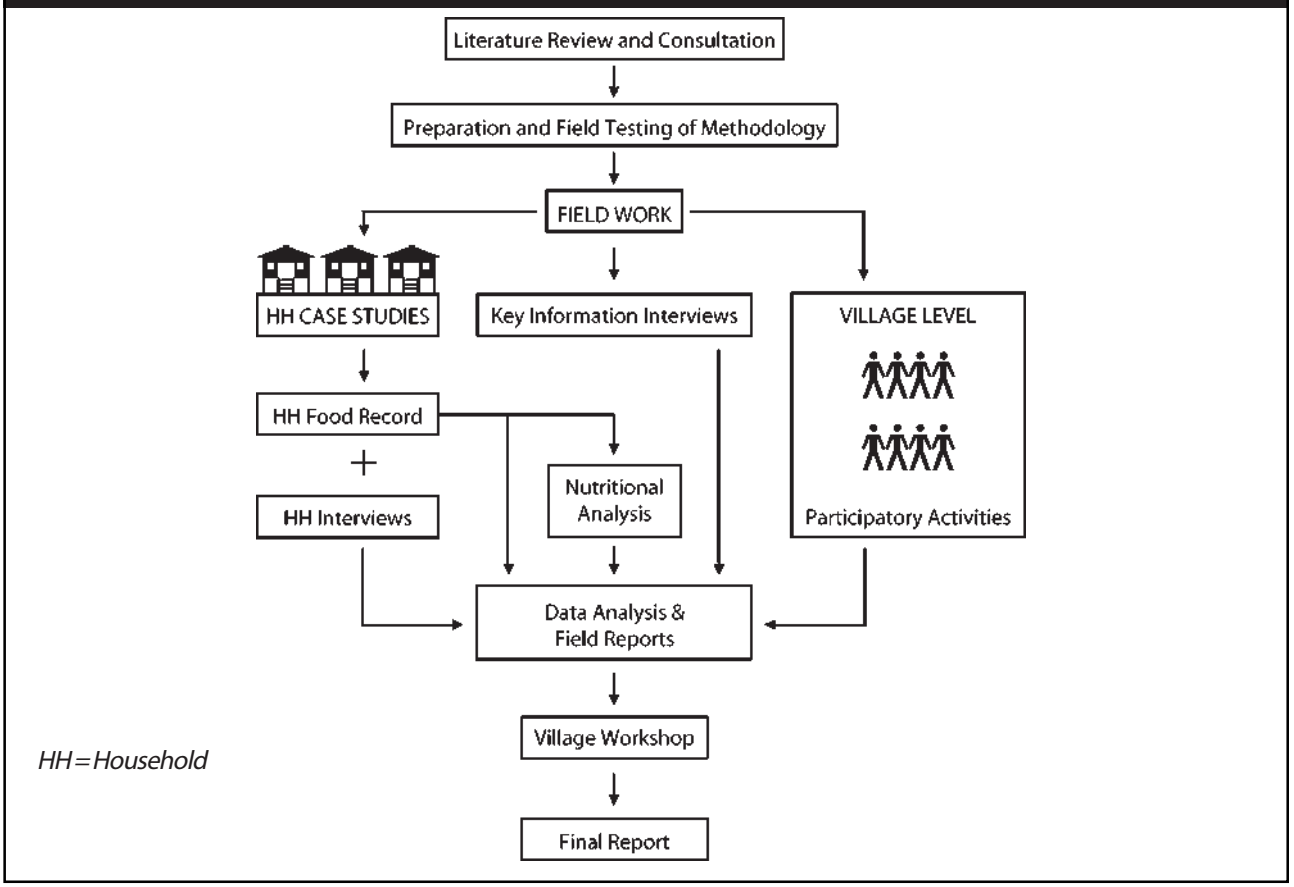
Three case study households in each village should be selected for household case studies. The three households should represent different levels of well-being, i.e. better off, intermediate, and poor. The quantitative household data provides a basis for comparing household dependency on forest food resources in terms of species, quantity/frequency of gathering, consumption, sale and exchange, gifts, villager valuation of the resources, and nutritional analysis.

Table 1: Village level questions and tools		
Questions	**Main Tools**	**Objectives**
How does the village livelihood system operate?	Seasonal calendar Group discussion Livelihood system diagramming	To understand the livelihood system and annual pattern of activities in the context of forest food harvesting
What are the seasonal patterns of resource availability and harvesting?	Calendar forest food resources Focus group discussion	To establish availability and harvesting according to gender and age
What species are available?	Forest food resource matrices for dry and rainy season – key informants	To obtain in depth seasonal information on food resource species
How do forest foods fit into the food system?	Food listing and ranking - mixed focus groups	To understand use and importance of forest food resources
What are villager perceptions of food groups and food values?	Food grouping activity - mixed focus group discussion	To identify local perceptions of food grouping, value in diet and food habits
Where are the source areas, how are resources harvested and by whom?	Forest walks and transects – mixed groups; women and children	To observe resource locations and harvesting in order to construct a site typology
	Participatory mapping of resource sites by separate groups of men and women	To learn about resource sites, status and gathering according to gender/age
	Village school mapping activity	To understand children's role in food gathering; To assess potential for introducing conservation awareness into schools
What are the trends in forest food availability and dependency?	Historical matrices Timelines - mixed focus groups Key informants	To understand changes in livelihood system and resource use over time
How does socio-economic level affect household dependency?	Key informant interviews - resource-poor families	To identify causes of/responses to rice shortage and food insecurity in poorest households
What are the key food resources and how could management be improved?	Discussion, planning sustainable harvesting systems - mixed focus groups	To identify key resources and initiate villager planning of sustainable harvesting systems
What are villager perceptions of management of forest food resources?	Mixed focus group discussions; SWOL analysis of traditional resource use	To share villager concerns; To raise awareness and stimulate villager action

Nutritional analysis

Many forest foods are higher in vitamins and other nutrients than domesticated varieties and provide high quality dietary inputs (see table 3). A household nutritional analysis will help in understanding overall household nutrition and the contribution of forest foods. The household consumption data can be analysed to obtain the total daily nutrient intake and the portion of daily nutrient intake from forest food for each household. Since there is no Lao standard, the Recommended Daily Allowance (RDA) should be calculated for each household according to the Thai standard (Department of Health 1989). The household

Figure 2: A systematic approach to involving villagers in a process of shared learning



RDA should be derived from the sum of nutrient requirements of the household members, according to household age and sex structure. The daily household intake of energy and main nutrients (protein, iron, calcium, vitamins A and C), should be calculated as a percentage of the household RDA and averaged for the seven days of the record. The daily nutrient intake from forest foods can then be expressed as a percentage of total nutrient intakes for each household.

Table 2: Household case study methodology

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

Table 3: Nutritional value of different forest foods			
FOREST FOODS	ENERGY	MICRONUTRIENTS	
	Carbohydrate, Protein, Fats, Sugars	Vitamins	Minerals
Forest animals, birds	High in fat Complete protein	Offal/organs high in nutrients Vitamin B	Animal iron
Fish,crustaceans frogs, molluscs	Complete protein	Some vitamin B	Animal iron, calcium from small fish (bones)
Insects, larvae, insect eggs	High in protein High in fat	Vitamin A Caterpillars rich in B12	Animal iron
Mushrooms	High in carbohydrate Rich in protein	Small amounts vitamin A and C depending on species.	Most species low in iron
Bamboo shoots	High in fibre and carbohydrate Rich in vegetable protein	Minimal amounts, lost in cooking	
Plants - leaves stems flowers	Low in energy Source of soluble fibre	Leaves important for vitamins A, C and folic acid. The darker the leaf, the more A,C	Vegetable iron from dark greens
Tubers	Rich in starch		
Honey	High in energy Rich source of simple sugars	Vitamin A	
Nuts	Carbohydrate, oils, protein		
Fruit, berries	Sugars and soluble fibre	Important source of vitamins A, C	Calcium, magnesium, potassium

Lessons learned

- The household case study approach can even be applied if there is limited time, support and facilities. By providing a focused and in-depth understanding of typical household conditions, a reliable indication of the food situation and the role of forest foods at the household level can be assessed and then placed in the context of the broader community picture with information from the village level study.
- A key factor is the need for effective translation, involving the local language, plus Lao and English languages.
- The opportunity for villagers to be actively involved in weighing and recording their resource harvesting and daily meals creates a focus of interest that can then be shared within the community.
- Women are particularly knowledgeable regarding resources and household food security issues, and should be actively encouraged to participate in such studies.

Definitions of participatory techniques

Transect walks - a combination of interview and observation as researchers walk through an area with their interviewee and ask about what is seen.
Semi-structured interview - interviewer uses a checklist of topics and questions but, depending on the interviewee, not everyone will be asked the same question.
Focus groups - people who share particular sets of interests or have common characteristics, i.e. single mothers, dry rice farmers. Groups of people are convened to discuss topics or answer questions prepared by the researcher.
Group meetings - village meetings which allow all types of people in an area to come together and collectively discuss ideas.
SWOL - strengths, weaknesses, opportunities, and limitations

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Participatory Land-Use Planning and Land Allocation

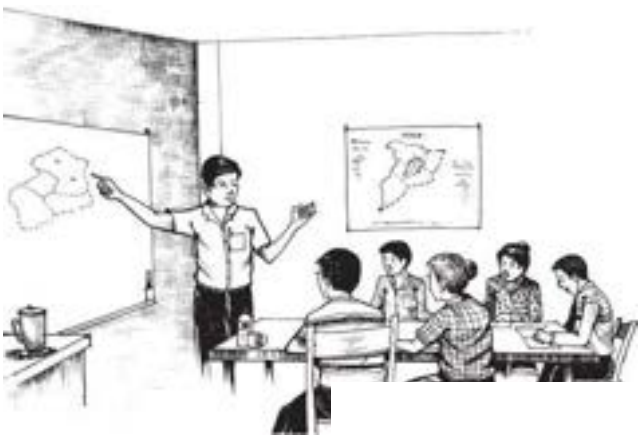
The government has a policy of encouraging villagers who practise shifting cultivation to adopt sedentary forms of agriculture. The aim is to reduce the area of steeper sloping land being used for crop production through the adoption of permanent crop production and maintenance of forested land. The strategies for doing this are:

- Allocating agricultural land on a temporary basis to provide farmers with land security.
- Encouraging farmers to invest in inputs to improve the productivity of allocated land.
- Increasing the area of land developed for wet rice production.
- Encouraging the planting of annual and permanent economic crops.
- Increasing villager participation in commercial tree planting and wood production.

The current rationale for promoting sedentary farming is a consequence of changes in upland agriculture. These changes include reduced fallow periods, and more intensive cultivation of sloping land. The effect of this more intense land use is that more top soil is being lost, soil fertility is declining and productivity is beginning to decline.

In order to facilitate the above strategies, Land Use Planning and Land Allocation (LUP/LA) procedures, methods and practices have been developed. An important aspect of the LUP/LA process is the participation of villagers in managing and protecting forest and agricultural lands: participation is key to sustainable development.

Understanding the sequence of steps (or the process) in LUP before attempting the fieldwork is most important. In the LUP/LA process there are procedures to follow, methods to apply and practices or tasks to undertake.



Procedures

These are the ten stages, comprising 32 steps, involved in preparing for land-use planning and conducting the planning and allocation exercise at village level. These conform to the stages for LUP/LA, as established by the Department of Forestry.

Stage 1: Preparation for Implementing LUP/LA

- Prepare implementation teams at district and provincial levels and conduct training for team members in Participatory Land Use and Management approaches. This will include preparation of survey and mapping equipment and materials. Villagers also need to be well informed, and must have the implementation activities and methods of the LUP process and GoL policies, regulations and objectives explained to them properly.

Stage 2: Survey and mapping of village boundary and forest and agricultural land use zones

- This necessitates the determination of village boundaries and the preparation of boundary agreements, followed by the drawing of a village base map. It is also important to survey village landmarks and topographic features to establish village reference points and to identify and map village forest and agricultural land-use zones.

Stage 3: Data collection and analysis

- Teams need to gather information on village land tenure, land use and land claims including traditional village agreements and farming systems. In addition, teams must gather information on socio-economic conditions and villagers' perceived problems and needs. This information should then be summarised and analysed to determine agricultural land allocation criteria.

Stage 4: Village land-use plans

- Conduct staff and villager awareness training on the definition, objectives and activities in forest and agricultural land-use planning.
- With support from extension staff, review and use existing village forest and agricultural land management agreements to help prepare initial forest land-use zone agreements and define appropriate agricultural land-use classes for a variety of locations.

- Select and demonstrate with participating families suitable land use options based on the above. Year end monitoring should be undertaken in order to facilitate planning and expansion of demonstration activities prior to adopting on going land-use plans.

Stage 5: Forest and agricultural land allocation

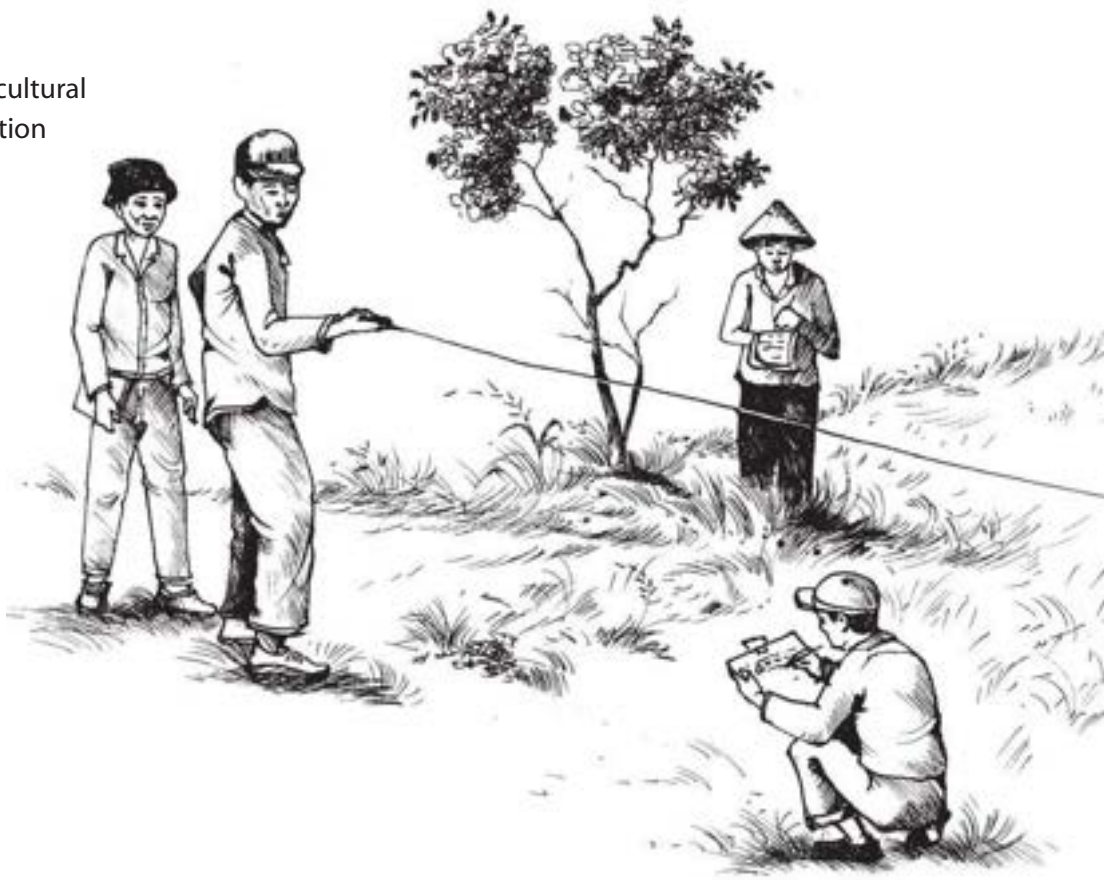
- Use the land-use zoning map prepared in stage 2 to discuss land use management with villagers. It is important to reach agreement on appropriate land uses for each of the land-use zones. It is then necessary to conduct a village meeting to verify land ownership and review land claims before allocating agricultural land.

Stage 6: Field measurement of agricultural land

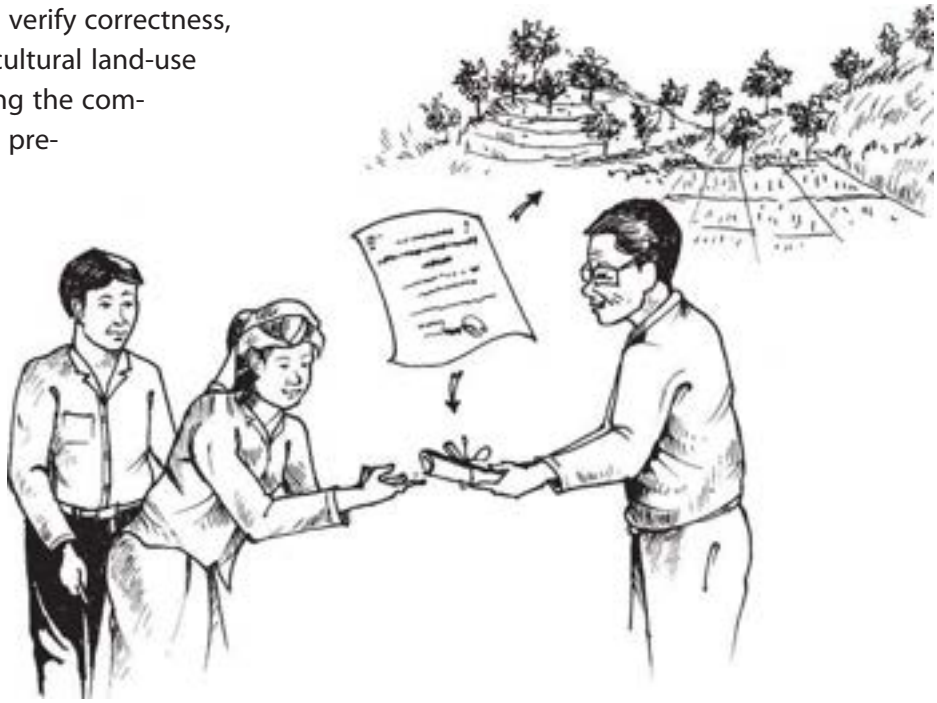
- Locate and measure agricultural fields and record information concerning land use. Use survey forms to record land condition, soil type, slope and proposed land use.
- Mark and identify the location of each agricultural plot measured on a 1:10,000, 1:5,000 or 1:2,000 field map.

Stage 7: Preparing agricultural and forestry agreements and transferring rights to villagers

- Initially, prepare temporary agricultural land transfer forms for each family (these should become permanent certificates after three years, though this process is in need of review).



- Using data from stage 6 verify correctness, confirm forest and agricultural land-use zones with villagers using the completed village map, and prepare village forest and agricultural land management agreements.
- Discuss and agree on appropriate forest and agricultural land management rules for each of the land-use zones incorporating existing village rules and agreements.
- Endorse and have the agreement signed by the village head, the LUP and LA committee and the District Governor.
- Finish the LUP/LA process at village level through a final summary with villagers.



Stage 8: LUP/LA information storage

- For each village in which land allocation is implemented, prepare copies of all relevant documentation compiled during the earlier stages: maps, recording forms, agreements, socio-economic data, land allocation data and LUP/LA reports. All documents are to be stored in the village and at the DAFO in appropriate containers and files.

Stage 9: Agricultural land allocation records

- When land allocation is completed in each village, a temporary land-use certificate (TLUC) record book needs to be established at the DAFO. The book should include all TLUCs cross-referenced, coded and checked against the village land use map.

Stage 10: Monitoring and evaluation

- Prepare and field-test the monitoring and evaluation procedures and forms.
- Conduct field monitoring of land-use practices with the village LUP/LA committee and villagers.
- Make a report and feedback monitoring results to villagers and the LUP/LA committee.
- Use the results to prepare a follow-up activity plan to address issues and problems identified during monitoring work and to improve the whole LUP procedure.

Lessons learned: improvement of the LUP/LA process

The GTZ Integrated Rural Development Programme in Mountainous Areas and the DAFO have been working to improve the LUP/LA process, in order to secure and upgrade the livelihoods of villagers in the mountainous areas of Sing District. The predominant hill tribe in the district is the Akha. It was found that in most villages people did not understand the reasons for LUP/LA and that in some cases the land allocated to them was not sufficient. More participatory elements were brought into the LUP/LA process; and in so doing a number of lessons have been learned.

Law, policies and regulations

- Prepare a summary of relevant documents, including a brief explanatory handout in Lao language.
- Village regulations (including traditional rules), should be drafted by villagers themselves.

Data collection and storage

- Improve cooperation within and between data collection teams in order to avoid duplication.
- Focus only on land and natural resource issues. It is not necessary to collect all socio-economic and village data: rather focus only on data relevant to land use zoning and land allocation (e.g. present land-use by villagers, understanding of village forest rules and regulations, family land use, land-use tenure and claims).
- Analyse the collected data more clearly for use in the LUP/LA process.

Boundary agreement and LUP

- In order to define boundaries, aerial photography can be used to specify zones and land use.
- Boundary agreements should be standardised, and a consensus signed by neighbouring villages.
- Villages which depend upon shifting cultivation need agricultural use areas that allow a sustainable rotational cultivation system (including fallow periods).
- Identify additional potential paddy land to be reserved for future land allocation.
- In case of future village resettlement, enlarged topographic maps can be used to identify potential areas for new settlements (including new paddy fields, water supply, topography etc).

Land allocation

- Ideally all families should be allocated an adequate number of parcels within the village agricultural zone, for both food and commercial crops.
- It is advisable that criteria for new land be developed together with villagers. This might help to minimise social conflicts among villagers and improve the livelihoods of the poorest villagers.
- Migrating families should be integrated into the process.
- LUP/LA needs to be reviewed if additional householders migrate to a village after the LUP process.

(Continued on next page)

LUP extension services

- In order to stabilise shifting cultivation and eradicate opium production it is important to offer alternatives through advice on land capability and development potential, in parallel to LUP.
- Objective advice must be provided to prevent new forms of land misuse/ exploitation.
- Consultancy and project staff attendance are necessary on a long-term basis in order to teach villagers new agricultural methods.
- Financial support is needed to help poor villages start/improve integrated farming systems.

Monitoring, evaluation and future prospects

- The LUP/LA process should be regularly followed up by assessment visits, impact monitoring and evaluation of the understanding of LUP/LA. In this way, any new problems and conflicts can be identified and managed more quickly. In addition, the process itself can be improved and updated. It is recommended that site visits, initially being more frequent, gradually decrease over time.
- A successful LUP/LA process is the starting point for the development of improved community-based natural resource management. Simple management plans are most appropriate for the use/supply of forests, land and water.

Source: Kallabinski & Lundgren 2004.

Extracted from:
Lao Swedish Forestry Programme. 2004. *Participatory Land Use Planning and Land Allocation*. NAFRI. Vientiane

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Lao Swedish Forestry Programme: Technical Booklets 1 to 8 pertaining to LUP/LA. Specifically booklets 4,5,7 & 8:

Technical Booklet 4: *LUP/LA Information Storage Methods*

Technical Booklet 5: *Establishing TLUC Record Books*

Technical Booklet 7: *Demonstrating Land Use Practices in the Uplands*

Technical Booklet 8: *Monitoring and Evaluation for LUP/LA*

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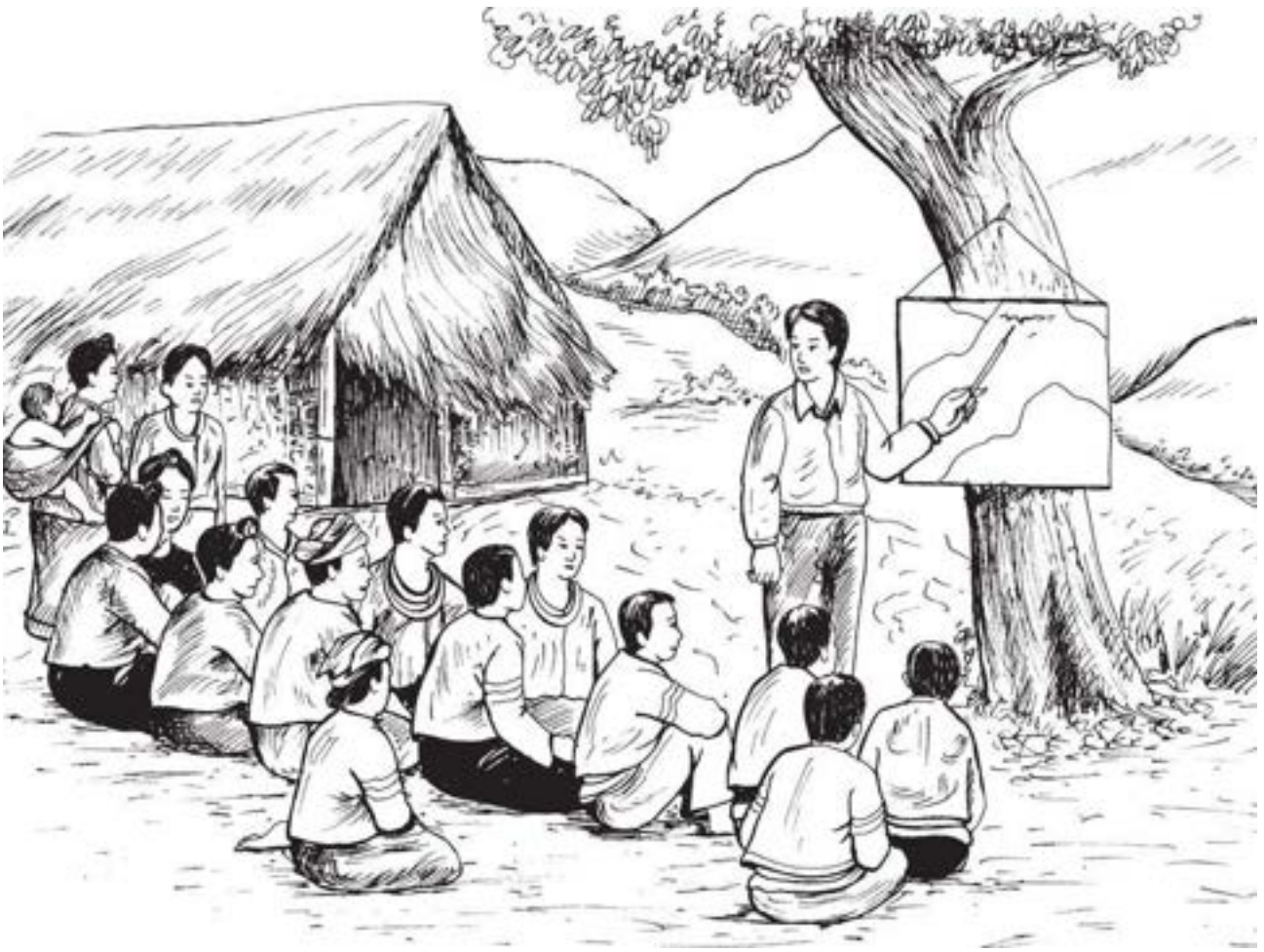
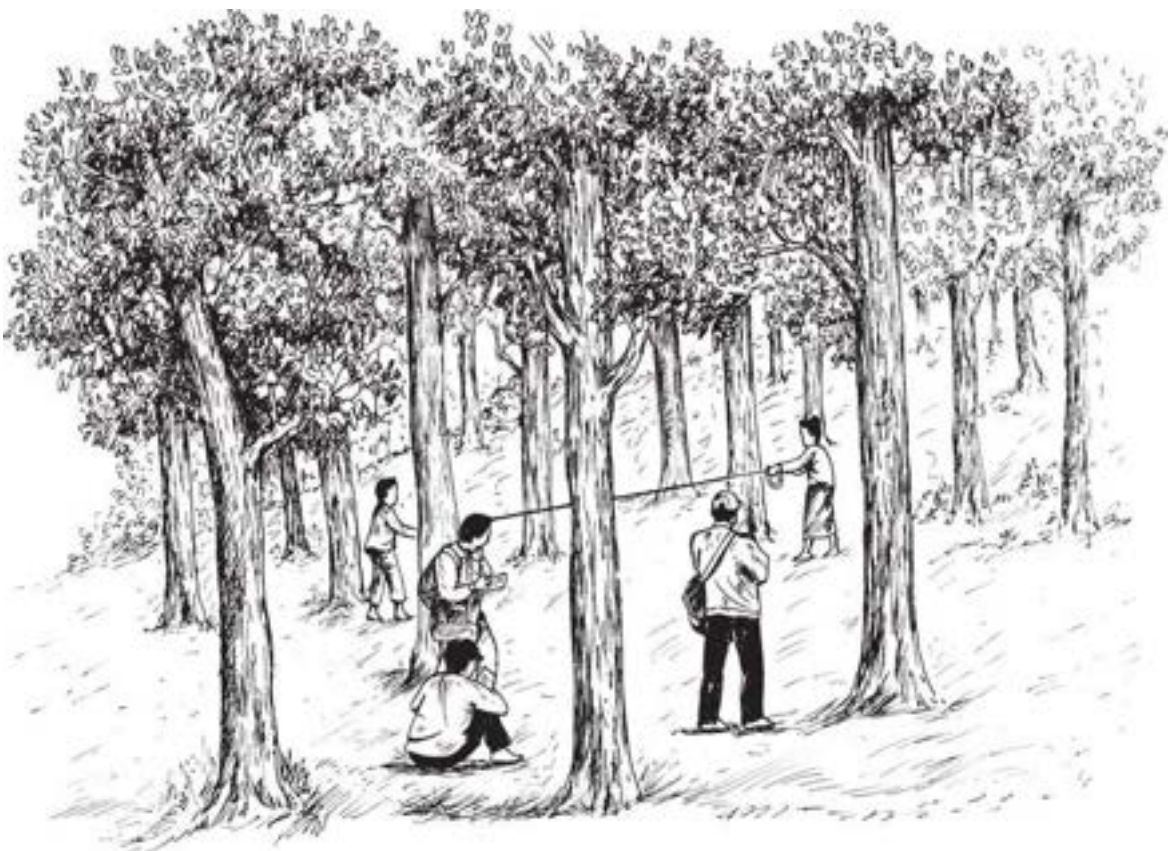
Management of Village Forests



Land Use Planning and Land Allocation (LUP/LA) is the basis for a national process of defining land zoning for forests and individual user rights based on certified land use titles. Land use planning deals with complex situations at the village level, setting the framework for land management, natural resources protection and socio-economic development, while considering customary rights, traditions and local conditions.

As a result of the revised LUP/LA process, villagers have been allocated forest areas based on a land-use zoning exercise (see Table 1). The results of land-use zoning are the necessary starting point for the development of improved Community Based Natural Resource Management (CBNRM) mechanisms, such as village forestry and NTFP management. However, detailed forest management and benefit-sharing plans are yet to be completed.

Overview of standard LUP/ LA procedures in Laos		
	Main Activities	
	Eight-stage procedure (MAF 1996)	**Modified ten-stage procedure** (LSFP 2001)
Stage 1	LUP/LA preparation (training staff, preparing materials and consultations)	LUP/LA preparation
Stage 2	Village boundary survey, land-use zoning, forest surveys and land-use mapping	Village boundary delineation and land-use zoning
Stage 3	Data collection and analysis of land tenure, socio-economic conditions and needs	Data collection and analysis
Stage 4	Meeting on land-use planning and allocation	Village land-use plans
Stage 5	Agricultural field measurements	Allocation decisions on forest and agricultural land
Stage 6	Preparation of forest and agricultural agreements and transferral of rights to villagers	Field measurements of agricultural land
Stage 7	Land-use management extension	Forestry land agreements and transfer of rights to villagers
Stage 8	Monitoring and evaluation	LUP/LA information storage
Stage 9	-	Agricultural land allocation records
Stage 10	-	Monitoring and evaluation



From LUP/LA to CBNRM

Simple management plans for NTFPs, firewood and timber production forests, and fishery areas need to be established. These plans are one of the fundamental requirements for a full handing over of management responsibilities to communities (decree on sustainable management of production forest areas No.59/ 2002, and regulation on the management of village forests No. 0535/AF 2001).

Establishment of village forestry schemes, and improved NTFP management based on the results of the revised LUP/LA, have started in Sing and Nalae districts of Luangnamtha and will be gradually expanded to other target areas in the GTZ RDMA project.

All CBNRM activities start with an assessment of existing resources and development trends over the past few years. For village forestry, the methodology of simple participatory forest inventories has been introduced. In this exercise, the designated village production and use zones of the forest are separated into management blocks showing similar or homogenous characteristics. During the inventory, villagers and local DAFO staff work together to identify the current tree species composition in the blocks, the distribution of stem diameters, and the condition of natural regeneration.

In a tree ranking Participatory Rural Appraisal exercise, villagers decide which local tree species are most valuable to them and how these might be regenerated in the existing production and use forests. This could be achieved by selective clearing, pruning or planting.

For each village production forest area, villagers then decide on detailed purposes such as timber production, firewood collection, bamboo forest and so on. Once the available resources are known, targets and management objectives are agreed by the entire population of the respective village or cluster area. Based

on these objectives, activities are defined and written down in a simple management plan. Yet management plans are more detailed, more technical in nature and more implementation oriented than the more general 'village regulations' already set up during the LUP/LA process. A similar procedure is followed to determine the NTFP and fish resources within villages. Once again, simple management plans are established for all NTFP collection and main fishing areas within a village. Standard formats for the management plans are currently under design.

Land-use planning and land allocation

Several studies have assessed the outcome and impacts of past LUP/LA activities. They confirm that in most villages, a high proportion of land has been designated for protection or conservation. Data from Bokeo and Luangnamtha shows that designated protection and conservation forests cover between 40% and 80% of village areas, while zones allocated for production range from 2% to 40%. Agricultural land makes up 20% to 40% of village areas. Production areas are often considered insufficient by the local population and do not provide self-sufficiency.

Village forestry in Laos has been defined as a partnership between the state and organised villagers for the management of designated forests to sustain benefits, which are equally shared by the villagers and the rest of the national community. Village forestry is understood:

- as a process rather than a predetermined output;
- as a continuum of approaches to people-oriented forest management with different intensities in the degree of participation.

A National Village Forestry Strategy was elaborated in 2001, but implementation of village forestry has been extremely slow. For example, in Bokeo and Luangnamtha there are no cases of village forestry based upon agreed forest management plans.

Village forest management agreements

During the LUP/LA process five forest categories are distinguished: protection, conservation, production, rehabilitation and degraded. Degraded forest can be allocated for agricultural production or reforestation. For all land with forest cover, Village Forest Management Agreements must be signed specifying the area and management regime. These general agreements do not contain precise forest management practices. However, in some provinces detailed village regulations are developed and signed in the villages. These describe the permitted uses and rules for agricultural and forest land found in each village.

Area management is the responsibility of an LUP/LA and CBNRM committee or cluster committee. To avoid having too many committees, it is preferable to work with the existing LUP/LA committees and give them the additional task of managing the village forests or NTFP areas. This does not preclude particular NTFP collection groups from taking specific responsibility for certain blocks or zones.

Based on management plans established by the villagers, formal forestry or NTFP agreements are signed between the head of the DAFO and the village LUP/LA and NRM committees. These agreements are valid for five years and are renewable. During this period villagers must prove they are willing and capable in managing forests and NTFP collection areas in a sustainable way. DAFO staff provide advice, supervision and training.

Improving Livelihoods in the Uplands of the Lao PDR was produced in 2005 by NAFRI, NAFES and NUOL.

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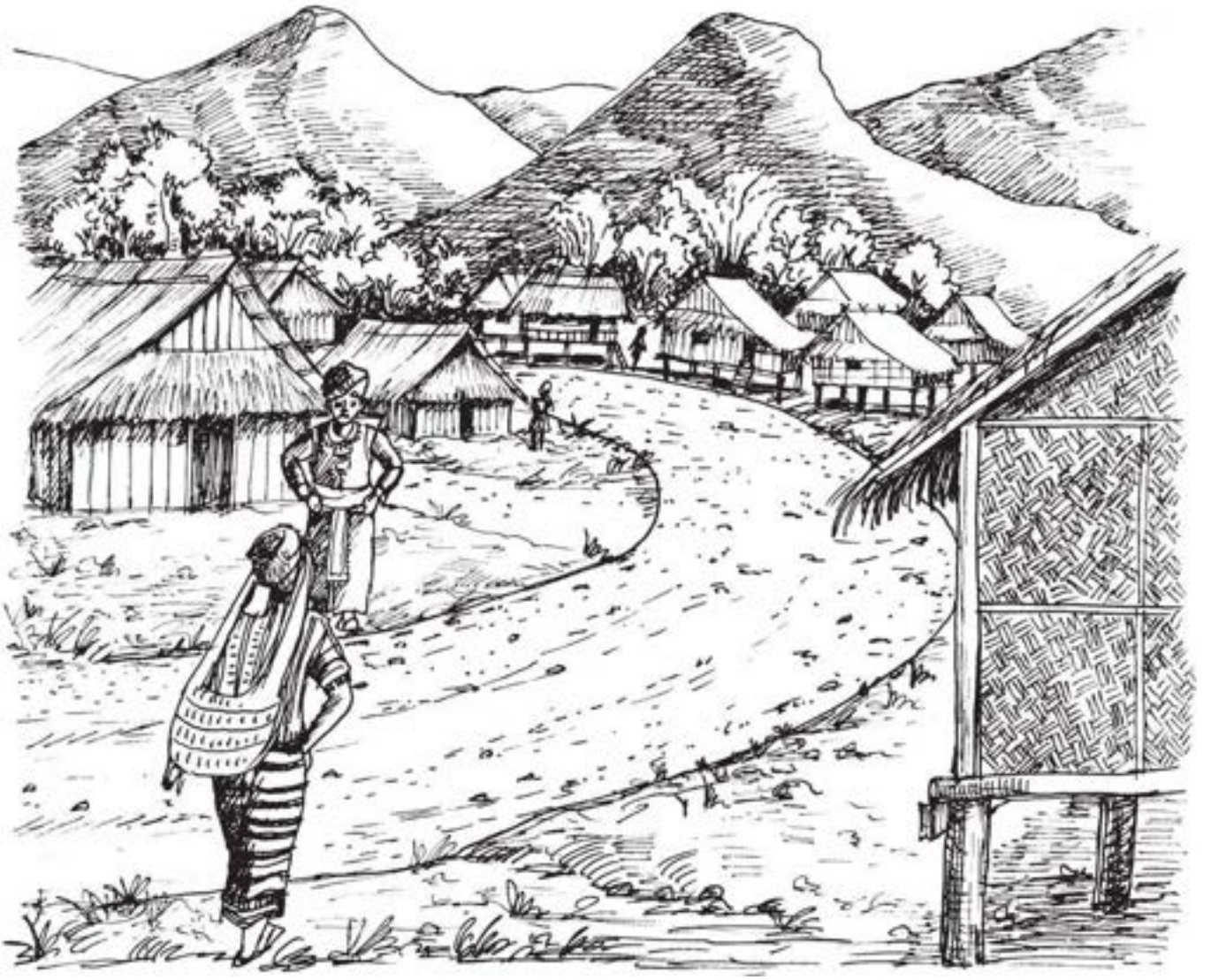
Issues from Village Relocation



Relocating people from isolated highland villages to more accessible areas forms part of the national policy to eliminate shifting cultivation and opium production and eradicate poverty. In Phonxay District of Luangprabang Province, the district authorities have introduced programmes to consolidate or merge relocated villages to provide better infrastructure and government services.

Research in study villages has so far indicated that the merging of villages, while having some desirable outcomes, is giving rise to a range of land use, social and livelihood problems. This is especially so when different ethnic groups such as Hmong and Khamu are consolidated into one village. The Lao-Swedish Upland Agriculture and Forestry Research Programme (LSUAFRP) has been working in close cooperation with district authorities to identify problems that have arisen and provide suggestions on land use planning procedures to ameliorate the adverse consequences of relocation.

The parties affected by relocation programmes are:

- The district agencies entrusted with implementing relocation.
- Those relocated from highland villages (in this case ethnic Hmong).
- The inhabitants of the villages to which relocatees are moving (in this case ethnic Khamu villagers).

Objectives of land-use research on relocation

1. To better understand the institutional, land-use and social issues and their causes.
2. To understand future farmer livelihood strategies in order to cope with relocation.
3. To propose potential solutions.

The Phonxay District Relocation Programme

The programme for relocation and village merging in Phonxay District aims to reduce the total number of 72 villages in the district to 41 villages by the year 2005. This involves the movement of 11,472 people.

The plan is not supported by any livelihood or land-use analysis and leaves much of the responsibility for relocation with the communities themselves. In study villages the plan includes the relocation of a total of 180 Hmong families from Pha Toup Tai, Phou Soong Noy and Pha Cha Norm to the new roadside village of Huay Maha.

Issues identified from studies on relocation

The issues surrounding relocation in general are of three types:

- *Institutional issues* arising from programme implementation.
- *Land-use issues* arising from concentration of populations.
- *Social issues* caused by merging villagers of different ethnic groups.

The institutional issues are:

- *Limited district resources:* the district lacks adequate staff and budget to provide the infrastructure required for relocation on the scale outlined in the plan.
- *Ambiguous agency roles:* relocation and land allocation programmes are managed and implemented by different district agencies, i.e. the District Administration and DAFO respectively. Concentrating populations creates land allocation problems for the DAFO.
- *Limited dialogue:* there is limited dialogue about perceptions and strategies between concerned agencies and village authorities when preparing relocation plans.

The land-use difficulties in Phonxay are:

- *Less fallow land to rotate:* most original Khamu families have fewer plots of agricultural land to use because new settlers have acquired numerous parcels.
- *Little or no land:* some of the recent arrivals have only one parcel of land in the new location, i.e. they have not been able to claim adequate land in their new location.
- *Land quality:* as agricultural land becomes more limited, some families have to choose less fertile agricultural land.

- *Land borrowing:* new settlers borrow land and pay the land tax to the Land Office instead of to the owner, with the aim of establishing claim to the land.
- *Land sub-division:* Khamu farmers have adopted practices such as the sub-division of parcels and crop rotations as an alternative to plot rotations. Villagers referred to this as *prayat din* (saving land), which may involve continuous cropping for three years on one parcel of land.
- *Weeds*: *imperata cylindrica* grass has started to infest cropping fields.
- *Vacation of allocated land:* to date about 121 ha of allocated land has been vacated by 26 families who have migrated out. About half of the land allocated by DAFO in 1997/98 has been acquired by Hmong families.
- *Distance from farming land:* Khamu families are now further away from their farming lands since they were moved to the 'New' Huay Maha village site.
- *Cattle mortalities:* there were eight cattle mortalities when Hmong families first moved to Huay Maha, where there is very little grazing land; the animal losses were valued at 6,400,000 Kip.

The social problems in Phonxay include:

- *Population increase:* in 1997/98 Huay Maha/Poung Pao had 58 families with a population of 337. By the end of 2002 the number of families had risen to 92 with a population of 647.
- *Human mortalities:* the mortality rate of Hmong settlers in Huay Maha, particularly children, increased beyond normal levels after they moved from higher elevations: nine deaths in the last two years.
- *Vacating houses:* when Khamu families moved from Poung Pao to 'new' Huay Maha they had to vacate their houses in the old village and build new houses.
- *Water supplies:* the Khamu abandoned the permanent water supply at the old site for an incomplete supply at the new site.
- *Housing land:* Hmong settlers are occupying housing land vacated by the Khamu.
- *Schooling:* the new temporary school at Huay Maha is inadequate.

How do land-use issues arise?

Government programmes

The issues are linked to and influenced by three government programmes being implemented by district authorities:

- *The Focal Site Strategy and Village Consolidation Programme:* this is the cornerstone of the government's rural development policy. It is officially viewed as a necessary means of reducing shifting cultivation. It specifies that a village unit may comprise no fewer than 50 families.
- *Opium Cultivation Elimination Programme:* differing interpretations and application of the policy at district level have resulted in the relocation of opium-producing villages to lowland areas in preference to undertaking alternate *in situ* development.
- *Shifting Cultivation Reduction and Alternate Occupations Programme:* this programme aims to stabilise shifting cultivation, stop indiscriminate logging, and regenerate forests through the adoption of permanent land-use systems, preferably in lower-lying areas.

Villager perspectives

Expected benefits from relocation

Representatives of the Hmong settlers indicated they would derive the following benefits from moving to Huay Maha:

- *Access to land:* access to adequate and suitable land for livelihoods.
- *Transportation:* road and transport access.
- *Markets:* access to markets to buy and sell commercial commodities.
- *Health services:* improved access to health services in roadside locations.
- *Education:* better educational opportunities for their children at the new location and access to higher education elsewhere.
- *Clean water:* access to better domestic water supplies at the relocation site.

Solutions proposed by villagers for overcoming land shortages

Few of these anticipated benefits have yet materialised. In answer to the most pressing problem facing them, Huay Maha villagers proposed the following solutions to overcome land shortages:

- *Village boundary*: expand the village boundary of Huay Maha to include upland areas in the old Hmong village areas.
- *Land reallocation*: exchange land between the villagers of Huay Maha, Ban Pa Toup, Phou Soong Noy and Cha Norm so that families have some plots adjacent to the road and other plots in the management areas of their old villages.
- *Livelihood strategies in 'far fields'*: plant crops such as upland rice, maize and Job's tears in the old village areas where soils and climatic conditions are more favourable, and raise goats, cattle and buffalo in areas further away from the road.
- *Livelihood strategies in 'near fields'*: plant permanent commercial crops such as fruit trees and NTFPs and undertake fish pond husbandry.
- *Access tracks*: pool labour to improve the walking track to the highland areas so that horses and farm tractors can transport produce to the main road and markets.

Addressing the issues

1. Where relocation has occurred or is occurring

The advocated approach is based on assessing the carrying capacity of lands available to the existing and projected population, both in the 'host village' and in the areas from where people have been relocated. This involves consultation with district authorities to formulate possible solutions to identified problems.

2. Preventative measures when relocation is being considered

Village relocation continues to occur in the highlands, and the consequences of this policy could be improved for all concerned if some mitigating measures were included in relocation plans.

Process of assessing the consequences of relocation and formulating possible solutions to identified problems	
Activity 1:	Gather secondary data from district authorities and target villages
Activity 2:	Verify populations and population trends in villages where relocation is occurring
Activity 3:	Verify and map existing village boundaries of host villages and adjoining relocating villages
Activity 4:	Calculate agricultural land available in host' and 'neighbouring' villages
Activity 5:	Approximation of carrying capacity of the available land in both the host village and neighbouring villages
Activity 6:	Identify future farmer livelihood and land-use strategies with representative farmers from each of the villages concerned
Activity 7:	Assess land requirements based on projected populations and livelihood strategies
Activity 8:	Expand the host village boundary to include enough land for the projected population (may involve incorporating all host and relocating village land in 1 village area)
Activity 9:	Undertake agriculture and forest land zoning using appropriate zoning criteria
Activity 10:	Prepare Land Management and Use Agreements for the expanded host village management area
Activity 11:	Undertake land re-allocation for relocated and original residents

Conclusions arising from action research	
Issue	**Conclusions**
District development strategy	• Re-orientate the strategy so that it is not bound by programme targets but is appropriate to the limited availability of staff resources and funds • Reduce the size and rapidity of relocation programmes to match the limited district resources • Introduce on-site community planning and alternate development approaches in shifting cultivation and opium cultivation villages
District rural development planning	• Increase villager participation in planning to ensure that village livelihood objectives and strategies are incorporated in village land-use and development planning
Land management at district level	• Strengthen inter-agency planning of land management programmes • Build improved land management planning capability at district level
The village merging and relocation programme	• Re-think relocation targets and timing • Consider alternatives to relocation, i.e. the construction of access tracks and small rural roads with villager assistance to enable villagers to retain production areas near old village sites • Integrate the development of forest and land management agreements with access road construction • Undertake the planning, costing and funding of infrastructural development and the provision of services at roadside locations prior to relocation
Population growth and land demand	• Undertake population growth projections and arable land area availability calculations when planning village consolidation • Reconsider the present criteria of merging small settlements to achieve 50 families per village near roadsides because it isolates villagers from production areas, restricts production and livelihood potential in the hinterlands
Village livelihood considerations	• Consider villager strategies, coping mechanisms and livelihood options when village merging is being planned • Provide access to production land for commercial crops within reasonable distance of village sites, and provide larger village production areas
Rights to land	• Ensure equitable allocation of adequate arable land to original residents and new settlers and provide land tenure entitlements in agreed production areas • Engage villagers in land redistribution and land re-allocation to ensure that host village families are not being disentitled by the influx of new settlers, and that new settlers receive fair allocations
Village land-use agreements and inter-village networking	• Prepare village land-use agreements with villagers after land re-zoning and redistribution, to encourage inter-village cooperation in agricultural land and forest management and use

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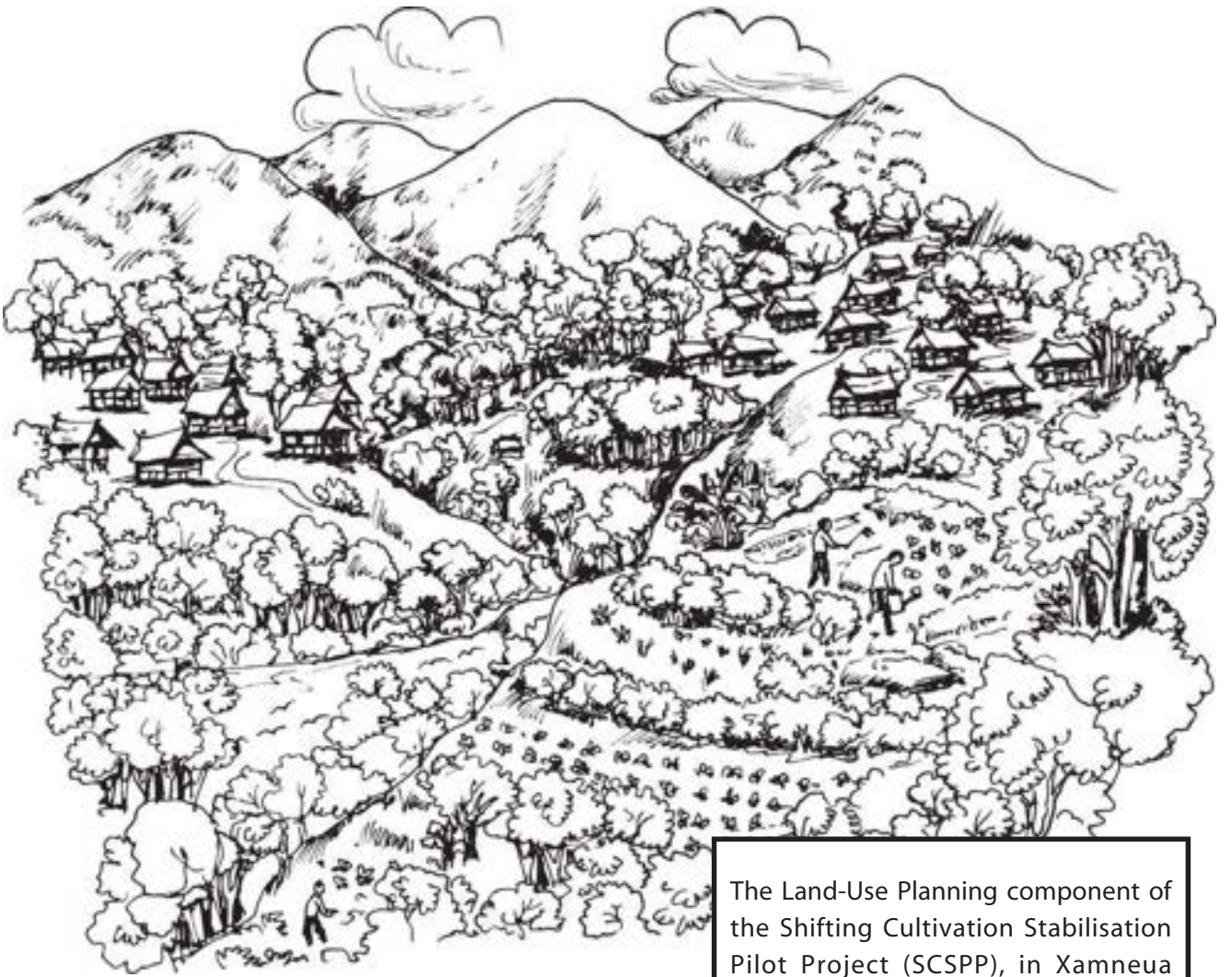
Village Land-Use Planning and Land Allocation: An Alternative Approach



The Land-Use Planning component of the Shifting Cultivation Stabilisation Pilot Project (SCSPP), in Xamneua District of Huaphanh Province, has been investigating and developing new and /or modified approaches and options to land use planning and land allocation in upland areas. This activity is being undertaken in a total of 52 villages.

Land allocation has been widely viewed as a mechanism for reducing shifting cultivation, with much emphasis placed on it at the district level. However, the impact of land allocation on shifting cultivation reduction may be minimal: assessments by the Forestry Inventory and Planning Division of the Department of Forestry during the period 1992 to 2002 suggest that areas of shifting cultivation country-wide remain approximately the same (FIPD 2003). Studies, including the Participatory Poverty Assessment (ADB 2001), have also indicated that some villagers regard land allocation as a cause of poverty, particularly in upland areas, because it reduces the area of farming land available to farmers.

These findings, among others that have been documented, suggest that village-level land use planning and land allocation (LUP/LA) approaches need to be re-examined.

The SCSPP approach to LUP/LA is based on the understanding that shifting cultivation of the 'pioneer' type (where undisturbed forest land is felled for cultivation), is not acceptable, and that the cultivation of land for agriculture using forest fallow rotations in agreed agricultural zones is acceptable (MAF 2001). This approach is appropriate for the physical and socio-economic conditions found in mountainous upland areas, and can be implemented by district and provincial agencies with limited resources, staff and financial resources. The aim is to contain shifting cultivation within agreed agricultural land use zones while providing villagers with agricultural and forest land-use entitlements and benefits. First there is an assessment of current land-use planning and land allocation approaches. Then the three phases of the SCSPP approach follow: The first phase focuses on land-use planning and land-use zoning. A second phase concentrates on monitoring villager forest and agricultural land use and inter-village networking activity, while a third phase, land allocation, provides agricultural land tenure entitlements to families.

Premises, characteristics and options of the SCSPP approach

Premises

The following premises have been adopted:

- Initially, the focus is on land use planning and land use zoning, not on land allocation.
- The aim is to retain the areas of remaining forest areas within village boundaries, not necessarily increase the forest areas.
- LUP work is undertaken in 'clusters' of villages occupying the same small watershed area, not single villages, to promote inter-village cooperation.
- These village clusters are later formalised into networks to encourage sustainable village management and use of village agriculture production areas and village protected forest areas.
- LA is deferred until after the villagers adopt the zoning and networking activities, and after the performance of villagers in managing forest and agricultural land is satisfactory. This enables villagers to prepare for land allocation.
- Villagers choose which parcels of land they wish to have allocated based on villager preferences and land development criteria established by the project.
- Villagers retain use rights for other agricultural land that is not yet allocated using a village-managed land distribution system.

- Land is allocated to families each year as it is developed, not only on one occasion.
- Concurrent agriculture and agro-forestry extension and credit programmes provide support for villagers to develop agricultural land.

Characteristics

The approach has the following characteristics:

- Workable with limited staff resources, i.e. *efficient*.
- Achievable with limited funds, i.e. cost *effective*.
- Achievable by staff with limited technical skills, i.e. relatively *simple*.
- Suitable for steep upland terrain as well as lowland situations, i.e. *flexible*.
- Recognises the variety of land uses and farming systems in villages, i.e. *adaptable*.
- Progresses through phases to increase villager understanding of the process, i.e. *gradual*.
- Contributes to shifting cultivation stabilisation, i.e. *responsive* to policy.
- Incorporates inter-village networking to manage natural resources, i.e. *participatory*.

Options and Flexibility

The approach is an adaptation of a process adopted by the government, commonly referred to as the 'eight or nine step procedure'. Depending on village conditions and the preparedness of villages, land-use planning teams may choose to implement three different options:

1. Delineate village boundaries – *village boundary approach*
2. Delineate village boundaries and village forest and land-use zones - *land use zoning approach*
3. Delineate village boundaries, village forest and land-use zones, and undertake land allocation - *land allocation approach*

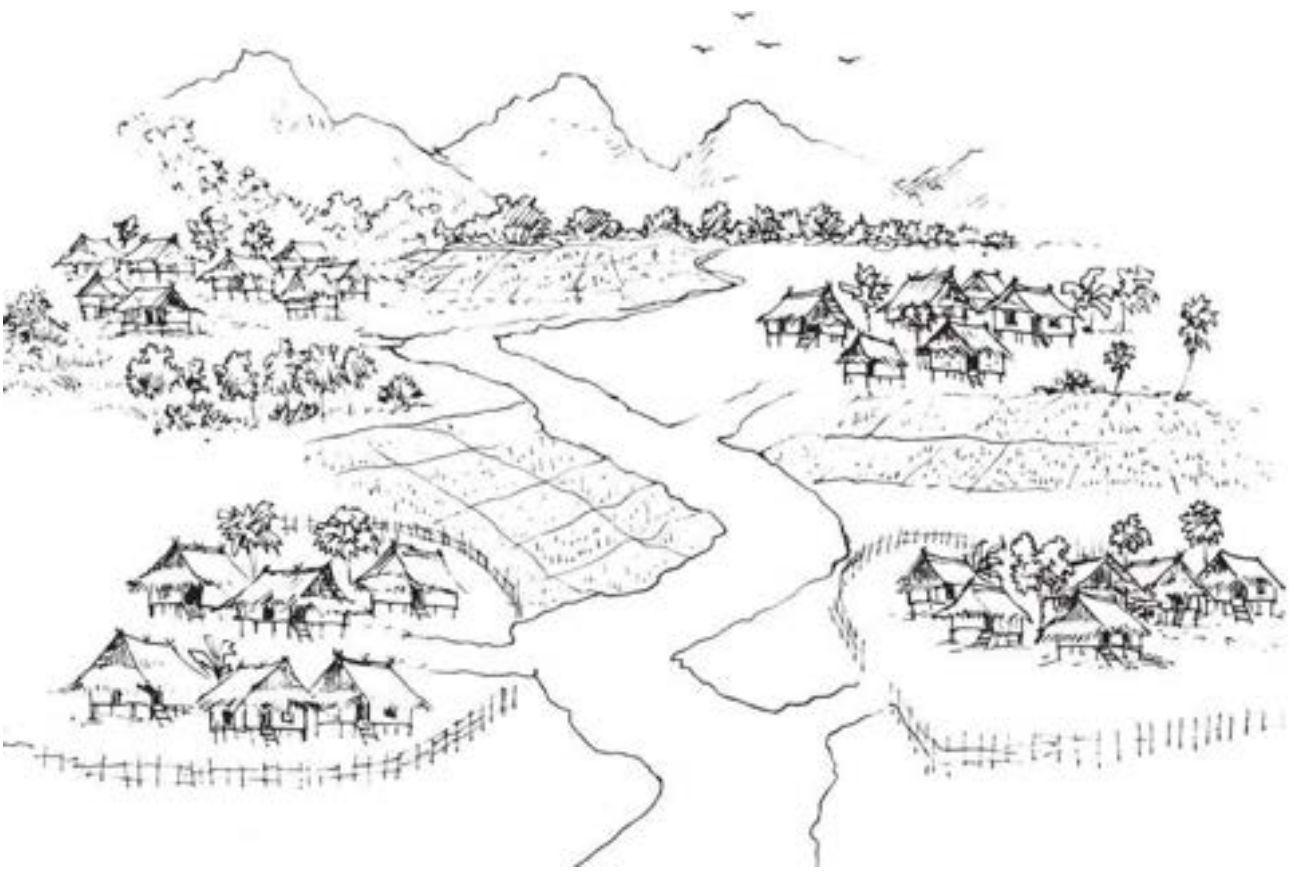
The advantage of having these options is that they can be used as separate options for particular villages at any time and/or used sequentially over a period of years in any village.

The steps in these options are illustrated below:

Village boundary approach
Step 1: LUP and LA preparation - staff and villager orientation.
Step 2: Establishment of village LUP/LA committee.
Step 3: Village boundary delineation (and, if appropriate, some preliminary zoning).

Village forest and agricultural land-use zoning approach
Step 1: LUP and LA preparation - staff and villager orientation.
Step 2: Establishment of village LUP/LA committee.
Step 3: Village boundary delineation.
Step 4: Village forest and agricultural land-use zoning.
Step 5: Preliminary village forest and agricultural land management agreements.
Step 6: Establishment of village land-use networks based on village 'clusters'.

Land allocation approach	
Step 1: LUP and LA preparation.	**Step 6:** Data collection and analysis (for land allocation) and land allocation decisions.
Step 2: Village boundary delineation and land-use zoning.	**Step 7:** Agricultural land parcel measurement and issue of Land Use Certificates to families.
Step 3: Preliminary village forest and agricultural land management agreements.	**Step 8:** LUP/LA data storage and agricultural land allocation records.
Step 4: Establishment of village land-use networks based on village 'clusters'.	**Step 9:** Village land-use plans for both agriculture and forestry land parcels *(based on the preliminary Land Use Agreements and networking and monitoring experiences)*
Step 5: Village and inter-village networking, monitoring and evaluation.	**Step 10:** Continued agricultural and agro-forestry extension (by relevant units).



Village types			
Type	**Approach**	**Farming System**	**Village Conditions**
Type 1 (low cost)	**Boundary approach**	Upland rain-fed farming system with fairly indiscriminate land use.	• Villages with indiscriminate shifting cultivation • Isolated villages with difficult access and terrain • Relatively low population densities • Villages where there is a low demand for land • Little or no paddy land available
Type 2 (medium cost)	**Land-use zoning approach**	Mainly upland rain-fed farming system with fallow field rotations and some paddy land.	• Villages with reasonable access • Medium population densities • Areas where fallow field rotation systems are used to maintain crop productivity • Villages where there is an increasing demand for land • Some paddy land available
Type 3 (high cost)	**Land allocation approach**	Mainly paddy land farming system with some or little upland cultivation. Permanent upland uses being adopted by farmers.	• Areas with good access and less difficult terrain • Areas with higher population densities • Areas where there is a higher demand for land • Villages where land values are higher (paddy, tree crops) • Higher potential for land disputes within the village • Potential for extension programmes to work effectively

Villages can be classified to help determine which approach is more suitable (see above).

Benefits from classifying villages

- Assists with setting priorities for LUP/LA implementation in villages.
- Facilitates more effective planning and costing of LUP/LA activities.
- Provides separate options for particular villages at any time and/or, can be used sequentially over time in a given village.

Key elements of the SCSPP approach

Active implementation of land-use zoning, and preparation of village forest and agricultural land-use agreements are useful tools in containing shifting cultivation and developing villager competence in forest and agricultural land management. Other key tools include the development of village networks, networking activity and participatory monitoring of villager management performance and problems.

Village forest and agricultural land use zoning

The aim of land-use zoning is to delineate forest and agricultural land-use categories that contribute to a satisfactory village livelihood system, while offering potential for retaining current forest cover levels. Land-use zoning is a participatory activity with villagers that enables LUP staff to understand village land-use practices when demarcating production and protection zones within an agreed village boundary. At the same time it enables villagers to under-stand government policies and programmes regarding land-use allocation and entitlements. Land-use zoning can contain the expansion of shifting cultivation by demarcating an adequate area or areas of agricultural land, within which villagers are permitted to manage the distribution of land parcels to families. Land-use zoning is complemented by village owned land-use agreements to manage

agricultural land, production forests, and protection forest areas.

Village forest and agricultural land use agreements

These agreements elaborate the management and use arrangements and conditions for each of the village land-use categories. They are developed with villagers at the time land-use zoning is undertaken, and are officially acknowledged by district authorities. Implementation of the agreements is facilitated and strengthened by village land use maps and village signboards. The village authority works with the appointed LUP and LA committee and the Village Development Committee to implement and enforce the conditions and rules of the agreement. LUP staff members help village authorities to resolve difficult land-use issues that arise to ensure that the integrity of the agreement is protected. Agreements should provide for flexibility in the use of land including conditions for the use of forests and land in neighbouring villages, and exchange of land for cultivation between villages.

Village networks, networking and monitoring

Clusters of villages with common boundaries are formally organised into 'networks', representatives of which meet regularly to discuss and resolve land-use issues and conflicts, and to progressively develop understandings on natural resource management and use at the network level. The inter-village networking commences from the time neighbouring villages come together to discuss and agree on village boundaries. Networking is progressively strengthened by the preparation of inter-village boundary agreements, and by awareness activities that facilitate an understanding of the village forest and agricultural

land use agreements of neighbouring villages. LUP staff members assist with organising network activity, and use the network meetings to monitor the implementation of village agreements, and to develop and document network agreements. Monitoring is targeted at the 'zone level' not the 'agricultural plot level' because there are limited district staff resources available. Monitoring improves the villager's ability to manage the land use zones as intended.

Land allocation

Land allocation is phased in at a time when villagers are comfortable with managing the land-use zones. Land-use rights to agricultural land follow the land ownership patterns established by the villagers themselves. The village authority and LUP/LA committees take responsibility for land distribution. They keep record sheets of land claimed and used by families so that the families have continuing access to various parcels of land. Land use certificates are issued for parcels of land on which families demonstrate they are making progress with permanent and sustainable agricultural practices. Land allocation will continue in phases as farmers progressively develop land parcels. Land use contracts are not issued because they unnecessarily restrict farmer's land use/cropping choices and flexibility to respond to market opportunities, and their enforcement damages relations between farmers and extension staff. Land-use contracts are also not required in the process of land registration. Official records of allocated land are maintained by the DAFO to ensure that a base record will exist to facilitate future registration of allocated parcels, and in the longer term, to facilitate land titling.

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Land-Use Planning in Protected Areas

Protected areas and the role of land-use planning

Protected areas are essential for the conservation of biological diversity and meeting community objectives. In the Lao PDR, approximately 41.5% of the land has forest cover, providing critical habitats and refuges for many endangered species. Since 1993, Laos has established 20 protected areas covering approximately 13% of the country and has developed management structures based on collaboration with local villagers. The villagers remain in the protected areas with user rights and a role in land-use management.

The problems facing protected areas include socio-economic factors affecting communities in and around protected areas (e.g. poverty, land tenure and equity). The overriding issue in Laos is how to balance conservation against the need to exploit natural resources to sustain livelihoods and foster economic development.

Under the conservation strategy, protection efforts are linked to land-use planning and allocation plus livelihood improvement for communities residing near or within protected areas.

The Area Production Model (APM), originally developed in the 1980s, has gained attention as a land-use planning tool in Africa and Asia. It describes the development of production and consumption in agriculture and forestry within a defined geographical area under various assumptions about management, land-use, socio-economic and macroeconomic changes. This approach is well adapted to the protected area management system.

Technology for providing land-use data

Participatory Rural Appraisal (PRA) is a practical research and planning approach that supports decentralised planning and democratic decision-making. A PRA values social diversity, community participation and empowerment. The main objective of PRA is to improve target communities' understanding of their own situation and environment. This sets the stage for participatory planning of conservation and development activities. There are a number of techniques to provide land-use data:

There are four pieces of principal legislation dealing with the devolution of rights and management of forest use at village level. They are based on an intention to decentralise natural resource management and conduct activities in a participatory manner.

- 1996 Forestry Law
- 1997 Land Law (revised in 2004)
- 1998 Agriculture Law
- 1998 Environment Law

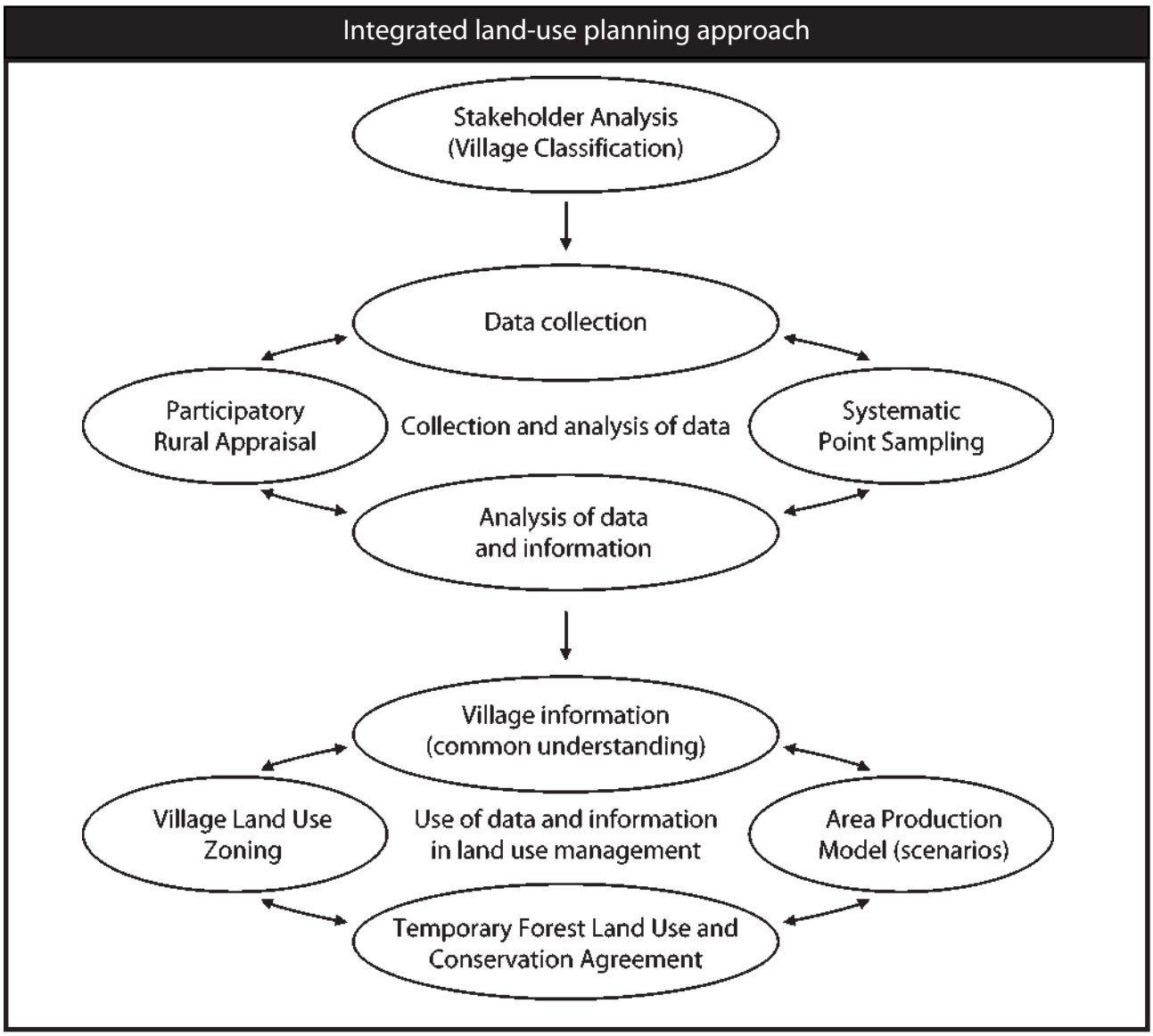
Source: DoF 2004.

- Aerial photos or satellite images to provide a geographical overview of the area
- Field point sampling with local informants

The integrated land-use planning approach

Land-use planning is an integrated approach that recognises local stakeholders' needs within a policy framework. A multi-disciplinary and mixed gender research team (e.g. forester, conservationist, sociologist and agronomist) work in collaboration with local key informants. The approach begins with a stakeholder analysis with local authorities to identify the key stakeholders. These are primarily villagers in and around the protected area.

The research team and key informants discuss and verify the data and information, which is then used for land-use zoning and analysis in a simulation model (the APM). Temporary forest land-use and conservation agreements are based on acceptance by all stakeholders.



1. Stakeholder analysis

Stakeholders are those who could be affected by a particular event, change or process. The main stakeholders identified in Nam Pui protected area were local authorities, villages in and around the protected area, military groups and project developers. The villagers were the most important group.

The location of the village determines its potential role and responsibilities in protected area management. Classification of stakeholder villages is based on their proximity to the protected area boundary:

- Villages distant from the protected area but using the protected area resources.
- Villages with boundaries overlapping those of the protected area.
- Villages located totally within the protected area.
- Villages adjacent to the protected area.

2. Data collection

The PRA and systematic point sample are used to collect data and village information. PRA activities include historical profile assessment, key informant interviews, household interviews, village dialogue, local knowledge assessment, participatory mapping and field observation. Below is a description of some of the tools that can be used.

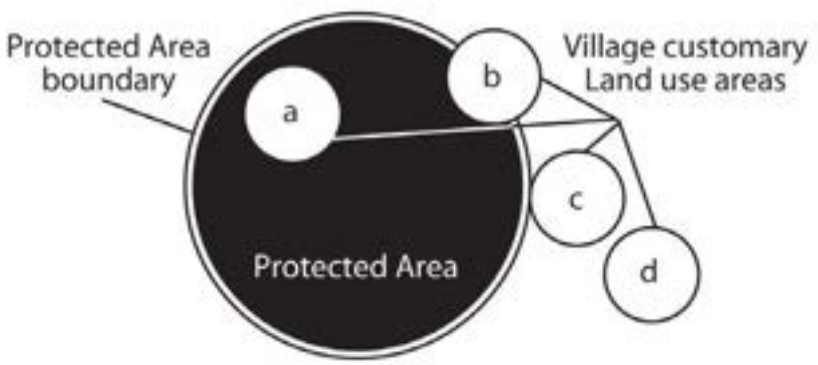
■ Historical profile

A historical profile compares trends in activities throughout the village's history, highlighting the relative importance of various productive activities over time. The written record is often limited in rural areas and under these conditions, the memories of people living within the areas will be the main source of information. Tracing, compiling and evaluating information can only be carried out through good relations between researchers and villagers.

■ Systematic point sampling

A systematic point sampling inventory gathers data about current land use. The survey covers the entire area with a systematic sampling grid. Sampling points are established using various techniques based on the local situation and available tools. Aerial photos and topographic maps can be a basis for the inventory. The research team and local key informants visit every sample point to combine objective measurement and field observation with local information about past and present land use. The sampling exercise provides an opportunity for the team and villagers to discuss the sample plots and get a general view of the area. Important variables useful for conservation management are recorded. These include tree species, NTFPs, wildlife species, salt licks, watering points,

Classification of stakeholder villages into four categories



a = Enclave villages :
The settlement and village-use land fall entirely within the protected area boundary

b = Straddle villages :
The settlement area is usually outside the protected area but some village use landfalls within it.

c = Adjacent villages :
The settlement area and village-use land borders the protected areas but do not encroach into it.

b = External villages :
Villages and their land-use are external to the protected area boundary, but their activities still impact on it.

streams and rivers, roads or footpaths and agricultural land.

■ **Key informant interviews**

With questions prepared in advance and using semi-structured interviews with key informants, baseline data is collected on socio-economic issues, forest use, hunting, fishing and wildlife habitat. To gather the data, the team divides into small groups, each responsible for obtaining specific information.

Data is collected concurrently with other activities, allowing researchers and villagers to rotate tasks to reduce boredom and to expose them to a broad range of experiences.

■ **Household interviews**

The aim of household interviews is to verify the village data (official records held by the village headman). The council of the village in Nam Pui protected area based household selection on a ranking of three socio-economic strata: well-off, moderate and marginal households; 10% of each stratum is randomly selected for interviews.

3. Data and information analysis

Data from the PRA and systematic point sampling are discussed by key informants and research team to establish a common understanding of livelihood systems and their impact on protected area resources. Analysis is a continuous process, occurring at each step of the collection phase.

The PRA and systematic point sampling summarise village information and present it in a way that assists planning. The collected data includes socio-economic conditions, demographics, land use distribution, agriculture production systems and the biodiversity situation. In this process, the research team collaborates closely with the villagers. The perspectives and consequences of future changes are discussed during participatory stakeholder meetings.

Three types of data are required in an APM simulation

1. The situation in the first year of the simulation (e.g. population, average per capita income, land use areas, agriculture and forest yield and biomass energy demand).
2. Change rates for subsequent periods of five years (e.g. population growth, agricultural yield, income per capita and energy demand).
3. Priority of land transfers: land is categorised into seven priority strata. When more land is required for agricultural production, the model moves land from other strata according to priorities for land transfer.

4. Village information

- **Area Production Model**

The APM guides strategic planning by simulating land use development and primary production areas. It is a Windows-based computer program for developing scenarios on demography, land use, fuel wood, plantation development and forest protection, among others.

- **Village land use zoning**

Village land-use zoning establishes a clear boundary between agricultural and forested land through a series of discussions with the village community. The village base map showing the boundary delineation at a scale of 1:10,000 is an important tool in this phase. Using a plastic overlay on the village base map allows staff and villagers to sketch and change

forest land-use zone boundaries during discussion. Field checks of the land use zone areas and boundaries are carried out with villagers to ensure their actual locations were understood.

5. Temporary forest land use and conservation agreement

The end of the process is an agreement on each party's responsibilities. Issuing temporary forestland use and conservation agreements is based on existing traditional rules, which after discussion with villagers, are improved.

Emphasis is placed on obtaining an agreement that is practical and workable. The temporary agreement is evaluated to ensure villagers can implement it. The testing period is one year, to verify that it is appropriate for managing and using the forest and land resources effectively.

Integrated land-use planning tools are flexible and complement the participatory approach.

Lessons learned in the Nam Pui protected area

1. APM helped pinpoint what parameters influence land use.
2. Land use planning and allocation are not 'one-off exercises' but a continuous process.
3. Combining results from the PRA and systematic point sampling improved the reliability of data for forest use zoning, as well as the data for analysis and scenarios.
4. Historic trends (production and consumption) and current land use are basic prerequisites for scenario planning on future development.
5. Identifying village management areas and forest-use zones and resolving use conflicts were the main activities for conservation management planning.

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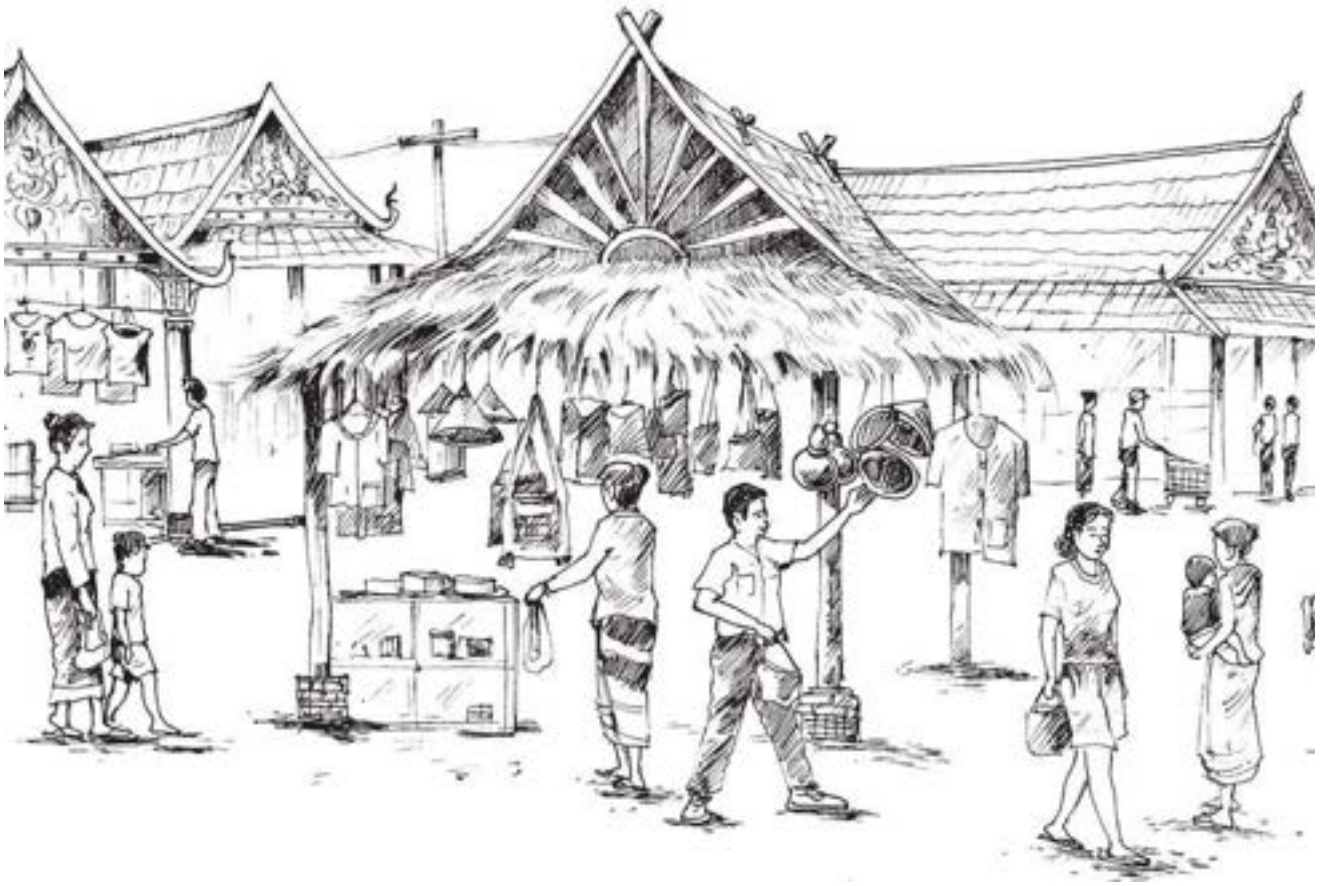
Linking Farmers to Markets: An Agro-enterprise Approach



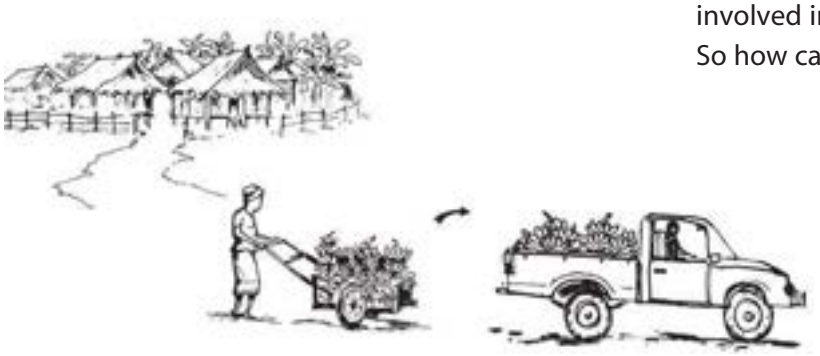
Lack of markets for products has been a common frustration to agencies attempting to improve rural livelihoods. Most market systems in Laos are poorly developed. This can mean that flow of market information might be poor, that volumes of product are low, or that transport arrangements are inefficient. As a result product costs are often higher than they should be, meaning that products from some areas cannot even reach a potential market. Improving market systems would benefit both farmers and traders, thus providing a win-win situation.

Working on market issues can stimulate and increase production. Once villagers appreciate market demand and conditions, they want improved technologies to increase production. Marketing could be a new entry point for many agencies that work with farmers, as it helps projects to better target activities, and to engage farmers in assessing improved technologies.

Principles of the agro-enterprise approach

The agro-enterprise approach developed by Centro International de Agricultura Tropical (CIAT), focuses on two key areas:

Zonal focus - 'the starting point'
This means that the project focuses on a geographical area as its starting point, rather than selecting a product to work with. Initially the zone might be quite small, such as a cluster of five to six villages but it could also expand to a whole watershed, district or province. At later stages of development, the territorial focus also means that the different resources and 'actors' (people directly involved in a particular market chain) in the same area can be better coordinated to work in an integrated manner. Improvements may be seen in transport, supply of planting materials, packing services regulation on trade, and so on.



Supply chain focus - 'the story from beginning to end'
The agro-enterprise approach helps villagers identify which products they wish to develop, and then works with the whole 'market chain' for these products. A market chain begins with the producers (farmers) and then follows the product as it moves towards the consumers.

The chain includes local collectors who pick up products from the villages, local or provincial traders who might have more facilities for transport and packing, and then processors. The processors, including small factories, are those who dry, roast or in some way improve the raw products before selling them to retailers. The last link in the chain is the consumer, who may be the general public, hotels or restaurants.

Market chains can be quite complex. A problem or 'critical point' at any point in the chain will affect the performance of the whole chain. The difficulty may lie not with the villagers or farmers, but rather be somewhere 'down-stream', such as with a trader who does not look after the quality of the product he or she sells. Working with actors downstream can transform such critical points into new market opportunities, which can then result in increased demand for the product. As one actor's actions can affect a market chain profoundly, it is essential that all actors in the chain are fully involved in the process - not only the farmers. So how can this be done?

Applying the agro-enterprise approach

The agro-enterprise development approach works through a series of steps, which survey the market chain and bring the different actors together to resolve problems at critical points. In cases where projects do not have a specified target village or a zone to work in, then an 'exploratory survey' should be carried out. This looks at the livelihood systems of different areas and can be used to select which group of villages the project should focus on. However most projects have target areas defined. Activities such as PRA fulfil the same function.

Step 1a: Production potential assessment

This enables villagers to assess which products they believe they have the capacity to develop commercially. To do this a few simple 'tools' can be used to help villagers think about the factors that will affect their capacity to expand or improve production of a product. These may include availability of land and labour for expansion, whether they have the necessary skills and materials such as equipment or seed, and availability of funds. Sets of cards are a useful tool to illustrate these different issues in village meetings. This should be done with men and women in separate groups; the two groups often have quite different preferences!

Step 1b: Zonal meeting for product selection

Volume of production is important in attracting traders to villages. If each village chooses different products, the volume of each of these will not be sufficient to interest traders. Thus all the villages in the zone need to join together to make a consolidated choice of the product to be developed as an enterprise. This can be done by having men and women representatives attend a 'zonal meeting' to make that selection. This meeting does more than just select a product: it is the first move towards encouraging the villages to work together. This can form the basis for the cluster of villagers forming a marketing network at a later stage in the development of the enterprise.

Hint: when individuals from villages attend a zonal meeting, their names may be written on cards and then displayed on a board. Fellow villagers may then easily vote for their chosen representatives.

Step 2: Market opportunity identification

Villagers select products for expansion based on their own expectations and often limited knowledge of market demand. To assess villagers' priority products, the team must design a 'market opportunity identification' study. For each product there may be different types of market. For instance, asparagus might be sold in (1) fresh markets, (2) mini-marts, (3) hotels and restaurants, or (4) canned for export. Each market needs to be assessed for viability in terms of its potential growth, scarcity, prices, and trading conditions. With this information villagers can then categorise each product in terms of (a) its agronomic potential, (b) its marketing potential, (c) the level of economic commitment needed to produce the product, and (d) its economic potential. Various other filters can also be applied, such as whether it is environmentally sound, or whether it will build on traditional values.

> *Hint*: initially, it might be best for project staff to make the above assessment and report the results back to the villagers. Once villagers have gained benefits from one or two products, they may then be committed to work through this process themselves
>
> *Hint*: selecting a product that already exists and working on an existing chain is likely to achieve results more quickly than introducing many new technologies.

Step 3: Market chain survey and village feed-back

All links in the market chain are surveyed to understand the role of each actor, and to identify where there might be 'critical points'. Prior to taking villagers to participate in this survey, project staff will need to map the market chain to identify actors, and arrange for the market chain survey with villagers. This will also help staff to mentor villagers during the survey to ensure they observe key issues.

Villagers participate in this key activity through 'Zonal Representatives', selected by the villagers themselves. Before beginning, the team explains to the Zonal Representatives about the actors they will meet and the key issues that need to be explored. The survey itself begins at the furthest end of the chain, with the consumer or retail market, and then works back up the chain. This means that as they meet each new actor coming back up the chain, villagers are already informed about the downstream requirements from the level they have just visited. This makes it easier for them to discuss these requirements and pose knowledgeable questions.

The second stage of this activity is for the Zonal Representatives to report back to their villages. This is quite a task, as it means that the two or three people representing the zone, including women, will have to travel to each of the villages in the zone. To facilitate the village feedback meetings, a de-briefing meeting is held at the end of the market chain survey. The results of the survey are reviewed, and charts are prepared for presentation in the village feedback meeting. To further facilitate the meetings, the chief of each village joins this de-briefing. This ensures that the representatives will feel welcomed and be supported when they visit each village. It also furthers network-ing between and within the zone.

Village feedback meetings ensure that all information about seasonality, volumes, prices at different levels and so on, is reported back.

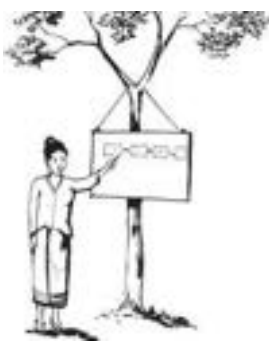
This immediately provides villages with a picture of the whole chain, giving them a whole new perspective. Significantly, this is all brought to them by their fellow villagers. These feedback meetings generate wide-ranging discussions, thus beginning the process of analysis among villagers about how they can respond to market demand and requirements.

All the steps up to this point contribute to making villagers informed and capable of discussing market issues. Without these important preliminary steps, villagers would struggle to participate effectively in Step 4, the stakeholder chain analysis meeting.

Applying the agro-enterprise approach

1. Production potential assessment
→ Villagers work out which products they believe to be commercially viable.

2. Market opportunity identification
→ Potential markets for priority products are assessed.
→ Products are categorised.



3. Market chain survey and village feedback
→ All actors in the chain are surveyed to identify 'critical points'.
→ Zonal representatives report back to their villages.

4. Stakeholder analysis meeting
→ Actors discuss and try to resolve 'critical points'.

Implementation phase

5. Implement agro-enterprise plans
→ Concrete actions are taken to directly address the critical points.

Step 4: Stakeholder chain analysis meeting

The details of the chain survey are reviewed at this meeting, allowing all the actors to identify the critical points together and begin to identify actions to resolve these points. The meeting is attended by Zonal Representatives, (those who participated in the market chain survey), and other actors in the chain, such as traders and processors. These actors may well be suspicious of the meeting but effort can be made to reassure them that it is for informal exchange, and should benefit them also. Some chains may have many actors at the same level (e.g. traders), and so judgement needs to be made about how many and which people to invite. Results of the survey can be presented for review. Each group can then discuss the issues and indicate what they consider to be the main obstacles, and how these might be resolved. Useful tools are drawn maps of the chain and cards that list issues at different points on the chain.

Why the outcome of the stakeholder chain-analysis meeting is important:

(a) All parties have recognised what the 'critical points' are, and possible opportunities to resolve them (there is a way out!)

(b) All participants, having listened to each other, begin to gain a sense that they are inter-dependent to some degree. This is an important realisation.

(c) Through general discussion some preliminary agreements are made, such as traders agreeing to buy at higher prices if certain conditions are met.

Step 5: Implementing agro-enterprise plans

While there may well be interest and consensus on issues at this point, it is quite likely that the actors will not be proactive without further project support. Indeed, up until this point, there has been merely a series of surveys and meetings, with no concrete action or any real improvements. This being the case, there is often some initial hesitation on the part of the actors to be proactive. The project overseeing the process needs to begin to facilitate concrete activities. Once improvements have been seen, the actors may then be more committed to continuing to plan and act independently.

Each action must of course deal directly with the critical points addressed in the chain analysis meeting. It is not possible to give a definitive list of possible interventions, but some which are commonly made include:

- Holding products to gain peak seasonal prices. This can provide benefits to both farmers and traders if negotiated well. Investigation of different storage methods might be needed.
- Gaining a greater volume of product by arranging pick-up points and therefore reducing the time and distance needed to collect products. Agreements between farmers and traders need to be made.
- Maintaining or improving product quality in order to ensure the reputation of the area's production in the market place. This may be rewarded later with higher prices.
- Improved packing by the trader to prevent damage of products. Packing and transport strategies need to be identified.
- Packaging by the processors may also be considered, so that consumers can easily

recognise products from the farms or villages that they prefer. Pilots of packaging styles may be needed.

Final thoughts

The agro-enterprise approach could be seen as simply a process for selection of products, followed by a series of surveys. Its effectiveness comes from (a) the participation of farmers in these surveys, and then (b) the joint analysis of the critical points by them with the other actors in the chain. Simply providing farmers with information about the chain is not in itself enough to stimulate significant increases in production.

This is a significant effort to make for a limited number of villages or a small territory. However, agro-enterprise can provide two forms of scaling-up mechanism:

(1) *Geographic expansion*: when critical points are resolved 'downstream', with traders or processors, these actors will attempt to apply the improved practices and stimulate production to as wide a number of villages as possible.

(2) *Product expansion*: once villagers have gained experience of the development of a product to become an enterprise, they will then begin to consider how they could apply this for other products.

It would appear form the brief experience of the Small-scale Agro-enterprise Development for the Uplands Project, that this approach will stimulate increases in production much more quickly than the traditional development strategy of introduction of improved technologies village by village. Furthermore as villagers become committed to increasing their production of products, this creates demand for the improved technologies.

Overall this process of working with the whole market chain, with actors such as traders and processors, results in not simply 'markets being found' for a product, but also in actual improvements of market systems. As lessons are learnt from experience with specific production in specific locations, it is likely that we will understand which interventions might be applied generally to improve market performance. These might then be applied broadly across other areas and for other production systems.

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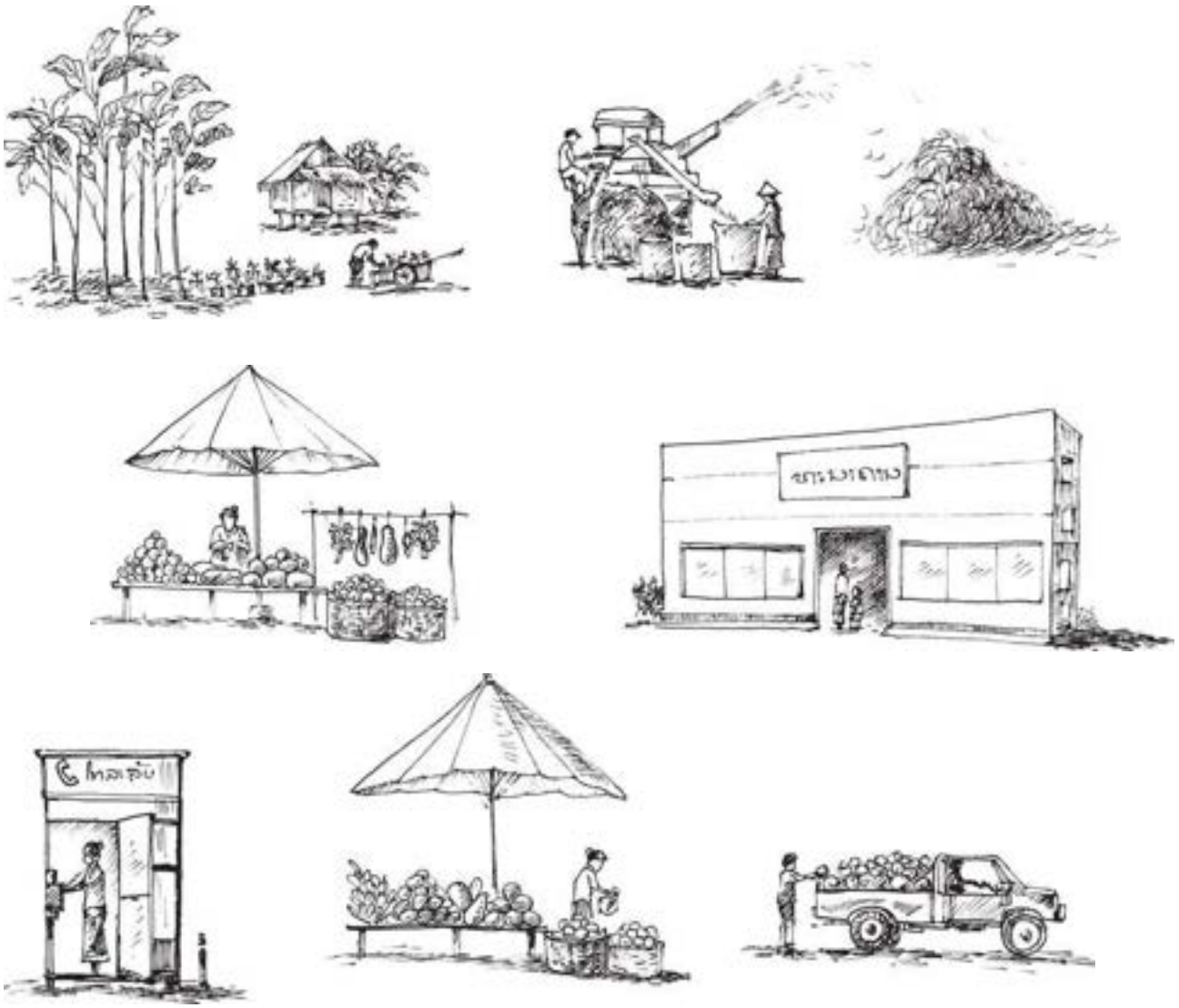
Stimulating, Improving and Sustaining Market Chains: The Role of Business Development Services



The uplands have often been regarded as a disadvantaged area in terms of production, but many of the environmental conditions in the uplands favour the development of particular products, such as crops suited to cooler areas. There are, however, problems with poor and underdeveloped market structures in the Lao PDR. Difficulties include limited access to existing markets, poor flow of market information and absence of checks and balances to ensure quality. A lack of business services supporting the development of enterprises has also been cited by the government (GoL 1999) as a barrier to market development.

A new approach developed by NAFRI and CIAT helps farmers and traders understand the market chains in which they operate, and thereby improves the efficiency of the chains. Known as the 'agro-enterprise development approach', the system deals with the entire market chain and directly supports the development of Business Development Services (BDS).

> BDS are small businesses, which enhance the effectiveness of a market chain (also called 'supply chains') by assisting other businesses operate and improve their efficiency.

An overview of the agro-enterprise approach

Agro-enterprise development is a straightforward approach to help producers and traders identify strengths and weaknesses in the market chains in which they are involved. The main stages of the process are conducted through a series of surveys and meetings, as outlined below.

As market conditions are always changing, it is important to ensure that a large effort is not expended to improve the efficiency of a single product chain, only to have this lost as market conditions change. The challenge is how the zone can remain responsive to changing market conditions. BDS can help actors meet further challenges by maximising and developing the effectiveness of a chain.

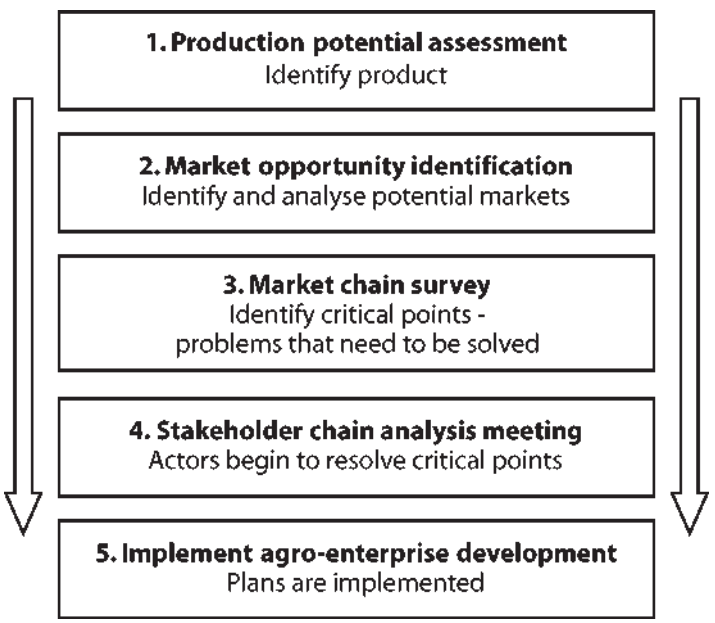
The role of BDS

BDS are small businesses in themselves and can be considered as a second level of market development alongside the development of a market chain.

Examples of how BDS help stimulate new and existing production regimes

- Shops selling fertiliser and seed make it easier for farmers in the surrounding area to grow vegetables.
- A villager with a truck makes it possible for goods to be carried to markets.
- Farmers who produce fish fingerlings enable fish farmers to raise fish more easily.
- Farmers providing fruit tree seedlings may encourage farmers to diversify into growing fruit trees.

Other farmers without such services will find it more difficult to obtain the materials they need to start, maintain or diversify their businesses and to transport their products to markets.

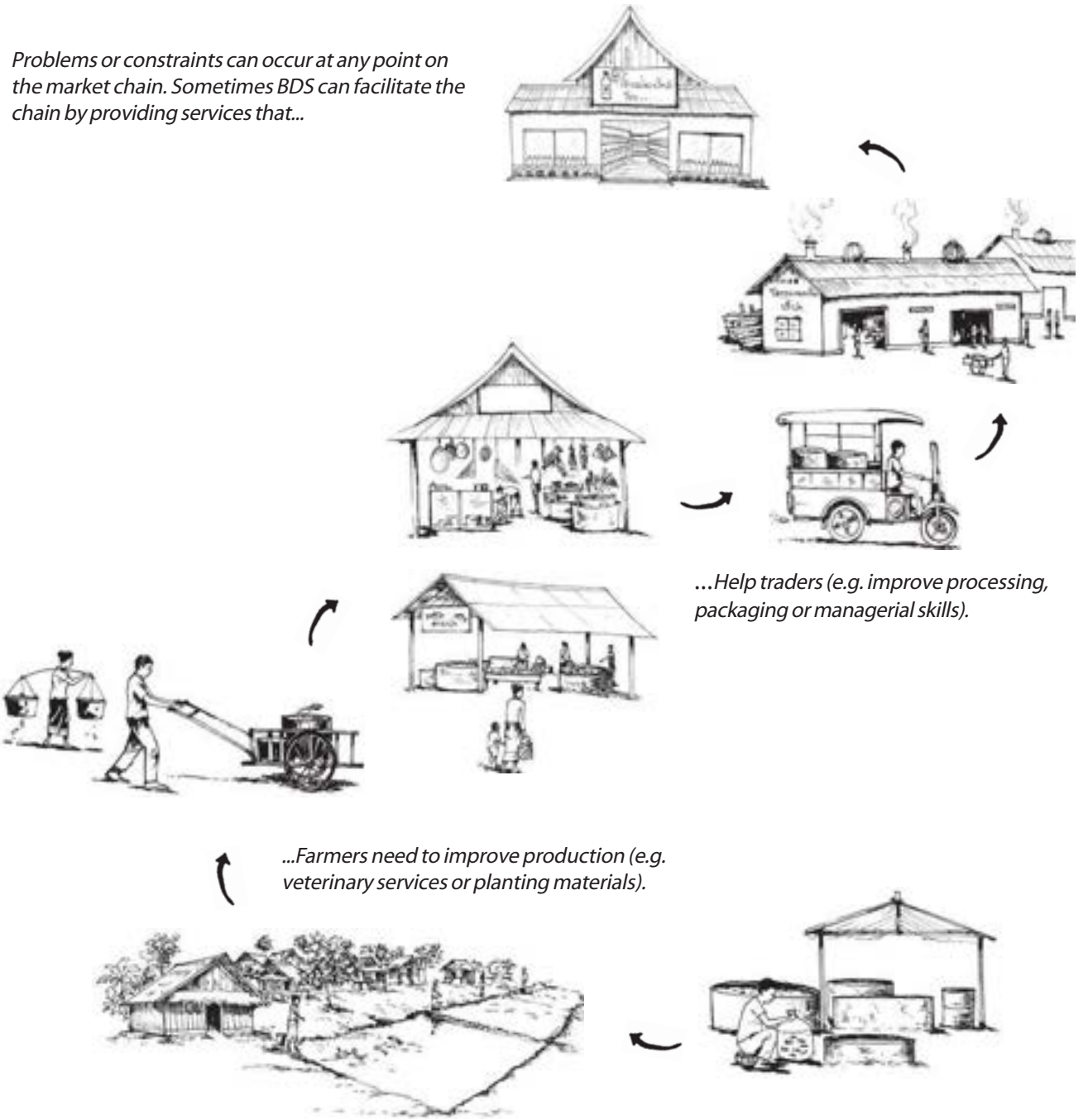


BDS may also:

- Process products, thereby adding value to them.
- Provide market information to actors in the chain.
- Serve as sources of credit.

Small enterprises offering such services make it much easier for businesses to operate. This therefore stimulates activity in the market chain. Indeed, such small businesses are normally active in stimulating activity as it in their own interest to do so. The more farmers who use their services, the better it is for their own business.

Problems or constraints can occur at any point on the market chain. Sometimes BDS can facilitate the chain by providing services that...



BDS and 'clustering'

Usually a new BDS will emerge only after an increase in production. If only ten farmers have fishponds in a village, then it would not make economic sense to start producing fingerlings. However once initial agro-enterprise activities have established 100 farmers with ponds, it might then begin to be attractive for some of the farmers to think about becoming suppliers of fingerlings in that area. Usually, there needs to be sufficient potential users of a service before a new service can begin. Of course, sometimes there are entrepreneurs who can envisage a market and so begin their service in the expectation they will gain profit in the future. Projects can support potential new BDS by providing both technical and management skills so that they can operate efficiently.

BDS and geographic expansion

Successful BDS can help to stimulate greater production. It is in the interest of the service provider to take their services to as many villages as they can. For example, farmers who have begun to produce fish fingerlings may travel to other villages to show others that if they want to make fish ponds they can now buy their fingerlings from them. Thus, active BDS will stimulate expansion of production to wider and wider groups of villages. Thus by working with such small operators, projects can have a terrific leverage effect.

Conclusion

It can be seen that BDS can:

- Improve existing production levels.
- Stimulate completely new production.
- Create diversification opportunities.
- Create geographic expansion of markets.

It takes a person with an analytical mind and entrepreneurial spirit to assess new market trends and take risks. As BDS are so valuable in the functioning of efficient and prosperous market chains, action needs to be taken to encourage and support potential service providers in the setting up of these influential small businesses.

Selected reference

GoL. 1999. *The Government's Strategic Vision for the Agricultural Sector*. MAF. Vientiane.

Authors:
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Market Opportunities for NTFPs: The Case of Bitter Bamboo

Forest foods are very important for the mainly rural population of the Lao PDR. Among forest foods, local people consider edible bamboo shoots to be the most important product. While most bamboo shoots are harvested and consumed in the rainy season (May-September), the species *Indosasa sinica* (bitter bamboo, or *Mai Khom* in Lao), found mainly in northern Laos, provides shoots that can be harvested in the dry season (January-April). This off-season product provides market opportunities for local communities close to the border with China. This case study describes how a relatively poor local community in Oudomxay, northern Laos, set up a marketing group to improve its income.

Finding an entry point for the project

The IUCN/NTFP project began in Nam Pheng in early 1996. Rapid Rural Appraisal (RRA) exercises and later a PRA (Participatory Rural Appraisal) were used to gather information. Around 20 activities were

discussed and later ranked into order of importance. The top five rankings were prioritised for immediate implementation.

The first priority was to introduce a rice bank. This was of clear importance due to the general rice shortage in the village. In times of shortage, families got into debt by borrowing rice. This led to increased forest destruction as villagers tried to either grow more rice or over-harvest their rattan to earn more money with which to buy rice. When the project established the rice bank, the villagers could immediately see its benefits, and from this point on they became much more willing to work with project staff.

History of Nam Pheng village

- Nam Pheng Village in Oudomxay was established in 1973, when people from a village with no road access, on Phou Tong Mountain, moved there.
- Nam Pheng is located in Namor District, a main trading route between China and Oudomxay. It is about 70km north of Muang Xay, Oudomxay's capital. There is year-round access to the village.

Bamboo is a very versatile material, used to make walls,...

- The villagers are members of the Khamu ethnic group and are animist. Most of them are employed in upland rice cultivation, and use slash-and-burn to clear the forest. Due to mountainous, rugged terrain, lowland paddy fields cannot be established.

...ladders,

- Rice yields are approximately 1.2 tonnes per hectare. This is not an annual figure, because the fallow period of shifting cultivation must be considered. This yield is highly insufficient for consumption needs. In 1996, villagers told project staff that 36 out of 42 families were short of rice for four to six months of the year.

...food,

...mats,

- As the villagers have insufficient rice, poultry, which need grain for feed, cannot be kept. During past attempts to keep poultry, the animals quickly became diseased and died. The main form of livestock kept is cattle. These are very easy for the villagers to keep, as they roam in the forest and find their own food. However, this leads to the trampling and destruction of saplings, so is detrimental to the forest.

...musical instruments,

- Nam Pheng is surrounded by forest rich in NTFPs, including bitter bamboo, cardamom, rattan and broom grass. Cash income ranking shows that NTFPs are the most valuable source of income.

and baskets.

Bitter bamboo marketing

Prior to the project

Every day from December to the end of April, women and children would go out to the forest and collect bitter bamboo shoots. They would then meet with traders coming from the Lao-China border, or elsewhere in Namor District, and sell their shoots in bunches. The villagers received very little money for the bamboo: the adults often bartered it for clothes, and children exchanged it for sweets. This meant that however many bamboo shoots the villagers collected, they still did not have enough money to buy sufficient rice for their needs.

Marketing introduced by the project

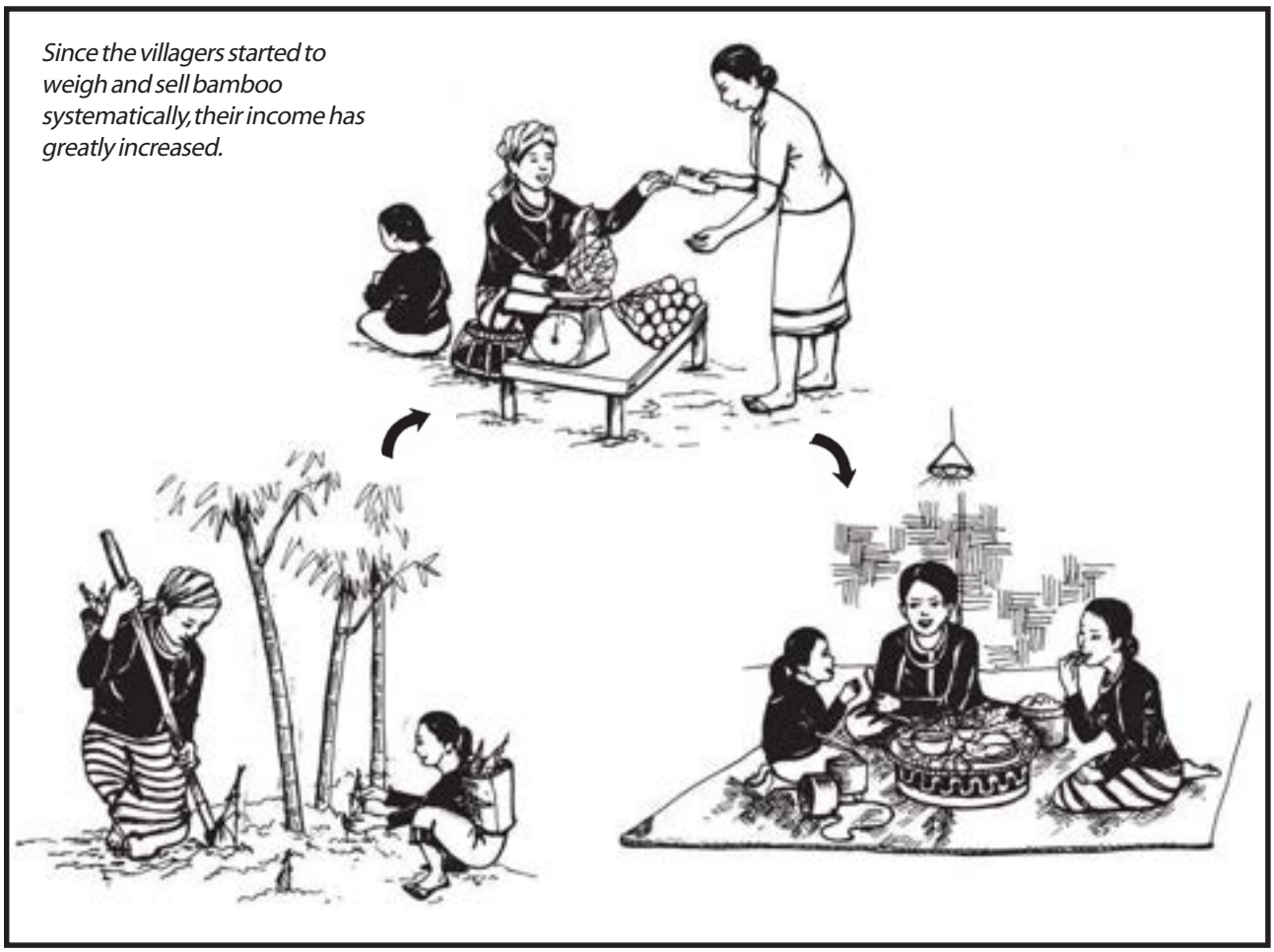
The project encouraged villagers to weigh the bamboo shoots and then sell them in precise units, i.e. kilograms, as opposed to in random 'bunches'. A few days after the project staff had helped the villagers to implement a new weighing system for selling bitter bamboo shoots, staff members were approached by some of the women in the village and told that they did not like this new method, and no longer wanted to use it. It was difficult to understand why this was the case, as the women were shy and not forthcoming with answers.

In an attempt to discover the problem, staff spent a day with the women, observing them in their activities, and asking them questions. It soon transpired that none of the villagers could properly use the weighing scales. They did not know how to read the scales and so were not confident in using them.

Once the problem was realised, project staff arranged for more sets of scales to be brought to the village, and for lessons to be given in how to use them. Lessons were given to all village members, but special attention was paid to the women, who would be the main users of scales. The villagers quickly learned how to use the scales and became confident in them. In role-plays they showed they would charge more for a greater weight, and not accept less. The benefits therefore became apparent to them, and they embraced the new system eagerly.

Socio-economic effects of the marketing strategy.

- Before project initiation, 36 of 42 families were short of rice for four to six months of the year. Two years into the project, rice shortages occurred in only 12 out of 42 families, and lasted for only one or two months prior to harvesting. Between 1998 and 2000 income from bitter bamboo shoots in the village totalled approximately 106 million Kip. This meant dramatic improvements for the village with incomes rising steadily over the period. Originally, most members of the village were very poor, and they put most of their income towards buying rice.

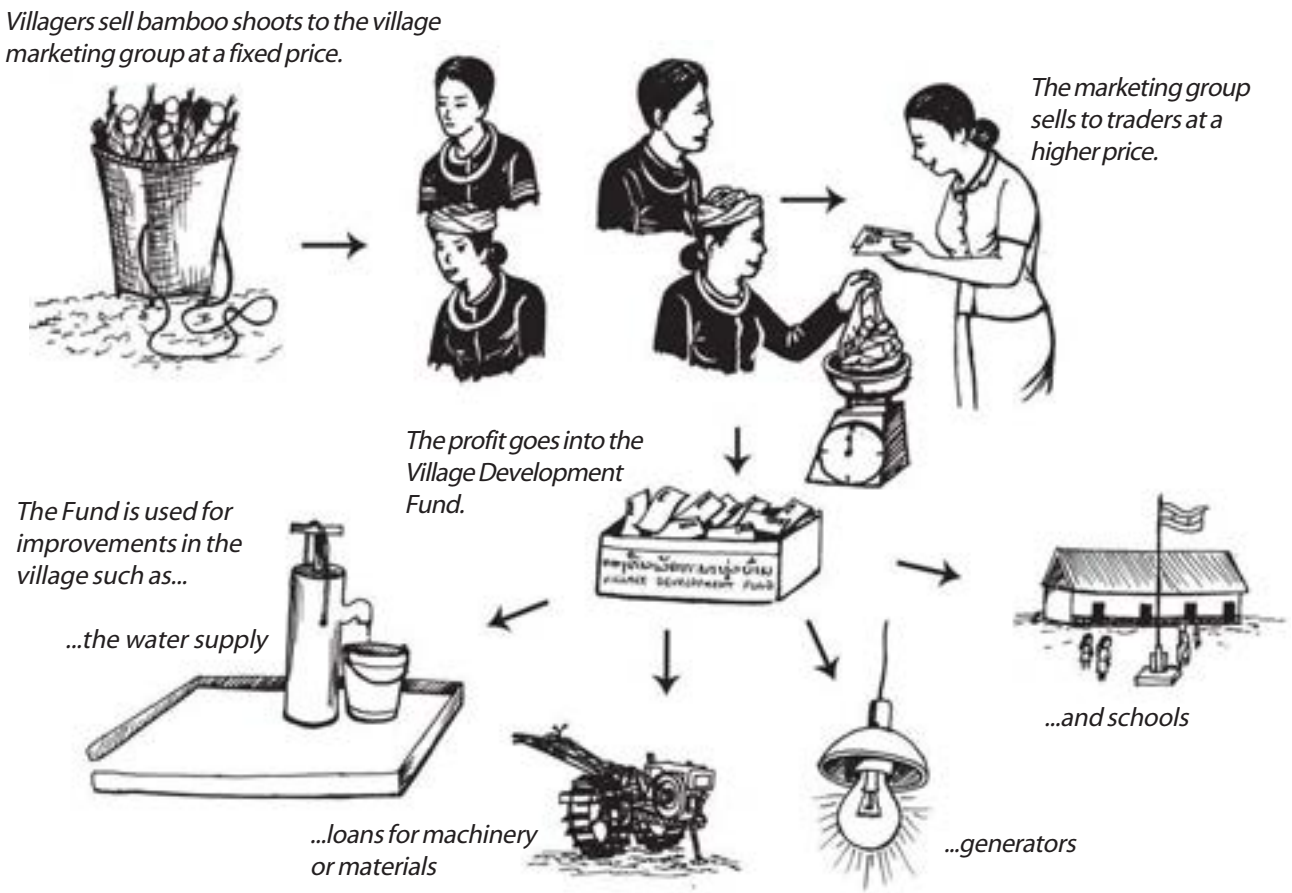


Now standards have improved, and many of the families have money left over after rice is bought. This has meant that some families have been able to save enough to buy such things as electricity generators, hand tractors and even televisions. Their standard of clothing has improved, and so has their general appearance.

- All these improvements are obviously strongly welcomed by the villagers, who are much more motivated towards managing their forest for the production of NTFPs.

Factors influencing villagers' income

- Most importantly, the *method of marketing*: prior to the start of the project, despite the fact that huge quantities of NTFPs were being collected, the marketing of the produce was poor, and consequently selling prices were low.
- The *size of the area* a group has rights over.
- The *status and type of forest* available.
- The *richness of NTFPs* and the *number of family members* available to collect NTFPs.
- *Weather:* for example, in 1999, particularly cold weather meant bamboo shoots grew at a much slower rate than is normal for December. Then, early rainfall in February caused rapid growth, creating an abundance of supply, leading to lower selling prices.



Village development fund

One major activity that the IUCN/NTFP project helped to set up was a development fund, which has proved to be successful. Before the fund, villagers sold shoots to any trader who would buy them. In 1998, they were assisted in organising a marketing group to which everyone sold their shoots for a price of 1,000 Kip per kilo. The group then sold the shoots on to traders for 1,100 Kip per kilo. The extra 100 Kip per kilo was contributed to the group fund and was then used for the following purposes:

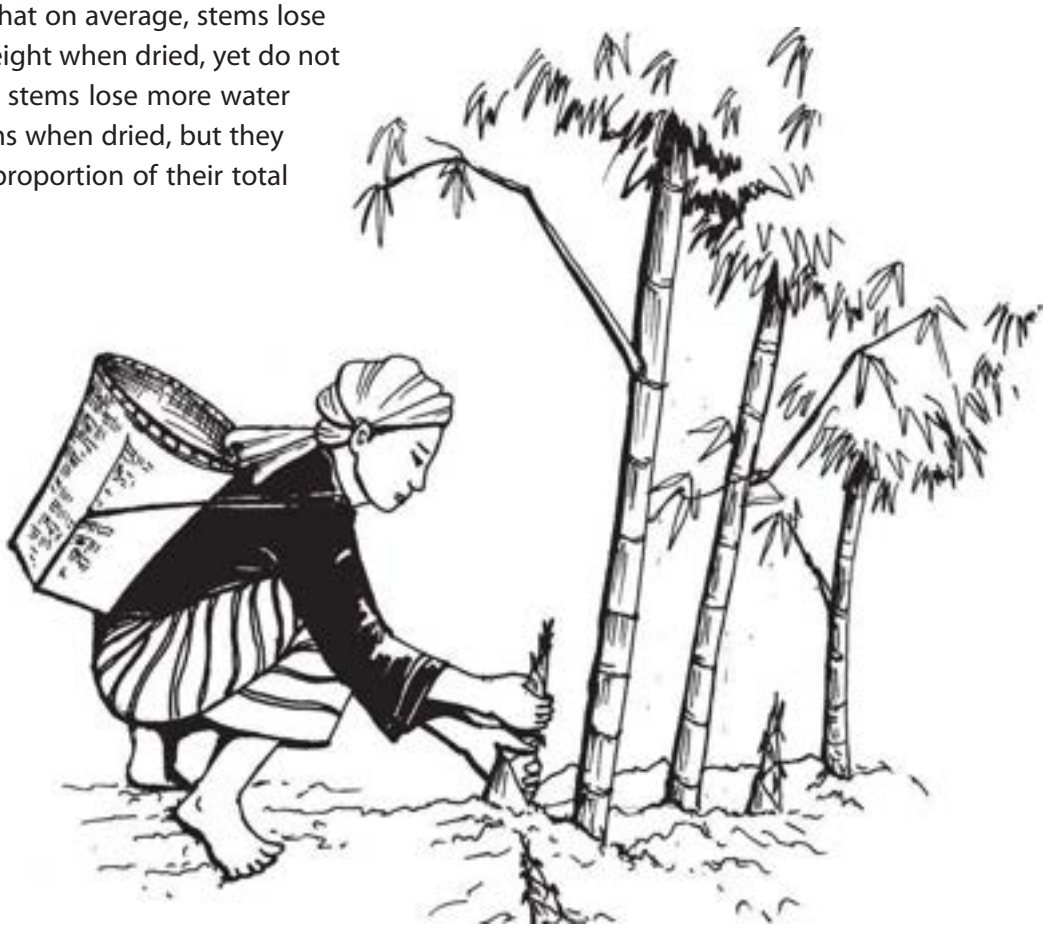
- Administrative and running costs including wages for trade-unit employees.
- Small financial incentives for the group committee.
- Welfare support to members.
- Implementing development activities.
- Provision of loans to members. The premium added to the selling price of the bamboo shoots is fixed at 10% but the base price fluctuates on an annual basis.

Between 1998 and 2000, the group fund accumulated 17 million Kip through sales of bitter bamboo, and later cardamom as well. It was decided the funds from 1998-99 would be spent on improving the village's water system, and for providing loans for development of agriculture and livestock. In 2000, 15 families received loans from the fund for a variety of purposes, both agricultural and non-agricultural. Examples of items bought include generators, hand tractors and house building materials. In May of 2000, the development fund was put towards the building of a new school - made possible through the provision of extra materials from the IUCN/NTFP project.

Sustainable harvesting

Making the harvesting of bitter bamboo sustainable became of great concern to the villagers once they discovered the potential income to be made from selling it. Villagers and local researchers set up trials to study the effect of various cutting regimes on the yield of shoots.

- Culm harvesting: villagers studied whether harvesting the culms has an impact on shoot production, as both products are valuable. The villagers found that culm harvesting does not cause any significant effect on shoot production within a two-year time frame. However, it is possible that the effects of harvesting culms may take longer than two years to arise.
- Drying culms after harvesting: villagers investigated how much the culms changed when dried after harvesting. This experiment showed that on average, stems lose 38% of their weight when dried, yet do not shrink. Younger stems lose more water than older stems when dried, but they lose the same proportion of their total weight.
- Factors influencing the extent of harvesting: the extent to which a plot is harvested depends greatly on its location. The nearer a plot is to the village, the more likely the villagers are to go and collect from that plot. Furthermore, shoots growing in different plots become ready for harvesting at different times. The difference in time scale can be up to a few weeks. When the harvesting season has just begun, the first shoots sold get a much better price, and as the season goes on and the shoots become more abundant, the price gradually drops due to the market pressures of supply and demand. This means that those plots which can be harvested relatively early tend to be over-harvested, whereas those in which shoots develop later may not be harvested to their full potential.



Key lessons learnt

- Identifying village priorities and addressing the most important is a crucial way to gain villagers' trust and stimulate interest in other project activities.
- The village group has shown itself to be capable of improving income by better organisation of marketing. The evidence suggests that management of collecting NTFPs for sale can reap greater financial benefits than agricultural production of rice, which is currently the main income source for many of the rural people in Laos.

Outcome of the group formation

- Village income from selling bamboo shoots increased at least six-fold.
- The community has improved its cash income, reduced its debts, and reduced its dependency on shifting cultivation.
- The successful marketing strategy has led the community to show increased interest in managing bamboo resources sustainably.

- NTFPs, in this case bitter bamboo, have been shown to be a good alternative to shifting cultivation. Through their collection, the need for slash and burn diminishes and can perhaps eventually disappear altogether.
- A major advantage of sustainable NTFP development - particularly of bitter bamboo - as an alternative to shifting cultivation, is that NTFPs are already known and harvested by villagers. Some of the proposed alternatives, such as contour farming are not known or understood. This could make setting them up extremely difficult, thereby making success less likely.
- The success of the marketing group has made villagers more interested in forest management. Villagers are now keen to try and establish a sustainable harvesting system through forest management and harvesting experiments.
- The introduction of a development fund has been a very positive step and has led to the creation of a pool of money which is being used to develop various community facilities and amenities, as well as to provide user group members with loans.

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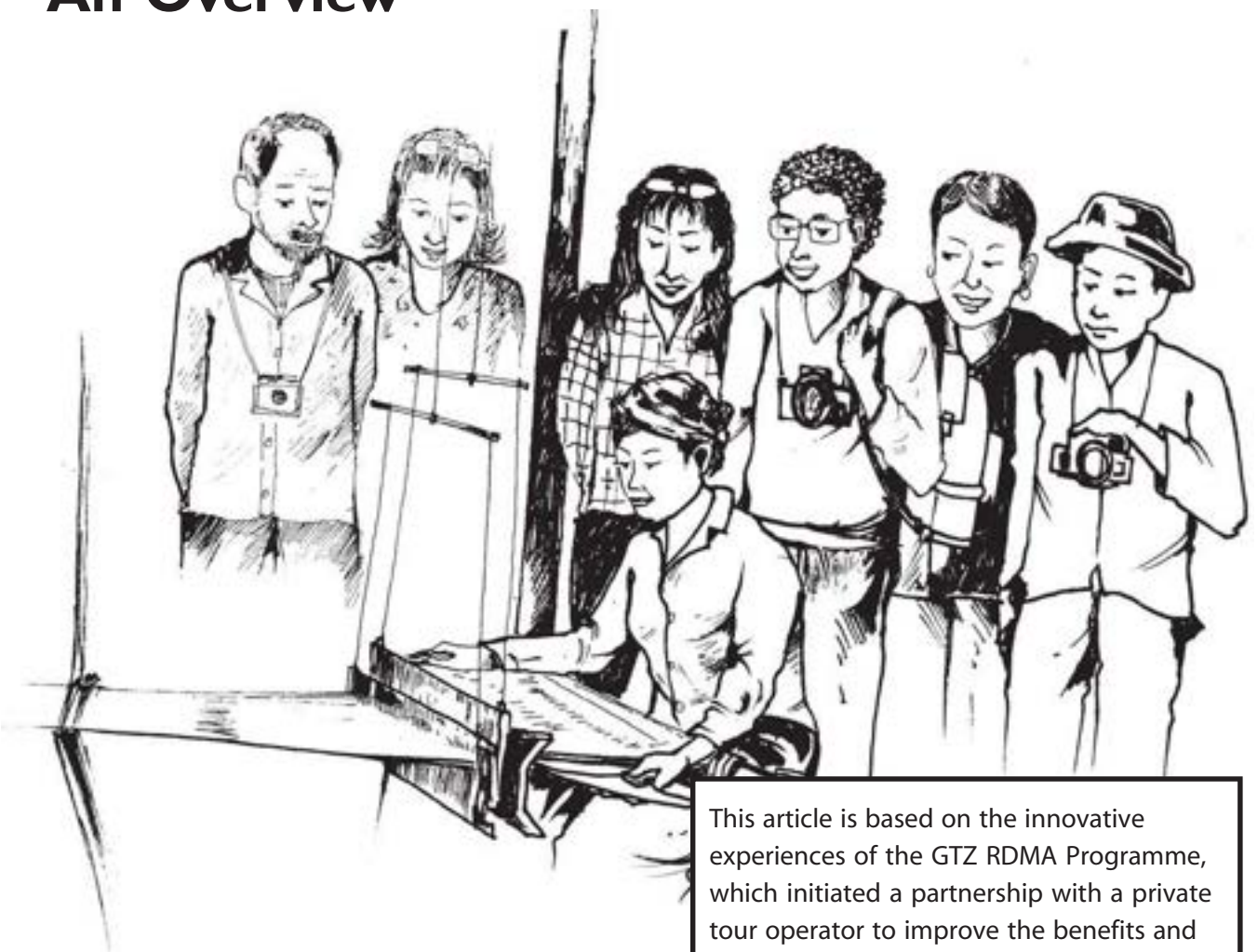
Community-Based Tourism in the Lao PDR: An Overview



This article is based on the innovative experiences of the GTZ RDMA Programme, which initiated a partnership with a private tour operator to improve the benefits and impacts of tourism to local communities in Luangnamtha. This is one of the first examples of the PPP approach being used in Laos. Behind these partnerships stands the conviction that if companies and GTZ pool their resources and know-how, they can achieve their respective objectives better, faster and at lower cost.

With tourism envisioned as a potent economic force in the Lao PDR, questions arise as to how villagers can be empowered to use and access its economic potential in a participatory manner.

Rural villagers and the tourism industry are mutually dependant on one another: it is rural village life and culture and the surrounding environment which are the main attractions for tourists. Tour operators hold the keys to the doors of global tourism but are dependant on the villagers to provide an authentic cultural experience and genuine hospitality. With a sense of ownership, authenticity, meaningful personal interaction and quality service, the tour operator is able to demand a good price for the experience. Villagers, however, lack the experience, knowledge and skills to manage and operate a tourism service business in all its aspects. Therefore, villagers are dependant on tour companies to provide training, guidance and marketing, and to bring tourists to them.

In this relationship between the villagers and the tour operators neither side possesses all the skills and resources to ensure a successful and sustainable operation. It requires a third party, the public sector, to facilitate a successful sustainable business partnership providing authenticity and quality to the tour operator and benefits and ownership to the villages. The public partner in this context is a technical cooperation agency (GTZ) which contributes not only financing but also development experience and expertise in working with villagers in the local environment.

The Public-Private Partnership (PPP), coupled with Community-Based Tourism (CBT) offers communities an opportunity to access the global market while helping to minimise the negative impacts. Likewise it offers the tour company the chance to invest in an authentic village-based tour programme without having to develop skills in community development approaches. The CBT approach with PPP creates local ownership, jobs and sources of income, trains local personnel, and transfers business know-how and technology in a sustainable and participatory manner. It links and draws on the strengths of the community, the private partner and the public sector.

What is Community-based Tourism?

CBT is a community development tool that strengthens the ability of rural communities to manage tourism resources while ensuring full villager participation. When applied properly, CBT can help villagers control the impacts of tourism while also generating income, diversifying the local economy, preserving culture, conserving the environment and providing educational opportunities. As CBT may provide villagers with alternative incomes, shifting cultivation in the uplands and poverty may also be reduced. CBT is not a classical tourism business focusing on investor profit. It requires a long-term approach and aims to maximise benefits for the local community and limit the negative impacts of tourism on villagers and their environmental resources.

"CBT is tourism that takes environmental, social and cultural sustainability into account. It is managed and owned by the community, for the community, with the purpose of enabling visitors to increase their awareness and learn about community and local ways of life" (REST 1997).

CBT as a community development tool

Community-based tourism and community development are inherently interlinked. Since the income generated from CBT is at the complete disposal of the community, the community is free to use the funds according to their own development priorities. This empowers the community to truly take charge of their own development. CBT, when successful, becomes a self-sustaining business, generating income for the community free from the stipulations and controls of an aid agency or government body.

Community-based tourism needs to be approached in a systematic manner, from studying the suitability of the community for a tour programme to ensuring that the community members have participated in making an informed decision to take part and are involved in monitoring and controlling the negative impacts.

CBT key principles and elements

The following elements should be evident before CBT can be implemented in a village:

Natural and cultural resources

- Local economy and modes of production depend on the sustainable use of natural resources.
- Some customs and culture are unique to the destination.
- Natural resources should be well preserved.
- There are sufficient natural and cultural resources to attract tourists.
- There are enough resources, such as food, to support tourism.

Community organisations

- The community shares consciousness, norms and ideology.
- The community leadership is strong and respected.
- The village is able to resolve conflict well.
- The community has a sense of ownership and wants to participate in the entire process of its own development.
- Community pride is generally promoted.

Management

- The community has the ability to make and reinforce rules and regulations for environmental, cultural, and tourism management.
- A local organisation or mechanism exists to manage tourism, with the ability to link it to community development.
- Benefits would be fairly distributed to all.
- A percentage of profits from tourism would be contributed to a community fund for the economic and social development of the community.

Others

- There are no situations in the village that would pose serious problems to CBT, such as relocation plans, potential natural disasters or political instability.

Steps to building community capacity for management of CBT

In order that CBT be developed in a systematic manner, a methodological framework needs to be adopted. An outline of a suggested framework is provided below:

1. Choose a destination.
2. Complete a feasibility study with the community.
3. Create an action plan.
4. Set up an administrative system.
5. Prepare for operation.
6. Monitor and evaluate.

Step 1: Choose a destination

Choosing an appropriate destination requires collecting information that leads to an understanding of the community. A detailed study of the village context includes collecting information about the village from organisations working there, government agencies, other villages in the area, and the villagers themselves.

Step 2: Complete a feasibility study with the community

The community needs to be fully involved in the process of deciding if they want to be involved in a tourism project. The process for building consensus in the community requires that the information and data be studied with the public and private partners and then an action plan be formulated. It is important to be open and honest about the limitations of the community when deciding whether to continue or not. The decision to develop CBT must be agreed upon by all parties. During this process the community will be stimulated to think about the reasons and motivations for developing CBT. They should be able to discuss the issues and visit communities which are already involved in CBT.

The villagers need to answer questions like:

- Do you want CBT to raise income?
- Do you want CBT to preserve culture?
- Do you want CBT to conserve natural resources?
- Do you want CBT to bring more knowledge and skills into the community?

Internal and external village mapping, occupational mapping, seasonal calendars, production trend lines and other standard tools can be very effectively used to facilitate these processes.

Step 3: Create an action plan

If all parties reach a consensus, next comes the planning process. In this stage the community creates an action plan and enters into an agreement with the tour company to develop CBT.

The issues that need to be considered include:

- Programme for the tourists.
- Services that will need to be provided.
- Development of facilities and infrastructure.
- Training that will need to be provided.
- Carrying capacity.
- Tour programme and price.

The public partner will need to formulate a monitoring and evaluation plan that includes the associated indicators, and the private partner can begin to draft a marketing plan and strategy.

Step 4: Set up administrative system

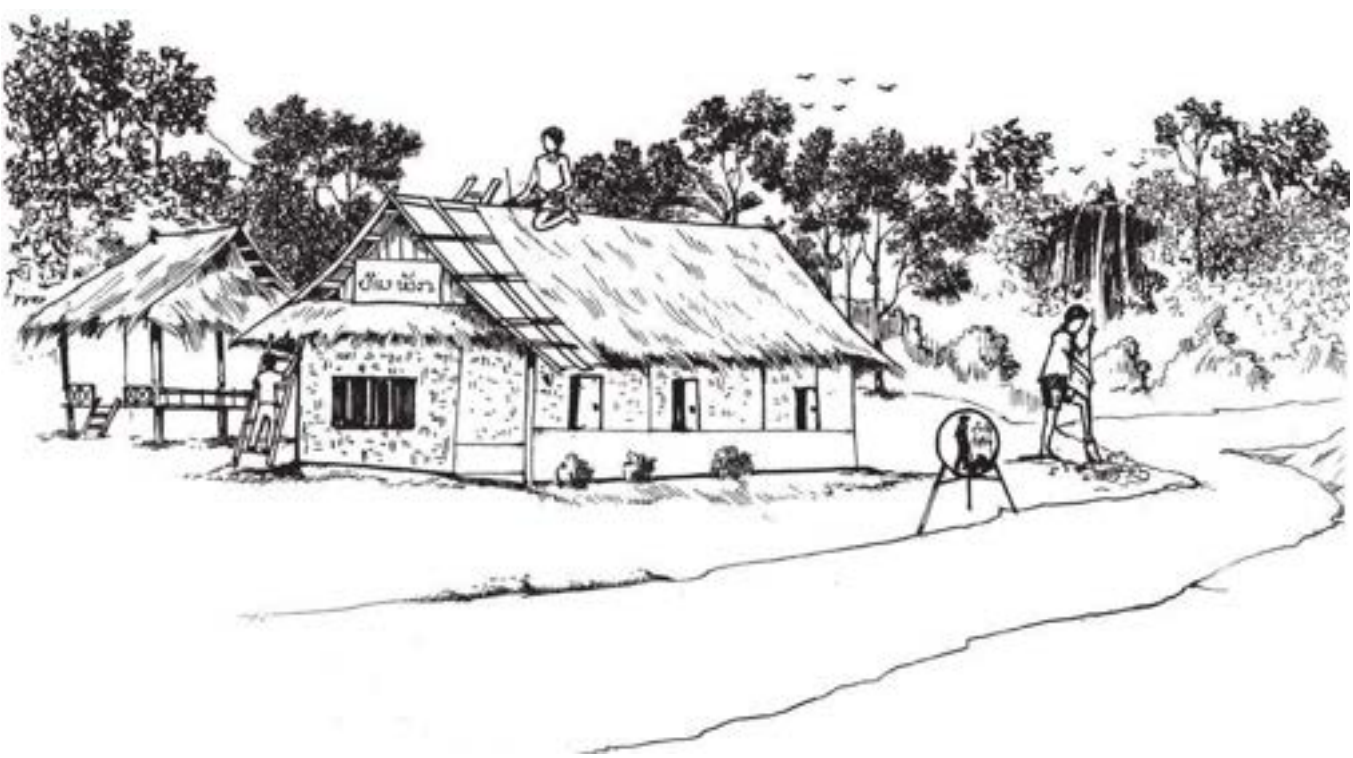
Without transparent organisation, confusion, suspicion and conflict can arise in the village. It is crucial that the village sets up a clear administrative system to effectively manage CBT. The organisation will focus on the following:

- Participation level of villagers.
- Division of roles in operation.
- Division of benefits.
- Transparency of management.
- Measures to control economic and social impacts.
- Measures to control natural and cultural impacts.
- Cooperation and communication with public and private partners.

Step 5: Preparation of operation

Before full operation of the tour program can start the village and its partners need to acquire skills and experience in operating CBT. The infrastructure must all be designed and built and the equipment acquired and put in place. At this stage emphasis will be placed on:

- Training: including guiding skills, language learning, food preparation, housekeeping and simple accounting systems.
- Preparation of information: involving the educational content of the tour programme; the things about themselves that the villagers will share with tourists.



- Infrastructure design and construction: community lodges, trails, water systems, power systems, toilets, etc.

The villagers will need to gain experience in guiding and operating the tour programme and distributing benefits. It will be necessary to bring pilot groups of tourists into the village so that the villagers can see what works and what does not and so that they can practice their skills and test the administrative systems.

Step 6: Monitoring and evaluation
Monitoring and evaluation starts once the programme is in full operation. It helps to identify problems, impacts and benefits, as well as to ensure the sustainability of the

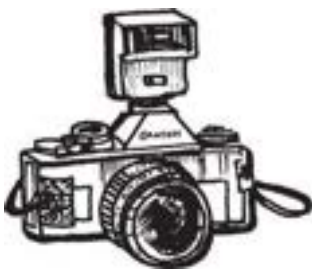
Benefits of Community Based Tourism	
Development Area	**Potential Development Benefits**
Economic	Sustainable and independent source of funds for community development Creates employment in tourism Increases household income Embeds development in local culture
Educational	Promotes the acquisition of new job skills Creates new professions in the village Imparts and encourages use of new knowledge in the village Cross-fertilisation of ideas with other cultures - promotes respect Fosters and promotes respect for local knowledge and skills
Social	Raises quality of life Promotes gender and age equality Builds capacity for community management organizations Fosters cultural exchange
Health	Promotes good hygiene Increase in and diversification of food production for tourists will improve nutritional status
Environmental	Promotes environmental responsibility Raises awareness of the need for conservation for tourists & villagers Promotes management of waste disposal

operation. It examines the extent to which the project is meeting its objectives. It should also result in plans and efforts to compensate for weaknesses, correct problems, adjust systems and improve the programme. Monitoring and evaluation is a participatory process. All stakeholders should play a role in gathering the monitoring data, assisting in the analysis, and in actions taken as a result of the final assessment and evaluation.

The aspects monitored include:

- Environmental impacts.
- Economic impacts.
- Cultural impacts.
- Social impacts.
- The efficacy of CBT as a development tool.

Information can be gathered from the tourists, the villagers and from physical inspections of infrastructure and the environment. Tools used for monitoring can include questionnaires, guest books, photographs, checklists, trend lines, seasonal calendars, discussion and analysis and interviews.



Ban Nalan case study

Ban Nalan, in Luangnamtha province, is a village hosting tourists overnight on a regular basis as part of the Nam Ha UNESCO Ecotourism project. The village now receives economic benefit through lodging, cooking, selling food, selling handicrafts, and through village volunteers who guide tourists.

Cooking and food sales are distributed by roster and all families provide for the tour groups. The lodge was constructed with financial assistance from the project and village labour, and it now returns a small income. Villagers suggested it would be possible to use this fund as the basis for small loans to start handicrafts or other income producing activities. At last report the village had a reserve of $1,000 in the community fund.

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Assessing Markets in the North

Small and Medium Enterprises (SMEs) and Private Sector Development are evolving quickly in developing countries and receive a lot of attention from donors. This is not surprising as the private sector is an accelerator for economic development in any country. SMEs contribute a great deal to a nation's GDP and also employ a considerable workforce.

In Laos, the economy is opening up and private enterprise initiatives are encouraged by the government. At national and local levels, donors are assisting the government in developing this sector of the economy. While assessing markets and market mechanisms in two districts in Luangnamtha province (Sing and Nalae), the GTZ-RDMA project has identified a number of issues of interest to other development projects active in this field. The overall strategy is to increase income and food-sufficiency and provide more reliable revenue for poor, food-insecure households. It is an inclusive approach that helps the rural poor reduce their vulnerability to changing circumstances. Better access to relevant information, services and markets enables farmers to make better-informed choices about risk-reduction and social relations, which are just as important for survival as increased business volume.

By opening access to economic opportunities for the poor, the approach is expected to contribute to regional growth and to opportunities for existing small-scale commercial enterprises.

The main entry point for this approach is through looking at income-generating activities and analysing the weaknesses and opportunities of the existing mechanisms underlying the economic activities of the majority of the population.

Defining the private sector

The project took a broad perspective when assessing the private sector. Instead of just considering private licensed enterprises, all commercial activities in the district were part of the assessment. Knowing the majority of the population is active in the agricultural sector, farming as a business was included.

There are about 400 licensed enterprises in Sing District, the majority being small market stalls and guest-houses. While there is no data on the number of people or households involved in these licensed companies, it is estimated that about 4,000 people rely on this sector.

Sing district
Muang Sing is in the north of the Luangnamtha province in a large fertile plain surrounded by mountains. Sing was once known for its upland opium plantings, but since 1995, the government has been eradicating this practice. The main sources of income are now cash crops, rice and livestock. The district, comprising seven sub-districts and 97 villages, borders China in the northeast and Myanmar in the northwest. The Akha, Leu and Hmong form the majority of the population of 29,307 (approximately 4,000 households). Sing is the gateway to Myanmar and Thailand and also has good access to China (its major trading partner) and to Long district. Trade is thriving.

An estimated 20,000 people earn at least part of their income from the agricultural sector, through growing, trading, transporting and selling. Many of these households practise subsistence farming, but generate at least some cash income from these other activities. Though these 'micro-enterprises' are not licensed, they contribute significantly to families' cash income. This is the reason the market assessment focused on this part of the private and trading sector.

Existing markets and relations

It is generally advisable to assess and work with existing markets and mechanisms. Regional market mechanisms are complicated, but identifying them forms the crucial building

blocks for further activities. New products can be introduced to a region or a trade mechanism, but they will be more effective if the weak existing markets have already been improved.

Trade network meetings: assessing needs and building linkages

Information on existing markets about constraints, trade flows and trends is gathered from semi-structured interviews held with traders, producers and government representatives. A Trade Network Meeting (TNM) provides information and improves linkages. A TNM brings together representatives of all active parties in the district's trade sector. The objective is to discuss trade-related issues. After introducing the market assessment, attendees give their view on the trade situation. The first TNM categorises constraints as experienced by various actors. During the meeting in Sing, participants were asked to name and categorise three constraints. Each group received a different colour of paper to write down the constraints, allowing the moderator to see the different group opinions.

After TNMs, smaller groups of traders and farmers meet to find solutions for these constraints. The meetings enhance trust, which is needed for building long-term relations within the supply chain. This provides a basis for improving quality levels, resulting in improved income for farmers.

The TNM has proven to be an excellent tool for assessing constraints in the trade sector. Based on this needs assessment, it is possible to formulate next steps and an intervention strategy.

Objectives of a TNM

1. Validate existing data.
2. Discuss the most important district markets (supply chains).
3. Strengthen existing market linkages and create new ones.
4. Discuss trade problems and complement if necessary.
5. Categorise constraints.
6. Formulate next steps.
7. If possible, institutionalise the TNM as a recurring platform for trade and trade-related issues.

Trade sector constraints in Sing district

	Constraint 1	Constraint 2	Constraint 3
Government	Markets and Marketing	Few Technical Skills	Rules and Regulations
Producers	Finance	Inputs	Markets and Marketing
Traders	Rules and Regulations	Infrastructure	Markets and Marketing

Possible interventions in the trade sector

- **Type of intervention**
  The intervention strategy depends on the strengths and weaknesses of the intervening organisation and the project's scope and available resources. An intervening organisation has a range of interventions for improving trade mechanisms. These could be improving infrastructure (e.g. road construction) or capacity building (e.g. providing marketing training).
- **Intervention mechanism**
  In capacity building, the delivery of the planned intervention is important. It is necessary to decide who implements the intervention and how it will be paid for. As the trade sector table shows, three constraints were listed as being most important. No interventions are planned for rules and regulations, but the following interventions are proposed by the GTZ-RDMA project for the other two.

Proposed interventions

- **Markets and marketing**
  Trade-related training is given on business skills, government role in a market economy and marketing techniques. Because the cash position of the involved actors is weak, the project will provide the training free. As far as possible, local enterprises and trainers will conduct the training. Another marketing-related intervention is providing assistance to set up 'contract farming' and formalising long-term relations within the supply chain.
- **Finance**
  The project initiates and supports village banks in the district. These enable villagers to enter into commercial activities, mostly focused on small livestock and buying higher quality inputs. Provision of small business training to potential borrowers by the Village Bank team is also under consideration.

Besides these activities, additional TNMs can be organised to institutionalise closer cooperation between producers, traders and government.

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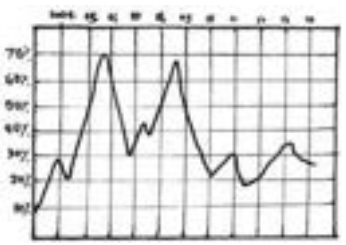
Market Chain Analysis

Technical solutions often have limited effect because livelihoods are still subject to market constraints. There are various approaches to market research but all of them at some point involve 'market channel analysis,' also known as 'supply chain analysis'.

Checklist for market channel analysis

Market channel analysis follows a product from producer to consumer. It identifies and describes:

- All points in the chain (producers, traders, transporters, processors, consumers).
- Prices in and out at each point.
- Functions performed at each point -- who does what?
- Market demand (rising, constant, declining, approximate total demand in the channel).
- Market constraints and opportunities for the products.



Do this analysis for: a) existing products, and b) potential products.
Tip: First identify the links in the market channel, and then fill in the details.

Identify and describe the market channels
Who handles the products? Who are the people in the chain? Who does the trader buy from? Who does he/she sell it to? How much product does she handle? How is it transported? Who is the next buyer in the chain? (Follow the chain all the way to the end). What is the buying and selling price at each point in the chain? How is it paid (credit or cash)? Who stores the product and how? How is the product processed and by whom? Is there more than one market channel? (Carry out an analysis for each).

Use a 'Functions Matrix' to understand the market channel for each product:

- List all the functions that are performed on the product along the market chain (e.g. processing, storage, transport, packaging, and so on).
- Find out who performs each function, where, and at what price.
- Fill in the details on inputs and outputs.

Market Constraints

- No buyers or only one buyer (monopsony).
- Cannot reach required volume for sale.
- Insufficient or declining demand.
- Falling price trend.
- Risk of price volatility.
- Trend towards substitution by other products.
- Difficult market entry.
- Too much competition (others can produce cheaper, control distribution or market the product more effectively).

Production/Processing Constraints

- Cannot be produced profitably.
- Cannot be processed profitably into a form that can be marketed.

Transportation/Storage Constraints

- Transport costs too high.
- Storage risks (spoilage).

Other Constraints

- Legal/regulatory.
- Finance (difficult to get credit).
- Market information.

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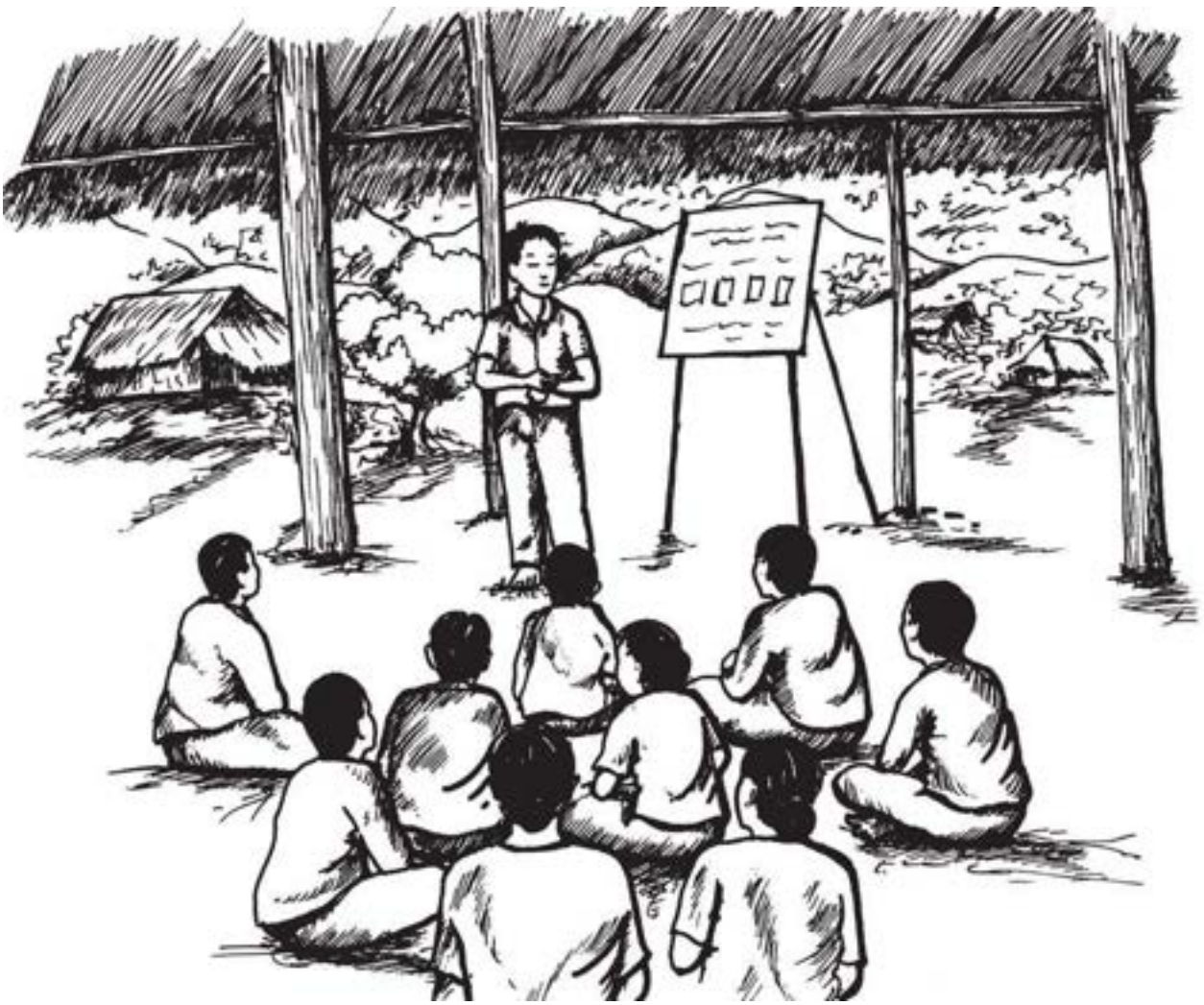
The Lao Extension System



Until recently, Laos did not have an effective agricultural extension service. Technology transfer was carried out by the technical departments of the Ministry of Agriculture and Forestry (MAF) on a campaign basis, and development projects conducted extension in their own individual and distinctive ways. In August 2001 the National Agriculture and Forestry Extension Service (NAFES) was established as a department of MAF. This was a fundamental step in the development of a national extension system.

For the past three years (2001-2004), the Laos Extension for Agriculture Project (LEAP) has supported NAFES in the development of a sustainable agricultural extension system based on participatory principles. LEAP has built on the experience of earlier projects and tested a consolidated methodology in three provinces. The outcome, called the 'Lao Extension Approach', is now being adopted by NAFES across the entire country.

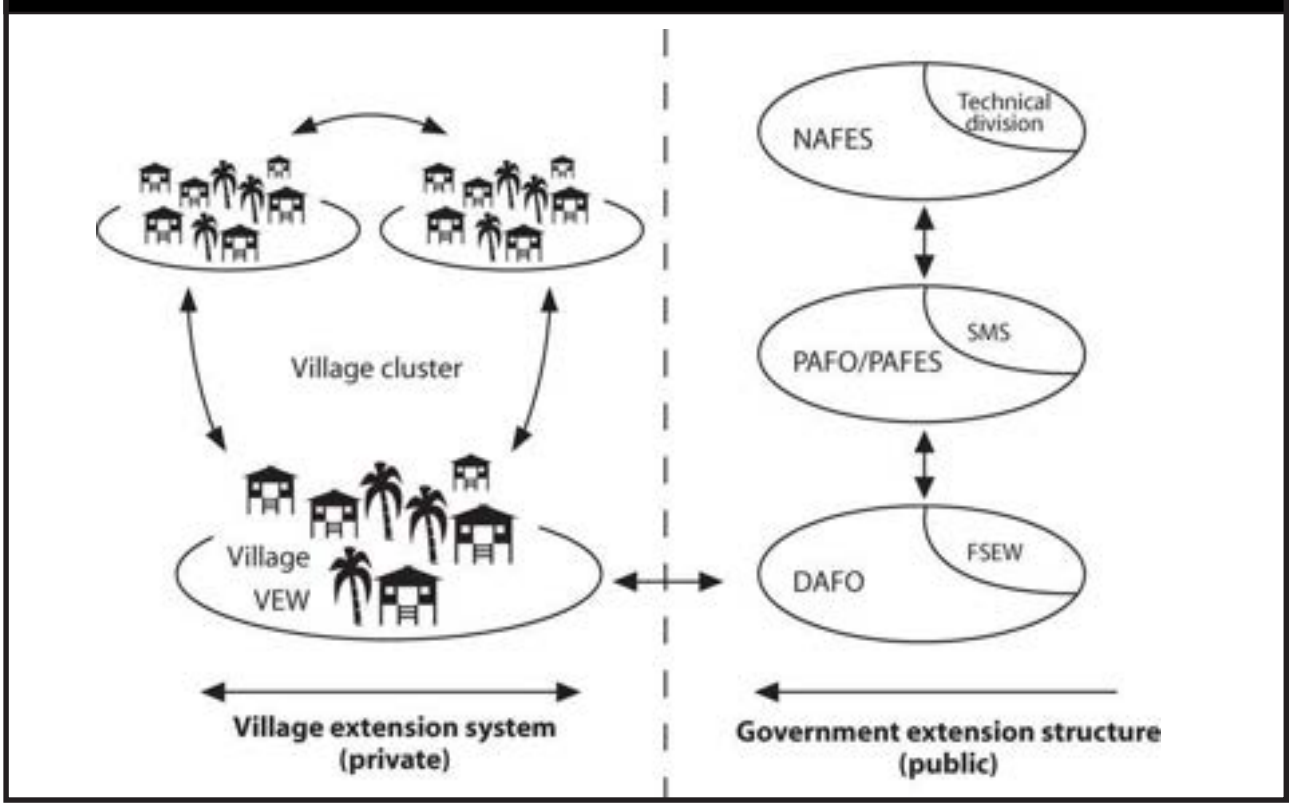
Policy framework for extension

Agricultural extension policy is described in a number of documents: 'The Government's Strategic Vision for the Agriculture Sector (1999); 'Prime Minister's Decree 01 on the socio-economic development of the country (2000)'; and the National Growth and Poverty Eradication Strategy (2004). These documents make clear the government's strong commitment to an extension approach that is decentralised, demand-driven and pro-poor. The role of MAF is to support the efforts of villagers to implement their own development.

The Lao Extension Approach

The Lao Extension Approach, or LEA, involves a set of policies, principles, structures and processes that should be applied in all provinces and districts, and by all projects that support extension activities in Laos. Details are available in the NAFES report 'Consolidating Extension in the Lao PDR' (2005). The structure of the LEA consists of two parts: the Government Extension Service and the Village Extension System (VES). This article focuses on the VES.

The knowledge support system



NAFES/PAFES - National/Provincial Agriculture and Forestry Extension Service
PAFO/DAFO - Provincial/District Agriculture and Forestry Office
SMS - Subject Matter Specialist
FSEW - Farming System Extension Worker
VEW - Village Extension Worker

The Village Extension System

The VES includes all village development efforts to ensure food security, livelihoods and economic progress. Development efforts by government agencies should be based on local conditions and potential and must be informed by, and based on, the ideas and inputs of local people who understand the special aspects of their own situation. This development structure and related procedures are called the VES.

Main principles of the VES

It is the responsibility of village authorities (e.g. village head and deputies, representatives of the elders, the Lao Women's Union and Lao Youth Union) to organise and supervise the extension system in their village.

The village authorities mandate an experienced farmer chosen by the villagers to be the Village Extension Worker (VEW). The VEWs are accountable to the village authorities, not to DAFO. Villages may have several VEWs, one for crops, another for livestock, and so on.

General principles of setting-up the village extension system

1. The learning project for each production group should run through a complete cycle.
2. To gain credibility the learning project should produce positive results.
3. The VEW is responsible for delivery of knowledge to the interested parties.
4. The transfer of a new technology requested by a production group is the responsibility of the extension generalist in cooperation with the VEW.
5. The village authorities should take ownership of the economic development of the village.
6. The village authorities are responsible for finding funds to carry out village extension activities.

VEWs cooperate with groups of interested farmers on particular topics. These 'production groups' learn and exchange new techniques for agricultural production. For instance, there may be groups that explore and develop storage and processing techniques or marketing channels for their products. DAFO supports the development of production groups through a process of identifying needs, training, coaching and exchange activities.

An extension generalist at the district level interacts with the VEWs. Once a new technique has been successfully introduced in a village, it is no longer the responsibility of the DAFO staff to spread the technology further throughout the village. This is done by the VEWs.

All resources for the VES are organised and managed by the village. VEWs are not paid out of the DAFO budget: how they are compen-

With support from LEAP, NAFES has developed and tested a simple process for launching the VES. The sequence of the curriculum is fixed, but the contents and pace of implementation are variable. The basic curriculum trains district extension generalists to perform the following steps:

Step 1: Inform the village authorities about the VES and explain the process. If the village authorities agree to begin the learning process, they are taken on a study tour to see an operating VES. During the field visit, they can talk with the authorities and farmers of the experienced village and get a first-hand impression.

Step 2: A one-day Training Needs Assessment is performed with all villagers. From this a decision to begin an initial learning project on one topic, and the first ten households to participate are chosen. This step has inbuilt gender-sensitive procedures. A constraints analysis is also included in the assessment to identify the issues more precisely.

Step 3: Training is designed and conducted according to the findings of the Training Needs Assessment. This represents the village's first learning project.

Step 4: During implementation of the learning project, an assessment is undertaken using the SIFT participatory monitoring tool.

Step 5: A farmer exchange is held with all interested households to discuss the results from the ten households who participated in the first learning project. This exchange has gender-sensitive procedures. Households interested in joining this particular learning project and further learning projects are identified.

Step 6: A final meeting with village authorities, future Village Extension Workers and interested farmers. Here the mechanisms of the VES are explained in detail. The village authorities may then decide to launch a comprehensive VES. The village authorities mandate the VEWs to share what was learned during the first learning project and organise new learning projects on additional topics with technical support from district staff.

sated is up to each village. This may be in cash, in kind or in labour. There is no blueprint for the compensation procedures. Village development funds will have an important role to play in this context.

Roles and responsibilities in extension

National Agriculture and Forestry Extension Service

- Assists the Minister in organising and encouraging extension in agriculture and forestry.
- Technical Division of NAFES coordinates and links with research, education and the technical departments at MAF, and manages extension implementation.

Central Extension and Training Development Unit

- Develops methods and curricula.
- Coaches staff in all provinces and districts.
- Trains provincial and district extension staff in pilot areas.
- Facilitates information flow between village and central levels.
- Supervises extension activities with the provincial level on a regular basis.
- Maintains a network with national and international institutions and a knowledge database.

Provincial Agriculture and Forestry Office

- Manages provincial agricultural and forestry activities.
- Technical sections of the PAFO provide advice on particular production systems.

Provincial Agriculture and Extension Service

- Trains and coaches district extension generalists.
- Identifies training needs of DAFO staff and farmers.
- Monitors, reports and conducts impact assessments.
- Coordinates between DAFO and Technical Sections.
- Develops extension material for specific agro-ecological situations.

District Agriculture and Forestry Office

- Maintains regular contact with farmers.
- Reports activities, problems and farmers' needs to the PAFES.
- Connects farmers with SMS, funding institutions and private sector (among others).

DAFO extension generalists

- Train and coach the VEW.
- Set and follow up learning projects.
- Apply (recurrent) Training Needs Assessments.
- Facilitate (initially) farmers COPs and VEW COPs.
- Advise on basic agricultural and livestock problems

Village Extension Workers

- Participate in VEW-COPs.
- Initiate and facilitate learning projects.
- Share knowledge and skills with production groups.
- Are compensated by the villagers in cash, kind or labour.
- Extend learning projects to non-learning-project-members

Launching the VES

To launch the VES, capable and competent extension generalists are needed at the district level. Because each village has different requirements and ideas for developing its agriculture and forestry, extensionists need a wide range of appropriate methodological and technical skills. If there are questions that the extension generalists cannot answer, they ask Subject Matter Specialists (SMS) based in the provincial centres or research stations.

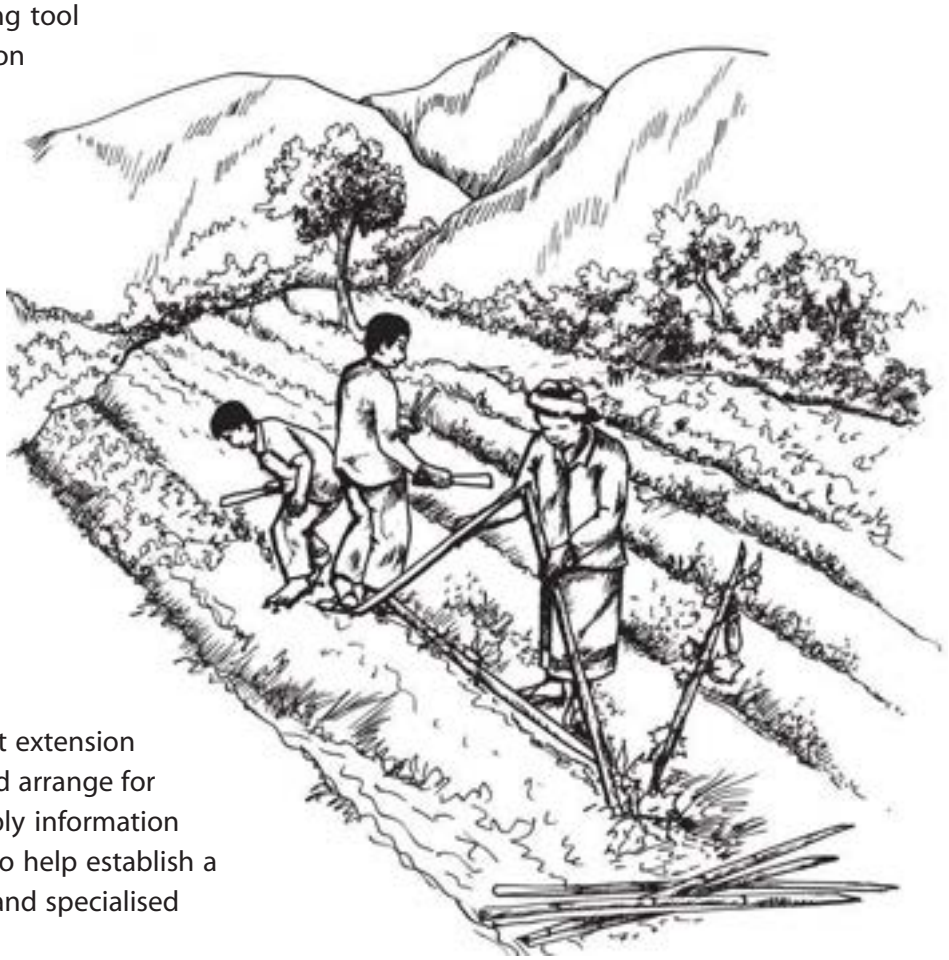
The methodological requirements are taught through basic skill training, which all district generalists receive. This simple standard process is called the 'Basic Curriculum for training District Extension Generalists' and includes theoretical lessons and practical applications with supervision by the trainers. Extension material, including tool books, modules on extension methodology, modules on technical subjects and a set of CDs, leaflets, posters and other extension material are provided as well. The basic curriculum is conducted and managed by PAFES trainers or already trained district generalists.

Roles and responsibilities

The main role of the district extension generalists is to provide and arrange for technical training and supply information to the villages. They will also help establish a network among the VEWs and specialised farmers in their districts to push the learning processes forward. Spreading technology in the village is the main task of the VEW. The provincial extension service provides the DAFO generalists with training in extension methodology and technical information through its SMS. The main task at the national level is the development of an overall strategy, training concepts and curriculum. The national Master Trainer Team trains and coaches selected DAFO staff and the first PAFES provincial trainers.

Immediate challenges

The Lao extension system has been thoroughly tested and includes experience contributed by all stakeholders. Although set up for the diverse requirements of the Lao people, the approach is new and only a few provinces and districts

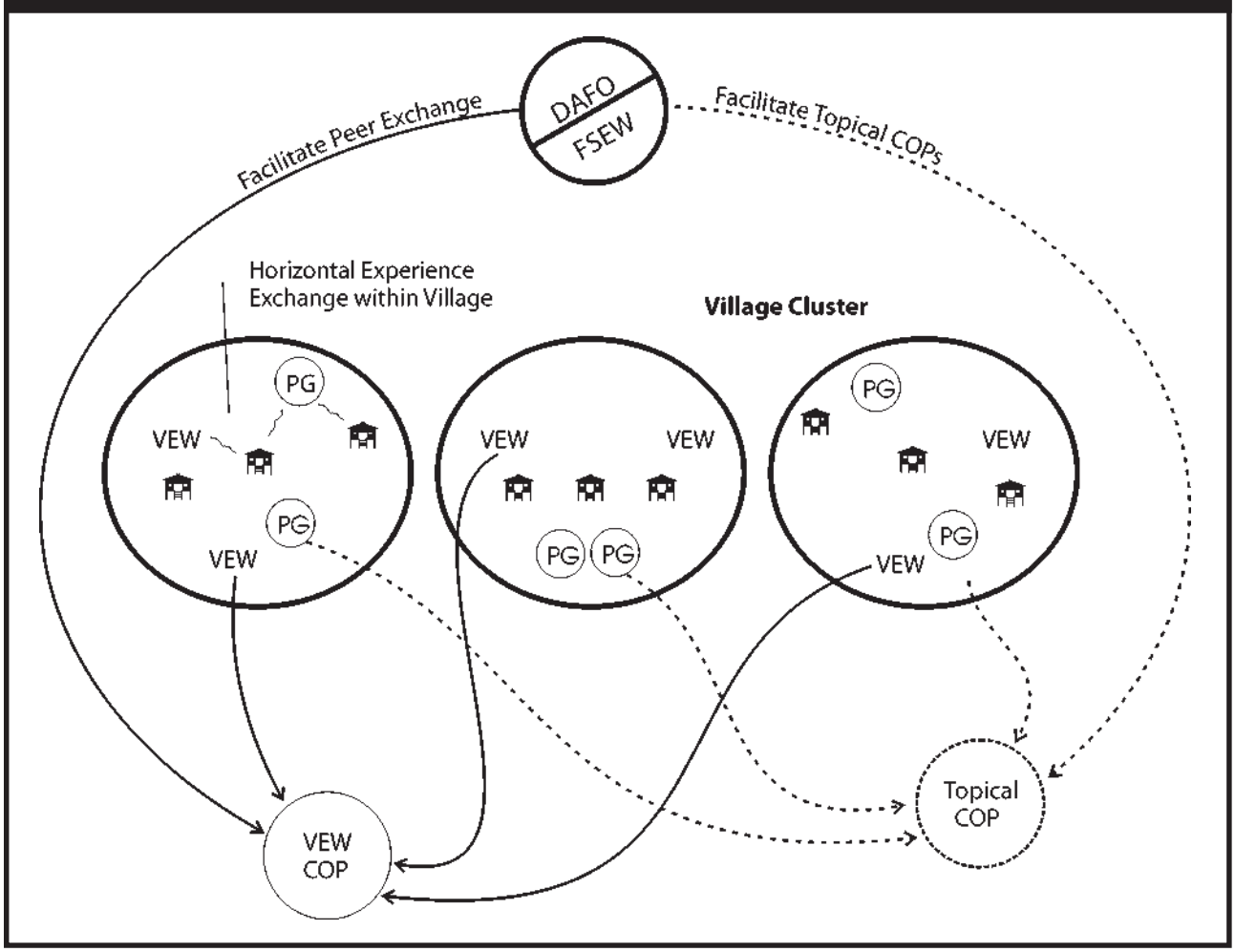


are as yet familiar with the idea. The challenge is to spread the concept throughout the country to every province, district and village. This requires a mechanism for delivery of services to the villages, including a model for training district generalists.

1) The financial aspects of VES

- Each village will have its own way of organising the required funds to run its VES, but no doubt some common features will emerge. The various ways that villages can pay their VEWs must be explored by establishing networks between experienced villages and those who want to learn how to arrange their finances. Training will also

Extension system at village level



FSEW = Farming System Ext Worker (Generalist)
VEW = Village Extension Worker
PG = Production Group
COP = Community of Practice

have to be considered to ensure village authorities and VEWs have the skills to manage their resources. Again, village development funds will have a crucial role to play.

2) **The delivery mechanisms of DAFO services to VES**

- These are operational concerns and include the most efficient procedures for DAFO services to be reliably available for the VES, and the most useful distribution of roles and responsibilities. These will depend on the specific situation in each district.
- In some regions of Laos, it can take a lot of time to get from one village to another or from a village to district headquarters. There have been discussions on establishing sub-centres in the district where villagers can meet the district extension generalists. These sub-centres may later be under the sole responsibility of the village clusters that are serviced by them.

3) **Training of DAFO staff to be competent service providers to VES**

- Many capable extension generalists who can help start VES programs and support their activities are needed. This is the most serious immediate bottleneck.

Selected references

Detailed procedures mentioned here, including application of the tools, are described in two documents:

LEAP. 2004. *Basic Tools Handbook for Agricultural Extension*, in Lao and English.

NAFES. 2005. *Consolidating Extension in the Lao PDR*, in English.

These documents are available on request from LEAP, or can be downloaded from www.laoex.org

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Participation: A Key Element of Sustainable Development

The Lao PDR is faced with the challenge of reducing poverty among the 80% of its population (i.e. about four million people) who are mainly engaged in subsistence agriculture, fishing, hunting, gathering and forestry. Reducing poverty, through wise use of natural resources and adoption of appropriate upland farming technologies, is the goal of most upland development and poverty alleviation programmes.

The challenge is complex and solutions are not simple. However, achieving these goals becomes more attainable and sustainable if people are not just passive recipients but take the role of active participants and

- *Participatory development* means involving people in diagnosing the situation and problems, planning and deciding courses of action, implementing agreed upon tasks, monitoring, evaluating and sharing the benefits as well as responsibilities of joint action.

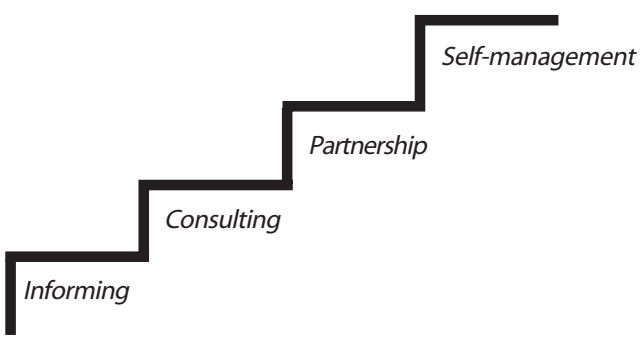
- *Participatory methods* allow stakeholders to interact and build a kind of partnership which allows better understanding of the important elements, dynamics, problems and opportunities of local communities.

responsible decision-makers. One of the strategic approaches to poverty reduction being explored by the government is 'improvement of livelihoods focusing on people-centred participatory development' (GoL 2004).

People's participation has been recognised as a key element towards relevant and sustainable development. Thus, many programmes try to integrate participatory methods into their work. Various organisations and projects have developed different approaches, tools and techniques in an attempt to promote people's participation. This has resulted in a variety of participatory methods ranging from the simple to the complex, and from the practical to the fashionable. Because of the excitement surrounding participatory methods, some people have been tempted to label just about any method as 'participatory'. However, basic questions remain. How participatory are these "participatory methods"? Who participates, when, how and why? The quality of participation is often in question.

Who participates?

Within the community, is it just the village officials, the men, the better-off farmers and the educated who participate, or, do women, the youth, the very poor, and the landless participate? Beyond the community, it is important to determine who the other stakeholders are and in addition, to determine the roles expected of them and how they will perform these roles. Who decides who has access to and control of resources? Who should benefit? Whose needs count?



When do people participate?

People are involved at different stages in the development of initiatives. Sometimes they are only allowed to implement projects conceived in meeting rooms. In other instances, they are involved right from the start in understanding their situation, defining and analysing root causes of problems and in planning, implementation and monitoring.

Another common problem is that people are only involved in the implementation but are left out of the monitoring and evaluation phase. Participatory Monitoring and Evaluation can, if conducted properly, provide the setting where stakeholders can together assess the progress, outputs, outcomes and impacts of a programme. How people participate or are allowed to participate can be grouped into two general levels:

Passive levels of participation:

- Informing, where outsiders merely tell people about a project to be undertaken.
- Consulting, where villagers are given the opportunity to express their concerns and suggestions.

Active levels of participation:

- Partnership, where there is an exchange and sharing of benefits as well as responsibilities to achieve a common goal. Outsiders and villagers are partners.
- Self-management, where people take initiative and collective action for their own development.

Some useful questions for development workers to ask:

- Are people merely respondents and beneficiaries or are they active decision-makers?
- At which level are people involved in their own programmes?
- What do we need to do to move to the next (higher) step?
- Will people's decisions be respected?
- To what extent do people participate?

Why should people participate?

In order to better manage natural resources, active participation and decision-making is key. The 'dole out' mentality, waiting for help to come or waiting to be told what to do, should be set aside. The end goal of participatory development must not be just helping people in the present but helping people to help themselves. In the future, they should be able to deal with problems even if outside assistance is no longer there.

Points to consider when using participatory methods

The benefits of participation have been well-discussed in other documents but what should we be careful about when using participatory methods?

- **Don't create false expectations**

Using participatory methods creates both excitement and anxiety among people, who tend to expect financial support or material rewards in exchange for their participation. Thus early on, the objectives, methods, expected outputs, roles and responsibilities of the stakeholders have to be well clarified.

- **Rushing leads to superficiality**

Sometimes development programmes are too eager to see results overnight, and so they do the programme 'for' the community instead of 'with' the community. Unrealistic time frames can short-circuit systematic participatory processes. Doing a programme in a participatory way requires more time and effort.

■ **Use participatory tools appropriately**

Participation is not ensured by using a wide variety or large number of tools. Production of Venn diagrams and seasonal calendars is not the aim of the process. Participatory visualisation tools should aim to stimulate both dialogue and critical thinking among stakeholders. The Eco-Development and Irrigation Project in Xay District, Oudomxay, revealed that their Participatory Needs Assessment/Village Level Planning method was more effective when used as a process of facilitating and raising awareness rather than as a data collection instrument.

■ **Communities are not homogenous**

Laos is an ethnically diverse country. What may be a good approach for one ethnic group may be totally unacceptable to another. There is no one magic formula that ensures success. Participatory approaches need to be tailored to meet specific needs.

■ **Enable people to participate**

The ability of people to participate actively depends on certain basic knowledge. Knowledge builds confidence and emboldens people to communicate their ideas. The ability to communicate sensible ideas enhances the ability to participate, and negotiate while allowing people to make intelligent decisions.

The Sustainable Agriculture Forum, an autonomous coalition of international NGOs and Lao development workers, emphasises the need for social preparation and awareness-building to enable people to participate effectively in long-term development.

■ **Sustain participation**

Participatory methods can only bear fruitful results when community plans are secured with immediate follow-up action. Support services like training on technical, managerial and marketing know how; animal vaccination

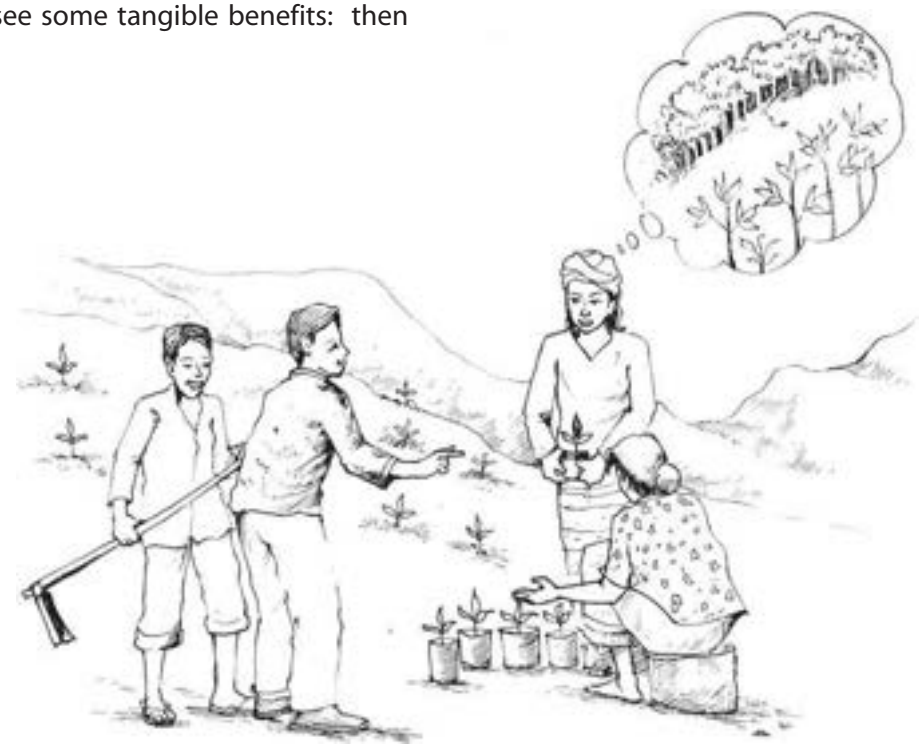
Challenges and lessons learned		
Challenges	**Target group**	**Comments and lessons learned**
Attitude and behaviour change	Development workers and, to a lesser extent, villagers	The focus of attitude and behaviour transformation should be to improve the ability of development workers to facilitate and guide change processes. Thus an attitude of learning and mutual respect should be fostered.
Institutionalisation of participatory methods	Development workers	The social and institutional environment plays a role in advancing or slowing down the promotion of participatory processes. Participation is not something that should be switched on only when development workers go to the field or work with villagers.
Decentralisation	Politicians and civil servants in central, provincial and district government institutions and local communities.	Mass organisations should play an important role in mobilising and empowering communities. In addition, decentrali sed participatory approaches should be institutionalised (through testing alternative approaches) into the structure and systems of government.
Political will	Politicians and civil servants	Participatory policy initiatives need effective implementation.
Responsible partnership	All stakeholders	It is important that the donor community, NGOs, and other stakeholders continuously work with the government to bring its goal of genuine participatory processes into reality.

and parasite control programmes; credit; or agro-industry linkages need to be in place.

The capacity of DAFO/PAFO staff should be strengthened so they can provide these support services effectively. Policy makers need to come up with facilitating mechanisms so that rather than being hampered by administrative procedures, staff are able to respond quickly to villagers' needs. Participation is sustained when people see some tangible benefits: then their degree of involvement gradually becomes enhanced.

■ **Consequences of participation**

Participatory methods involve social mobilisation, which may threaten existing power structures in the community. It is important to identify existing traditional mechanisms of participation and build on, not against them.



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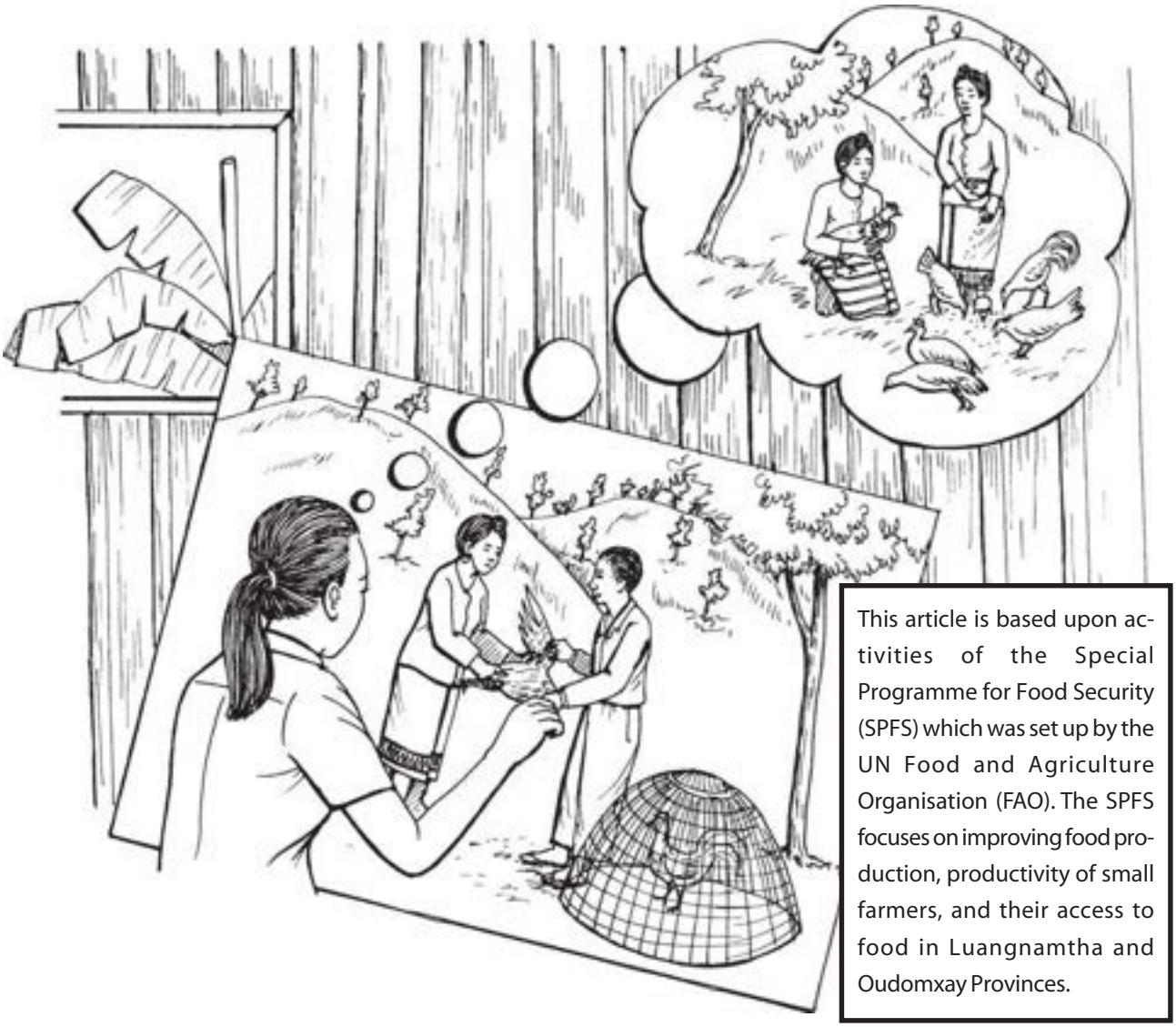
Reaching Rural Women in the Uplands



This article is based upon activities of the Special Programme for Food Security (SPFS) which was set up by the UN Food and Agriculture Organisation (FAO). The SPFS focuses on improving food production, productivity of small farmers, and their access to food in Luangnamtha and Oudomxay Provinces.

To achieve food security and poverty reduction in the Lao uplands, it is crucial to include gender analysis. Women are often ignored, overlooked or forgotten in many agricultural programmes, even though they are the backbone of agricultural production, processing and marketing, and of domestic work and the household economy. The current general lack of reliable data, and the lack of recognition and valuation for women's unpaid work in agriculture is hampering a complete understanding of the situation and environment that upland women work and live in.

There is a need to ensure that new technologies and alternative development options are suitable for women and are sensitive to the division of labour in the uplands, i.e. are gender sensitive. In addition, there is a need to measure the contribution by women to both national and household food security.

Promoting gender equality is an important national goal, as reflected in Articles 22 and 24 of the 1991 Constitution. The recently established National Commission for the Advancement of Women is guiding line ministries, agencies and mass organisations in developing strategies and action plans to promote gender equality at national, provincial, district and village levels.

Role of women in Lao agriculture and food security

Women work alongside men in agricultural activities. For example, in upland rice production, men traditionally plough, make bunds and prepare seedbeds, while women do more than half of the rice transplanting, weeding, harvesting, threshing, and post-harvest operations.

In the northern uplands, the traditional task division has changed due to a lack of male labour. There are a number of factors that determine the shortage of farm labour:

- Opium addiction among productive male adults.
- A very young population.
- Young men migrating to town centres, seeking more profitable employment opportunities.

This places an extra strain on women, who are increasingly involved in land preparation, irrigation and preparing bunds and seedbeds. In addition, shorter fallow periods result in more weeding, which directly affects women's workloads (Souvanthalisith 2002). Furthermore, it is mainly women who are responsible for the health, nutrition and feeding of their families. They often choose which foods to purchase and find ways to feed the family when supplies run low.

Women often account for 70% or more of the rural workforce in the Lao PDR (FAO 1998).

Difficulties in reaching rural women

Time limitation:

- Project activities are often formulated and designed in a hasty manner.
- District, provincial and project staff often have very limited time to prepare training materials and field activities. This results in very general training handouts and field activities that are not adapted to local environmental conditions or to the interests and needs of different target groups such as men, women and elders.

To overcome these problems, SPFS:

- Provides district extension staff with technical advisors and helps tackle the above-mentioned constraints during monitoring and evaluation workshops.
- Provides training for provincial and district staff in the field once a week, to demonstrate new technologies, to motivate and to follow up on project activities.
- Tries to identify farmers' interests and adjust activities accordingly.

Communication:

- The gap between policy/programme and implementation is a severe problem. Programme policy is well outlined and documented, but implementation and the delivery of services to villagers often lag far behind planning
- There is a lack of capacity among government and project staff to communicate with upland villagers and, more specifically, with upland women. Project staff are often Lao speakers while the majority of women in upland villages do not speak or understand the Lao language. Village chiefs usually help interpret during meetings with women and elders but there is some doubt as to whether conversations are interpreted correctly.

To overcome these difficulties:

- Translators/interpreters who speak and understand the local languages should be actively sought.
- Awareness training for district staff in how to communicate with the farmers (learning to ask why!) is another way of creating better understanding between stakeholders and project staff.

Low participation by women:

SPFS has found that the participation of women is generally lower than that of men. This is especially so in the area of rice and cash crop cultivation, which are considered men's domains in spite of women's major and ever-increasing contribution. Male migration and opium addiction are further increasing the load on women.

- Women have limited availability, due to their very full schedule. In addition to agricultural production, women are also responsible for tasks such as cooking, cleaning, fetching water and collecting firewood.
- Women do not automatically attend meetings unless specifically asked or even encouraged to come.
- The majority of women in upland areas do not read, write, speak or understand Lao language.
- Participation of women is higher in Lao Loum (lowland people) and Lao Theung (midland people) societies than it is among Lao Soung (upland people) groups.
- The number of trainers and district staff who are women is also low.

To increase women's participation:

- It is advisable to organise separate meetings at convenient times and locations for women, although there are no cultural obstacles to organising mixed-gender meetings.
- Find ways to encourage women's participation as much as possible by selecting topics of interest to women, looking at the workload required by newly introduced technologies and carefully preparing group meetings at a convenient time and place for women. Given that many women have little time to devote to attending group work and training courses, special arrangements have to be made to ensure their participation.

Lack of information:

- Available data on the diverse rural society in Laos is limited and rarely indicates women's responsibility for much of the day-to-day work and decision-making on the family farm.
- Data also fails to reveal the many other important food production and processing activities that women commonly perform, such as home gardening, tending livestock, gathering fuel or carrying water.

To improve information quality and quantity:

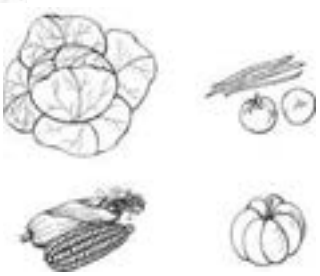
- Appraisals should explain in detail the constraints and bottlenecks women encounter in adopting proposed new activities and technologies.

Given the predominant role of women in agriculture and food security, it should be clear that:

- Women need to be equal partners in the agricultural development process in upland areas.

Example of women's priorities
In Nam Leu village, Namtha District, women have indicated that their top priority is improvement of lowland paddy production and the intensification of village handicrafts (cotton and bamboo based). The women cultivate organic cotton in the upland fields and have a long tradition in paper bamboo production. Their main constraint is lack of marketing experience (quality control, labelling, packing, selling procedure, receiving orders, etc.). Furthermore, the tools and equipment they use are very labour intensive.

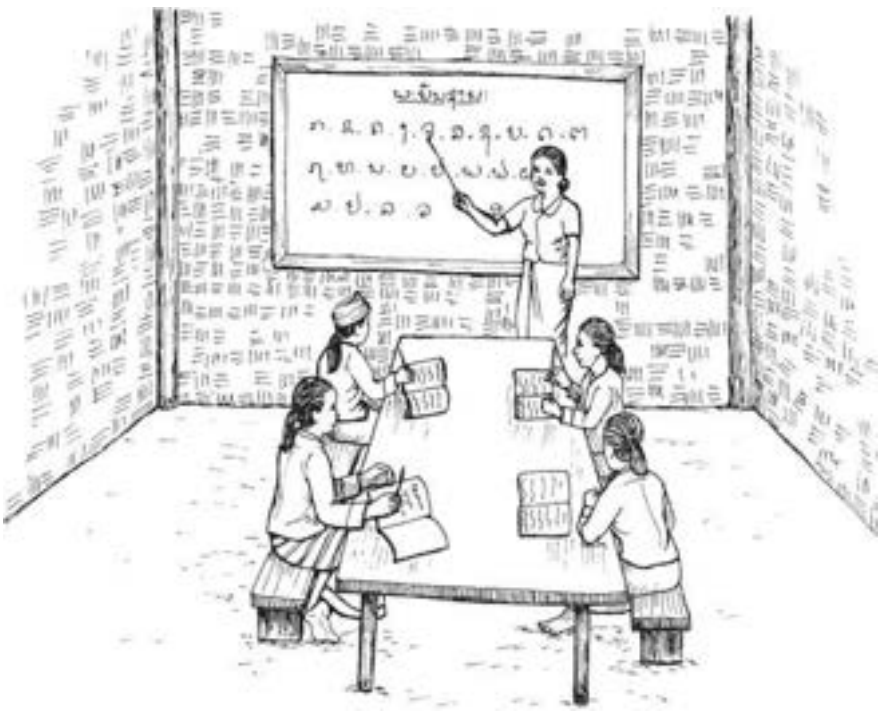
- In order to promote agricultural development and enhance food security, projects and programmes need to incorporate gender analysis as an integral component at all stages and levels.
- For women to increase agricultural production they need to break from the cycle whereby lack of land rights means that there is a lack of access to credit: banks are often less inclined to lend to women if they have no land, but without credit, women cannot purchase land.
- Access to agricultural inputs is also of vital importance. Extension services and cooperatives that distribute inputs rarely reach women, who in any case often lack cash to purchase inputs, thus contributing to their low level of production.
- Agricultural extension needs to focus on upland cropping (rice and cotton) and vegetable production to improve nutrition and the food security situation. This area is mainly controlled by women, who therefore have some control over the inputs and outputs. When focusing on cash crop production, it is important to verify if there are nearby markets, and if women have access to market information, financial facilities, transport and so on. Normally men have better access to such things.
- Access to extension and training services is another area that needs to be improved. Few services focus on women or have a significant number of female staff.
- Increased access to education, technology, rural organisations (cooperatives, farmer's organisations) and services (transport, markets) would enable women to improve agricultural production and food security at the household level.



Promoting gender sensitive approaches and technologies relevant to upland areas

The Lao extension programmes can only be tailored to address women's priority needs if:

- Men and women farmers are listened to at the village level.
- Methods such as participatory rural appraisal are employed.
- Staff at all levels in the agricultural and forestry sector acquire a sound understanding and awareness of gender issues.
- Awareness of and responsiveness to ethnic group's livelihoods and needs increase at all levels.
- The number of women extension workers from different ethnic groups is increased.
- Rural women's resources and available time are considered and their needs specifically targeted.
- More hands-on field training is provided in gender disaggregated data collection, compilation and analysis.



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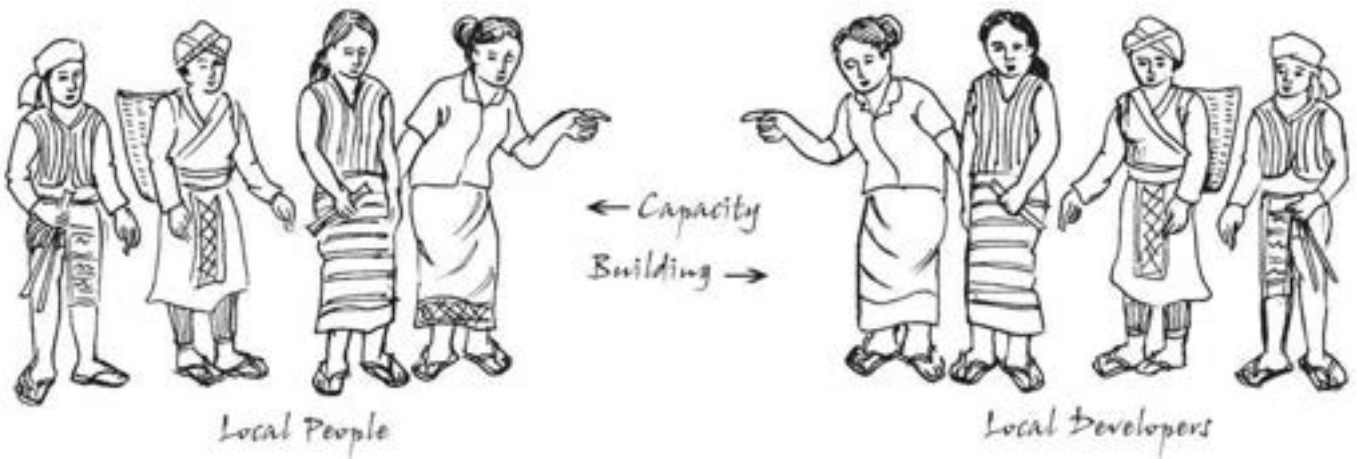
Choosing the Local Capacity Building Pathway



In 1999 the Sekong Ethnic People's Development Programme (SEP-Dev) set out to develop a community development strategy and institution aimed at improving the living conditions of multi-ethnic communities in the remote districts of Dakcheung and Kaleum. A problem analysis and design workshop was conducted, at which provincial and district officials decided to:

- Focus on building local capacity and community activities.
- Aim for a long-term, sustainable programme - not a five-year project.
- Build the capacity of local technical services.
- Start with road access to communities.
- Move slowly from village to area development.
- Rely as much as possible on local personnel with local language and cultural skills.

Important questions SEP-Dev attempted to answer at the onset of the project:

- Could the programme mould the critical core of necessary development professionals from the local multi-ethnic populace?
- Could it afford the time and slow pace needed for capacity building, rather than undertaking numerous community development activities quickly?
- Could a programme funded largely by external donors develop into a permanent sustainable institution within the local government - i.e. a long-impact programme, not just a short-lived project?
- Could development improvements in isolated remote villages eventually gel into area-wide development of trade, marketing, service outreach and transport?

To meet these conditions, SEP-Dev had to find creative solutions and, at the same time, cope with enormous constraints:

- Isolated and diverse ethnic villages (ten different ethnic groups in Kaleum and Dakcheung).
- Newest provincial administration, created only in 1984.
- Limited and dangerous road access to the districts (open six to eight months per year).
- Difficult dirt track access to villages.
- Twelve phone lines and irregular electricity in the provincial capital.
- District government staff have low education and technical levels.
- No critical core of experienced community development professionals.
- Limited technical skills in the private and government sectors.
- Barely visible transport and market systems.
- Very high levels of unexploded ordnance (UXO).

Lesson 1: Set an appropriate pace for building local capacity

In 1999 SEP-Dev faced a choice for framing its programme management and community development efforts.

Choice One: Move quickly into its community development component by bringing in many experienced external professionals. This would show immediate and visible community activity results. The long-term risk, however, was the possible loss of building a local sustainable development institution staffed largely by local managers and developers.

Choice Two: Pace the rate of fieldwork commensurate with local staff capacity. In Sekong this meant starting from the basics on programme management and community development. Daily tasks would serve as learning platforms for local programme managers and developers. The risk was that low initial outputs on community poverty reduction would mark SEP-Dev as a 'slow mover' and could dissuade long-term financial support.

The 1999 Design Workshop firmly endorsed Choice Two. Citing the poor results of an externally driven development project in Dakcheung ten years earlier, the province decided to concentrate on building local ownership and capacity first. Furthermore, both the province and its external donors recognised that establishing a sustainable rural development institution rooted in good governance practices could take a decade or two.

For the first three years SEP-Dev concentrated heavily on building local management capacity. Fieldwork was limited to five target villages in Kaleum and Dakcheung and two road-way accesses. In 2002 and 2003, as staff capacity increased, the pace and volume of fieldwork climbed. By the end of 2003, SEP-Dev had supported development plans in 64 remote villages of Dakcheung and Kaleum.

In the end, the initial time spent on building local capacity on management and community development has not hindered the scaling-up of fieldwork, despite an enormous learning curve for the local staff. Furthermore, the chances for a sustainable provincial development institution have certainly improved.

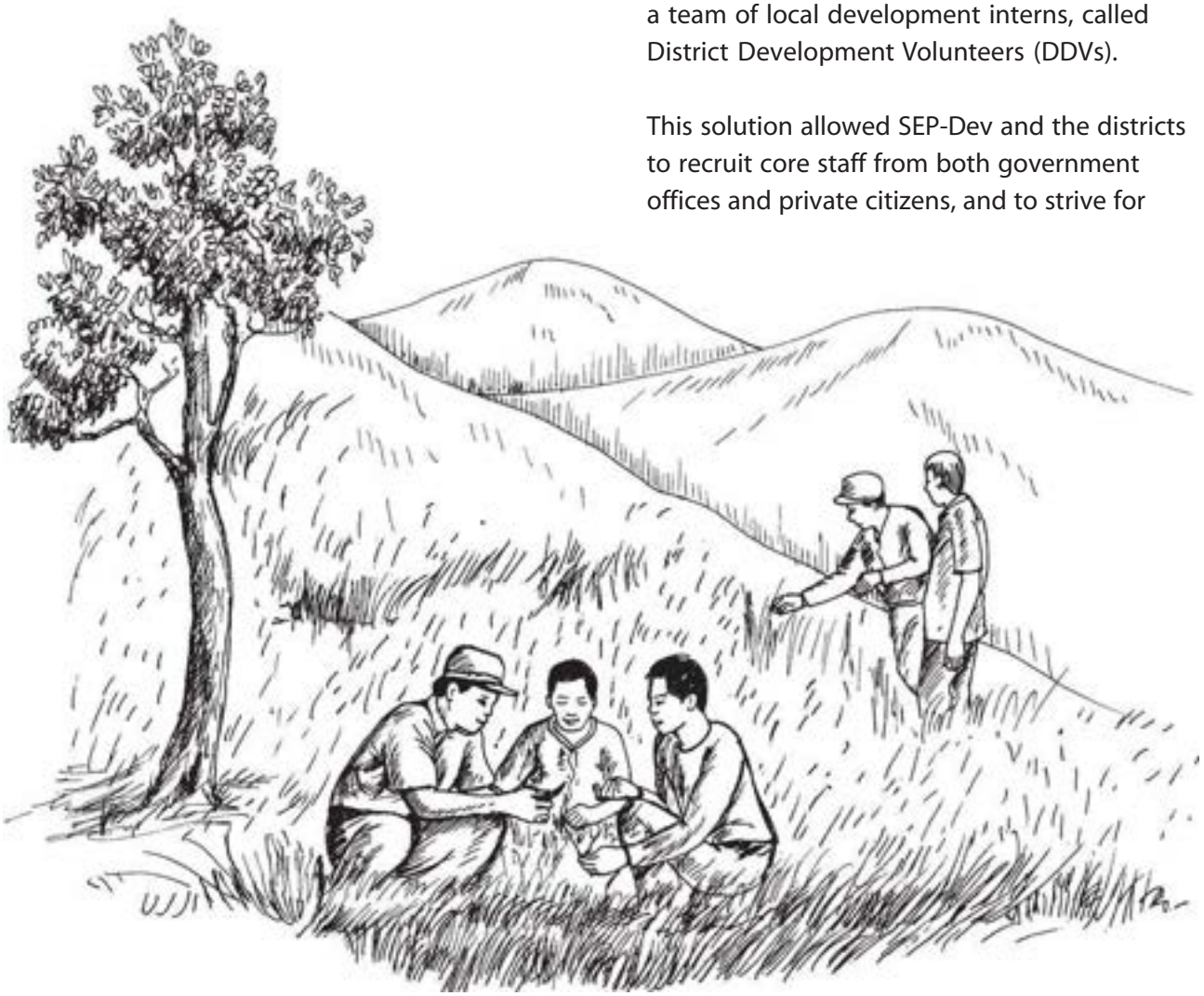
Lesson 2: Mould the critical core of provincial and district developers from local people

In 1999, SEP-Dev's initial and most immediate task was to create a local core of community developers. SEP-Dev's staff had to become the key facilitators between remote, under-served communities, government technical services and external funding support.

How could SEP-Dev create such a team of professional development facilitators when so few provincial and district officials and private citizens had development experience or training? At the same time, how was SEP-Dev going to find a staff that could handle the cultural and linguistic diversities of Kaleum and Dakcheung?

The workshop participants came up with a bold new approach for the Lao PDR: create District Management Units consisting of two government-appointed District Managers and a team of local development interns, called District Development Volunteers (DDVs).

This solution allowed SEP-Dev and the districts to recruit core staff from both government offices and private citizens, and to strive for



ethnic diversity and gender balance. All staff have to come from the district and be fluent in at least one local language.

Today the district teams function like a hand: the two government-appointed District Managers form the palm of the operations. They direct the team according to SEP-Dev's principles and standards and the government's policies and planning, and they solicit district technical support for community activities. The DDVs in each district are the fingers that facilitate the daily development activities in various villages. DDVs ensure good communication between villagers, SEP-Dev and the technical services. They facilitate community discussions on data collection, planning, and agreements. They alert the district managers about problems and monitor inputs and outputs. DDVs are given basic stipends and continual on-the-job and semi-formal training for up to five years.

The DDV concept is the country's first attempt to offer vocational development internships in remote areas to multi-ethnic peoples with limited education and development exposure.

Creating a critical core of local Developers: What SEP-Dev has learned

- Districts teams are the key facilitators of development communications with remote ethnic villages, especially for women and children. Each member of staff must be able to communicate in local languages, to appreciate the richness of subtle cultural diversities, and to help SEP-Dev's development efforts become ethnically sensitive and appropriate. However, the qualifications for staff selection often need to be lowered to be compatible with local conditions.
- Attaining both gender and ethnic balance in staffing is possible and highly advantageous for working in remote, ethnically diverse areas. Through such staff, SEP-Dev easily involves those who cannot communicate their desires and ideas in Lao language, many of whom are women.
- Remote area district staff need intensive and continual on-the-job training and side-by-side coaching. At least five years of support - and maybe up to ten - are

required. To mentor district teams more effectively, SEP-Dev decided to base advisory support at the district level from 2004. Refresher training is essential.

- Establishing job descriptions, plus criteria for personnel selection and assessment processes demonstrates good governance practices to district authorities. SEP-Dev provides an excellent learning venue for modelling such governance concepts in remote districts. This practical learning is also helping districts take up their decentralised tasks.

Lesson 3: Foster close linkages with local government services

SEP-Dev's mandate calls for making linkages between participatory community development plans and government services. However, government services often have too much work and too little money. At the district level, technical skills are rather low. Again, government participants in the 1999 design workshop came up with useful suggestions for fostering a mutually beneficial relationship.

- Incorporate senior department authorities into SEP-Dev's planning and review processes. Quarterly and annual coordinating committee meetings provide key venues for activating critical linkages between community plans and government technical services.

- Train up and use the technical officers of local departments as much as possible. Today, SEP-Dev works closely with government technicians on livestock raising, paddy rice extension, roadway construction, water supply, hygiene and health promotion, and school improvements.

- Strengthen the technical and outreach capacity of GOL departments and mass organisations through Mini-Projects. Here SEP-Dev devised a unique and popular approach. Each department or service unit can apply annually to SEP-Dev for small grants (up to US$2,000) for training and piloting new efforts in remote areas. In this way, departments learn how to write and implement small funding proposals, and how to monitor their work.

After five years of using these approaches, SEP-Dev and its provincial and district partners have established a mutually beneficial relationship. The local authorities share annual plans with SEP-Dev, as they are beginning to realise SEP-Dev's role as a 'facilitator of development'. Department heads send staff to join SEP-Dev's training processes on comm-unity planning, monitoring and assessment, and technical training. Furthermore, the authorities have asked that SEP-Dev's work be institutionalised into mainstream government efforts and that SEP-Dev assist the province and districts with facilitating the creation of annual development fora with external partners.

Lesson 4: Resolving remoteness by improving access ways

In the original formulation document, SEP-Dev's initial community development strategy focused largely on direct interventions in remote villages. However, SEP-Dev has now realised the critical importance of small-scale access improvements as the first intervention in isolated areas.

From numerous community dialogues, villagers expressed high demand for pathways, small-scale dirt roadways, and safe stream crossings.

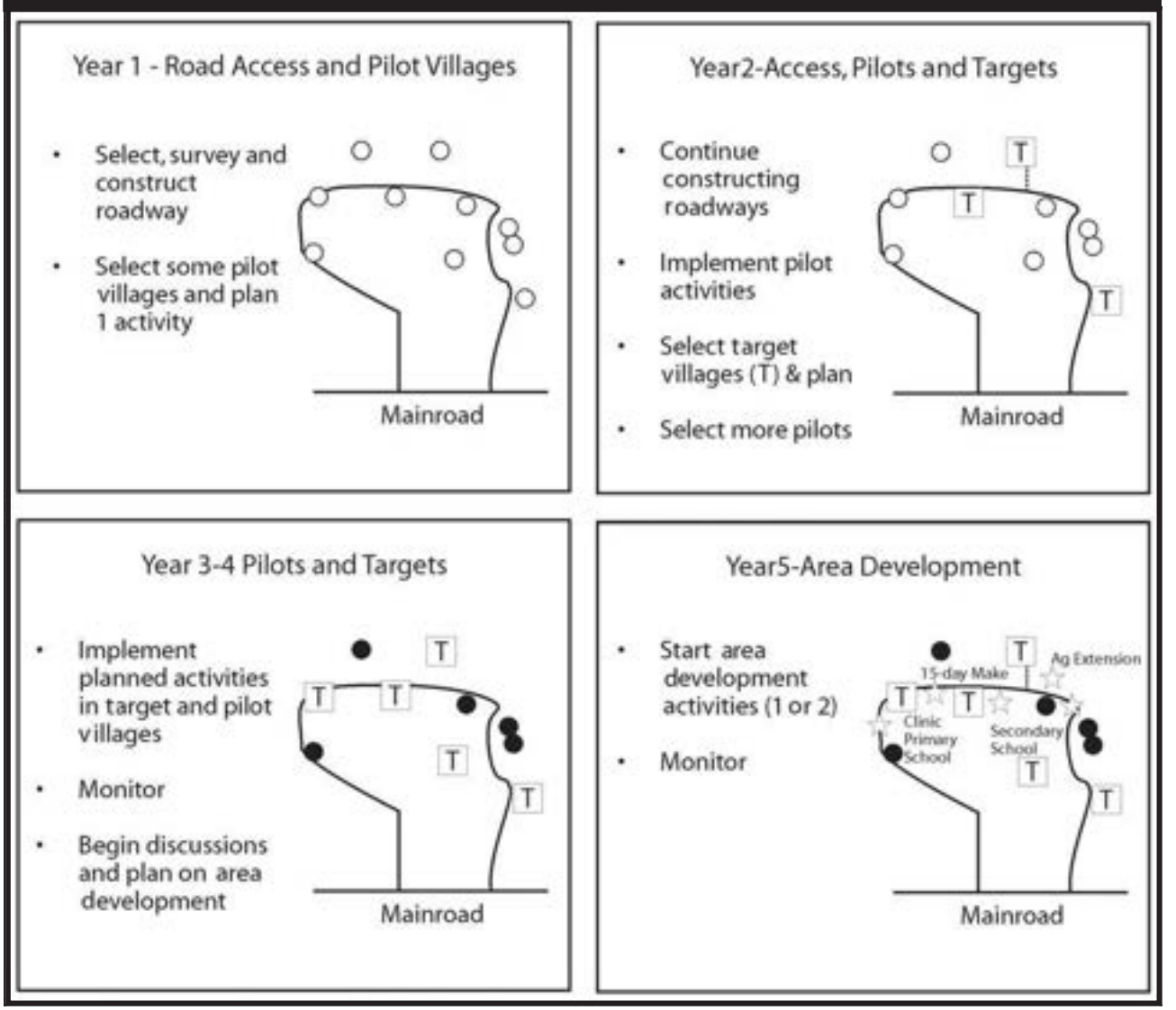
Villagers understood well that whatever improvements they made to education, water supply, health, food security and income production, they still needed to break away from the problem of isolation.

The demand was logical and wise. With access improvements:

- UXO Lao could bring in its vehicles and equipment to clear land of unexploded ordnance.
- Time and human labour required for transporting materials (water pipes, tools, rocks for gabion weirs. etc.) were reduced dramatically.
- Inter-village exchanges, trading and even development planning could emerge.

From five years of practical learning, SEP-Dev has reformulated its Strategy for Community and Area Development into four steps, with improved access at the beginning of the process.

Four-step community and area development process



Step 1: The district and SEP-Dev consider possible development areas. Community dialogues are initiated in a few villages to identify problems and help villagers create community plans. The demand for small-scale access improvement usually emerges as a major concern. At the same time SEP-Dev approaches other villages near the proposed roadway to see if there is a common interest in improving access through manual labour. After agreements are made, UXO Lao clears the ordnance, a survey is done, shovels and hoes purchased, and Food for Work requested from the World Food Programme. SEP-Dev invites a few villages to start a pilot activity: usually clean water supply or a school is chosen.

Step 2: As the access roadway is built, pilot activities are implemented and more pilot villages are taken on. Based upon performance on the roadway construction and the pilot activity, a few communities are invited to become target villages. This designation allows SEP-Dev to support longer-term community development. Step-by-step, villages choose their next activities to promote crop and livestock production, improve health and education, or reduce daily labour.

Step 3: Between the third and fourth year, new pilot and target villages are selected along the roadway and community development activities start. The inter-village road maintenance meetings and development exchanges stimulate the beginnings of area cohesion.

Step 4: By the fifth year, SEP-Dev and the district facilitate an area-wide planning workshop to foster an Area Development Plan. The plan might include development of a 15-day market system, a secondary school, a clinic, and an agriculture extension office - all of which would prove cost-effective for a group of communities.

The local capacity building path

SEP-Dev has chosen to take an innovative path to development, one that is less expedient and rarely travelled. SEP-Dev's approach emphasizes local capacity building and ownership as its main strategies. While such an approach takes time, patience and long-term perspective, it ensures that local people will be able to carry on long after the project ends.

SEP-Dev is implemented by the Provincial Government of Sekong Province and funded by UNDP and NORAD.

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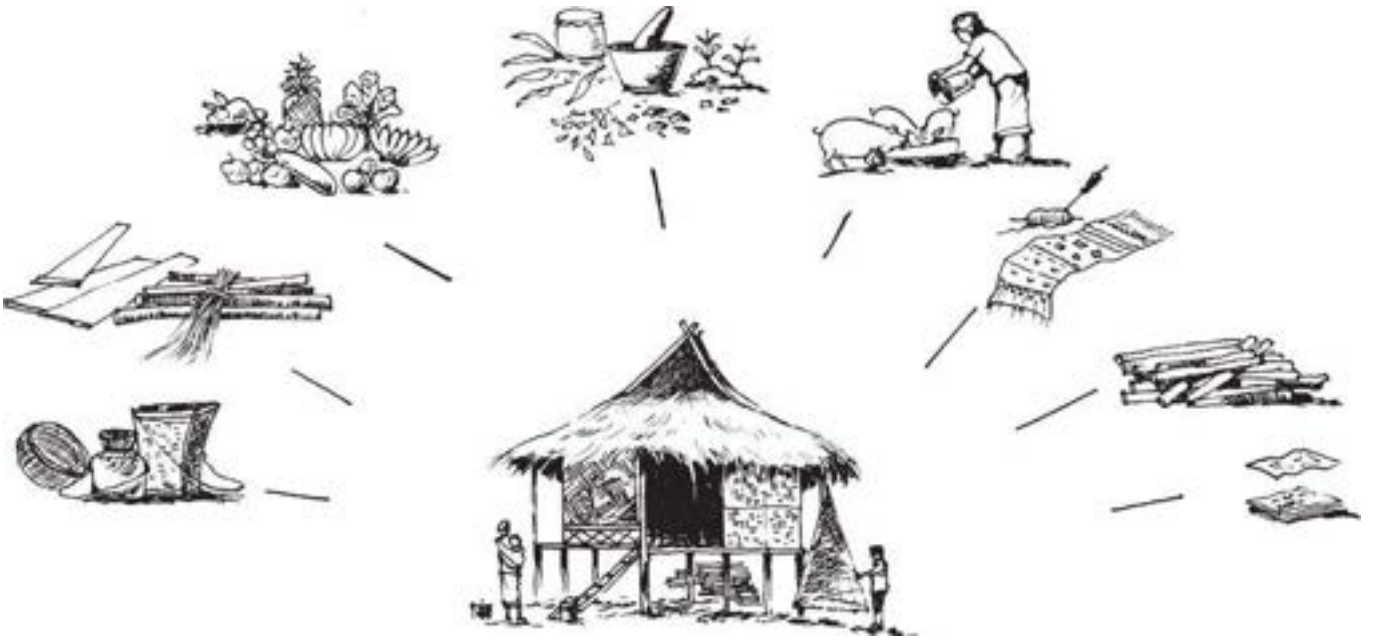
Livelihood Analysis: A Checklist



The household is the basic economic decision-making unit in rural society. It is essential to understand householders' livelihood strategies in order to make sense of what they are doing and understand how they perceive opportunities for change. Here is a checklist to help you with 'livelihood thinking'.

> The Socio-economic Research Unit of NAFRI has been developing its capacity to conduct research in support of rural development.

a) What are the householders' livelihood objectives? What do they actually hope to accomplish? For example, some households might want to produce all their own food, whilst other might prefer to grow cash crops and buy their own food. What problems do they have in meeting these objectives?

b) What you are proposing - does it help them reach to their own objectives? Are their objectives and yours the same or different? Would they be willing to consider other ways of achieving their objectives, for instance by adopting new technology? Would other objectives also be acceptable to them, such as cash crop surplus rather than subsistence sufficiency? What problems would they encounter in pursuing the new objectives?

Resources

a) What resources (land, labour, capital, etc) does the household have? What resources do they need to make a decent living? Do they have enough? What problems do they have concerning access to resources?

b) What you are proposing - is it reasonable when considering existing constraints on resources? How will it affect their access to resources? Will it help them solve their livelihood problems or will it create more problems for them? How could these new problems be solved?

Definitions

A *household* is a group of people who live and eat together and typically engage in joint economic activity. This group is usually based on kinship and in Laos is normally comprised of the nuclear or stem family.

Nuclear family is father, mother and children.

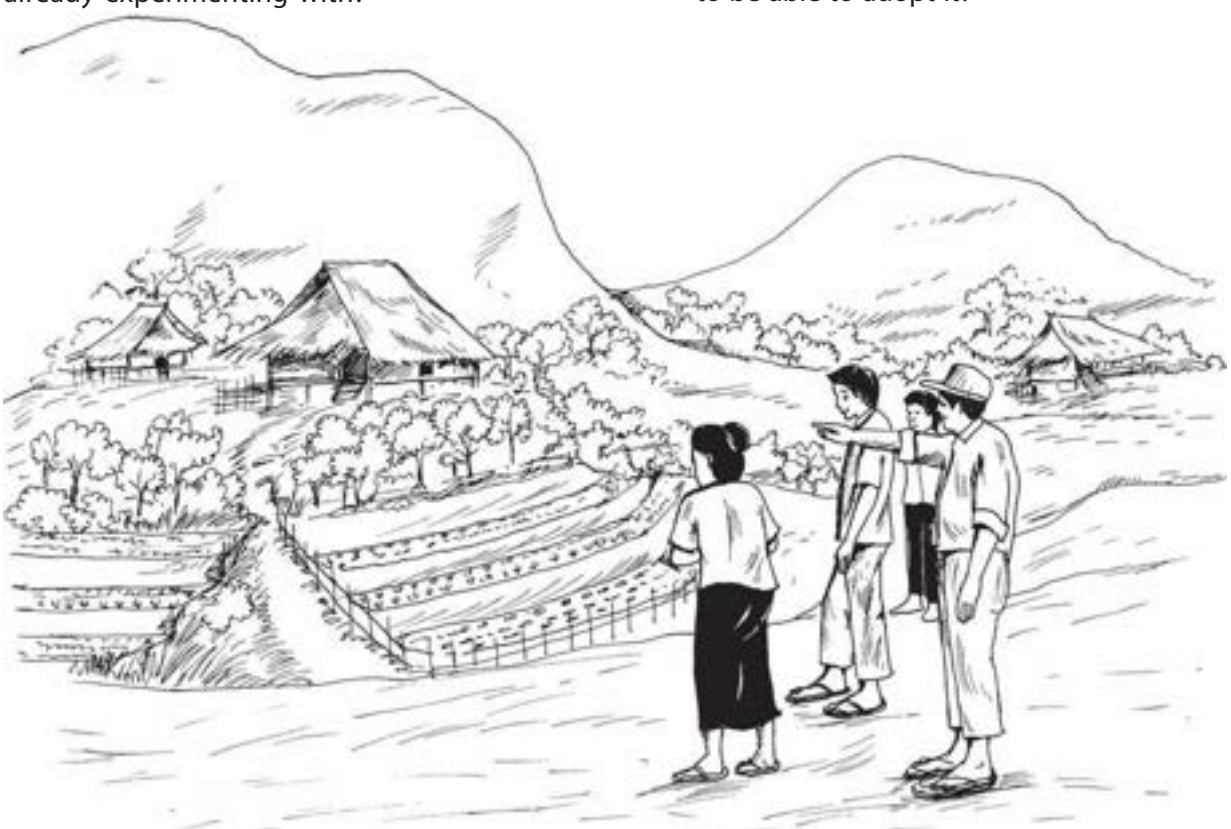
In Laos, *stem family* = nuclear family + surviving members of the grandparental generation. Other household groupings are rare.

While there are many definitions and complex systems developed to explain the concept of livelihoods, *livelihoods* can

Technology

a) What indigenous technologies do they have? What new technologies have they adopted? What can be done to improve the existing technology? What new technologies are they already experimenting with?

b) What you are proposing - do they have the technology needed to do it? Would they be interested in trying it? What kinds of training and other support would be needed for them to be able to adopt it?



Knowledge & Values

a) What indigenous knowledge do they have? What traditional values and beliefs are associated with this knowledge? What opportunities and limitations does this imply?

b) What you are proposing -- does it make use of their traditional knowledge? Does it challenge their values? How can your ideas be adapted to fit their knowledge system and values? Are they interested in acquiring new knowledge through training, study tours, etc?

Livelihood Strategy

A livelihoods strategy is a combination of all of the above. Some questions to ask include:

a) What is their existing livelihood strategy? What problems do they have in pursuing this strategy? What is their strategy for solving existing problems? Would they be interested in other strategies for achieving their objectives (other technologies, new land entitlements, new market opportunities, etc.)?

b) What you are proposing - how does it relate to their existing strategy? Is there a way to integrate the old with the new so that the new does not seem completely unfamiliar? How can you build on their existing strategies? How could the existing strategies be adapted to take advantage of new opportunities?

Rapid livelihood system diagnosis

A good way of understanding the inner workings of the livelihood system is to analyse how households organise the means of prod-uction at their disposal in order to meet the basic needs of the household economy. The table

Household livelihood system - diagnostic results		
Basic needs Supply system	←	*Production subsystems* (components of basic needs subsystems)
Direct needs (outputs consumed directly by the household)		
Food	←	**Crops, livestock, fish, NTFPs, purchased foods**
Energy	←	Firewood from forests & fallows, crop residues, etc.
Shelter	←	Timber, NTFPs, purchased
Medicine	←	Medicinal plants, purchased medicines
Cash	←	**Short term cash crops, livestock, NTFPs, cottage industries +**
Savings/investment	←	**Long term savings/investments in livestock, trees, banks, farm improvements +**
Indirect needs (major inputs for producing outputs that are consumed by the household)		
Feed for livestock	←	**Grasses, forage, crop residues, feed crops**
Raw material for cottage industry	←	NTFPs, timber, crops, purchased materials

below, from data gathered in northern Laos, shows the main elements of this approach. The basic needs of the households are supplied by the 'basic needs supply systems," each of which is composed of a number of 'production subsystems'. The basic needs are universal, but the exact manner in which they are supplied varies from area to area and from household to household. The system is diagnosed by:

1. Establishing the household's objective for each supply system.
2. Determining how (means and strategies) and how well (performance) these objectives are being met.
3. If there is a problem with particular supply systems (shown in bold below), the relevant production subsystems are diagnosed to identify the causes of the problems.
4. The causes of the problems then become focal points for experimenting with solutions.
5. If solutions for specific problems within the existing livelihood strategy are difficult to achieve, the household may need to consider alternative means of meeting their objectives.

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Using Agrarian System Analysis to Understand Agriculture

The regional study of agrarian systems provides a methodology for understanding the diversity and the complexity of agricultural practices. It provides a research and planning tool that allows us to understand each form of agriculture and to roughly establish the characteristics of the historical transformations and geographical differentiations of a rural society. This helps when defining appropriate policies, strategies, programmes and projects that are related to poverty or resource management.

Agrarian systems analysis has been used by the Faculty of Agriculture of the National University of Laos and the Comité de coopération avec le Laos (CCL) to design regional development projects in a number of provinces and to improve the knowledge of Lao agronomists.

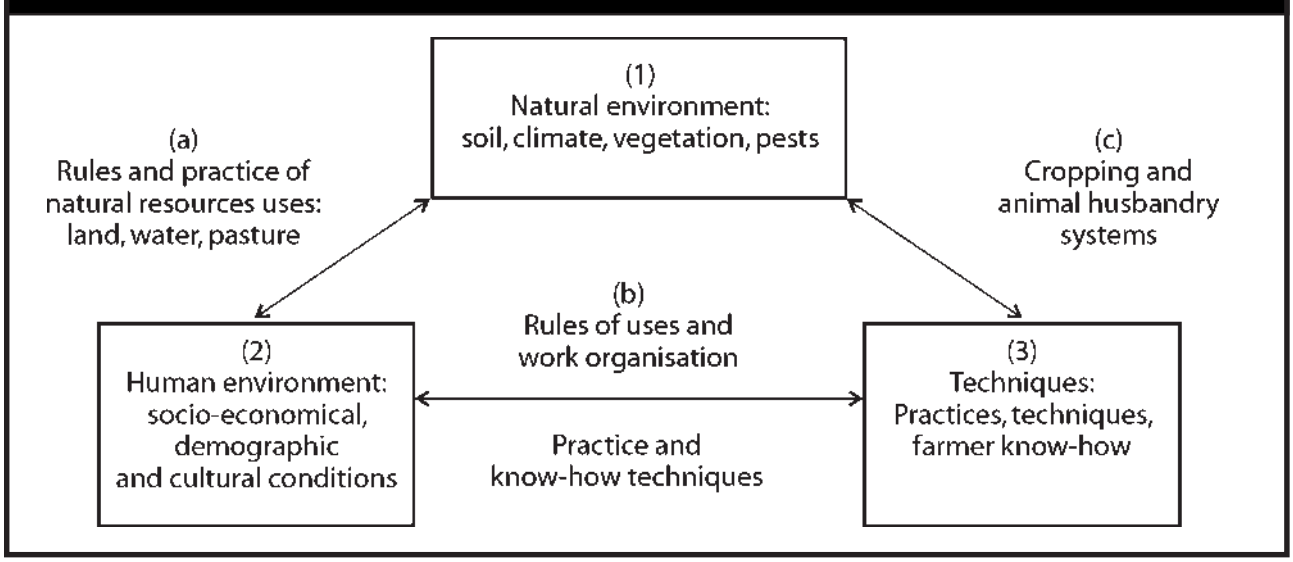
An agrarian system can be defined as the way farmers exploit the environment by using the relations and interactions that occur between all of its social and physical components. The system also takes into account the limits of the environment and its ability to reproduce.

The agrarian systems approach takes a historic perspective by taking into account the spatial and temporal limits of an agrarian system. It tries to understand the organisation, the operation, the renewal and the differentiation of the past. This in turn helps provide a better understanding of the complexity of the present dynamics, the socio-economic structures and the mode of exploitation of the ecosystem.

The mode of exploitation consists of the farm work, the inert production means (equipment, tools, etc.) and the living production means (crop seeds, reproductive animals, etc.) that perpetuate a cultivated environment. It is a social product, the result of the relations between different actors whose objectives can be identical, complementary, and/or contradictory.

An agrarian system is composed of three main elements (Figure 1):

Figure 1: Reciprocal relationships between components of an agrarian system



Methodological approach

The methodology of the agrarian systems survey is based on:

- Analysis of agro-ecological, technical, social and economic elements and their interactions. Agriculture is a complex combination of diverse parameters.
- The study of a limited number of different situations. The diversity and complexity of agricultural situations can be surveyed by a limited number of well-chosen case studies.
- Looking at different scales, from the international level down to the plot levels. Like climate, local agricultural situations can be seen as the product of a general situation and local particularities. The agrarian systems survey is conducted from a general to a local scale.
- Studying the evolution of farming systems at different times. Agriculture is changing and appropriate interventions cannot be proposed without understanding the trends that already exist.
- Using simple tools such as landscape observations and discussions with farmers. Agricultural landscapes and farmers' knowledge are the best and largest source of organised information.

- Using an iterative approach. Information from observations or interviews is cross-checked and verified so hypotheses can be tested and adapted.

How to analyse and diagnose agrarian systems

To understand the mode of exploitation of a particular ecological region by communities with similar rules, it is necessary to understand the methods the communities use in each part of ecosystem. Exploitation at farm level cannot be understood without knowing the mode of exploitation of each parcel and herd composing the farm.

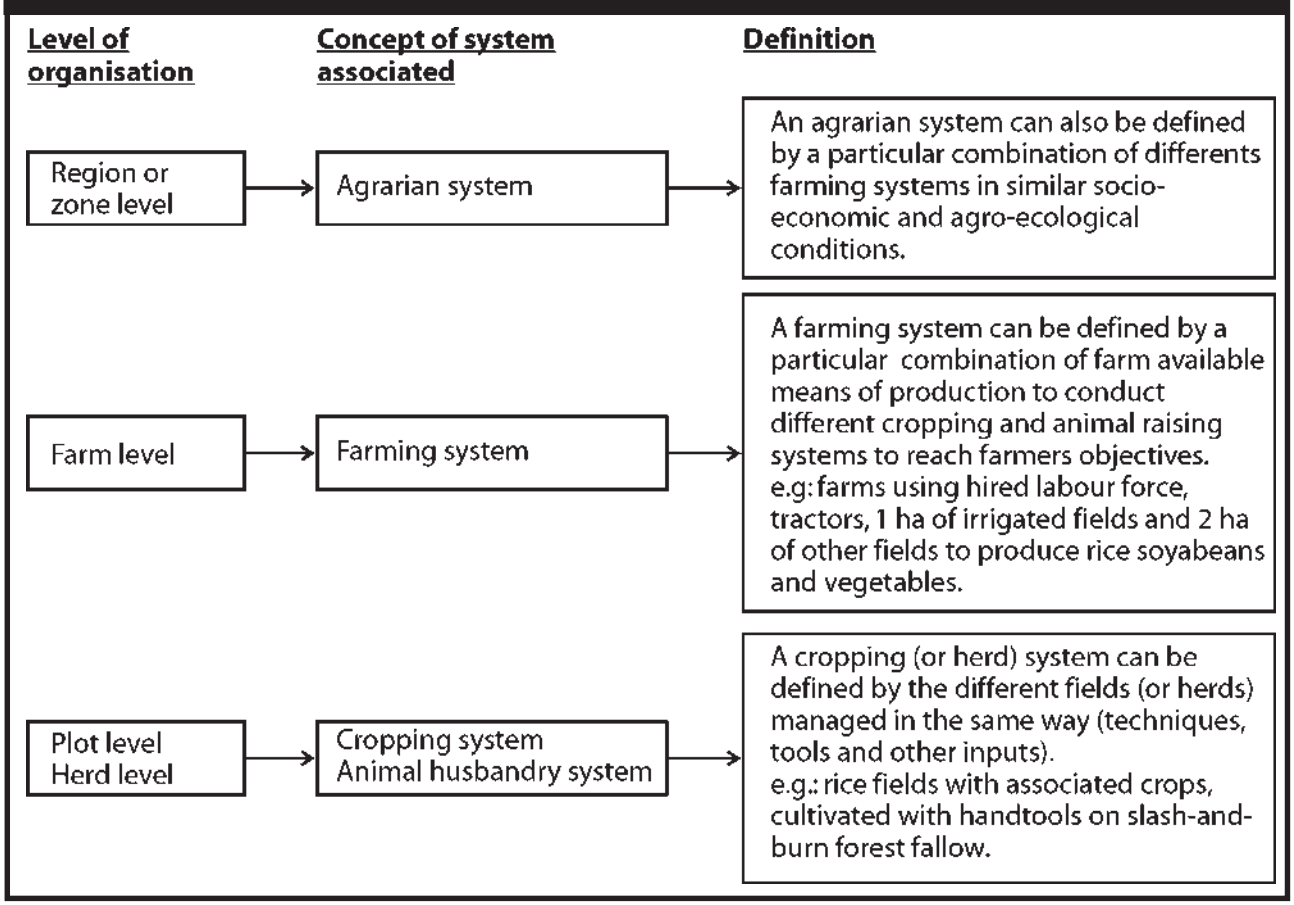
Analysis and diagnosis of complex agrarian systems is conducted at three different levels:

At regional level: *identifying a limited number of homogenous zones.*

An administrative region like a district or a province can present a great diversity of agricultural situations. To avoid making a single proposal for intervention in the whole region, or to avoid making too many proposals that could be difficult to implement, it is necessary to identify a limited number of zones with different agricultural situations, and to understand the main characteristics of their evolution.

At this broad scale, it is important to understand the main ecological and socio-economic characteristics and the main associated modes of natural resource exploitation. Available ecological and socio-economic data, such as

Figure 2: Analysis and diagnosis of complex agrarian systems

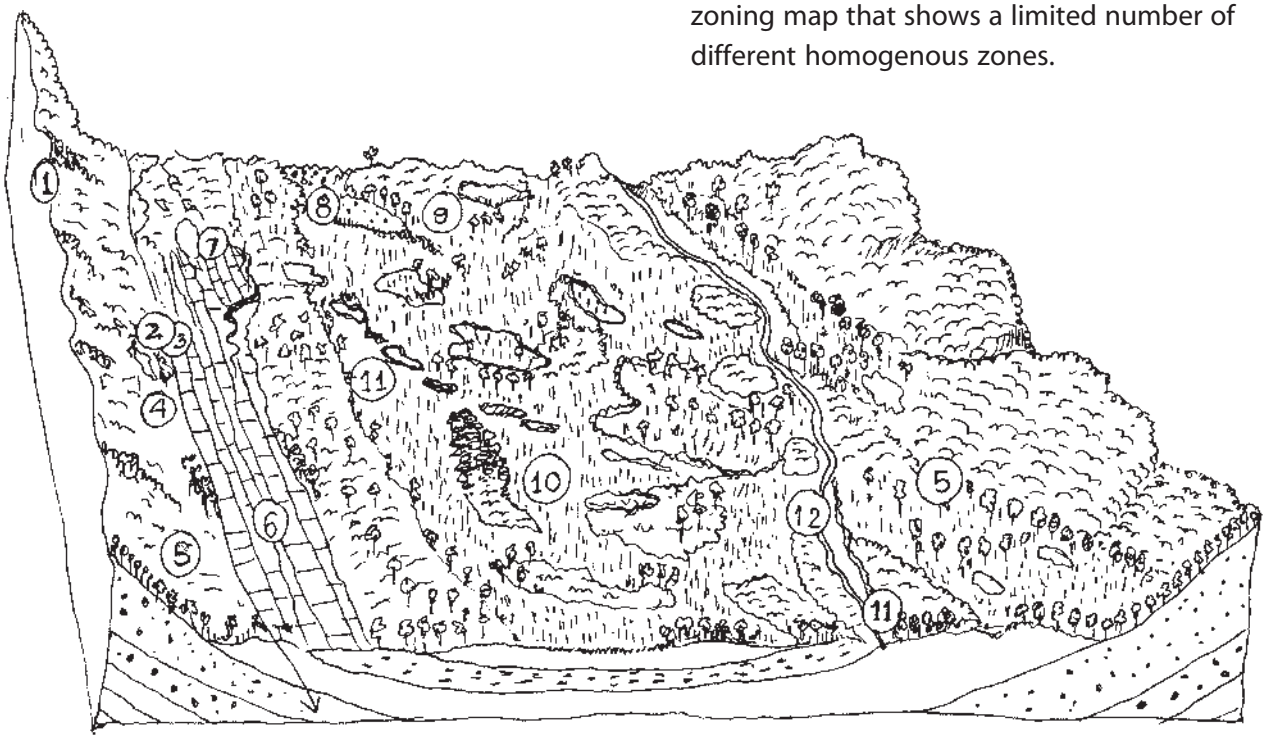


topographic, geological, soil or vegetation maps, climatic data, survey data, various statistics, population density, and main infrastructure can be very useful in making a hypothesis to explain agricultural differences.

Fieldwork is also necessary to observe the agricultural landscapes along transects and to identify the different agro-ecological and socio-economic conditions (see Figure 3). Important factors that explain agricultural differences are: landscape types (plateaux, valleys, plains), vegetation types (forests, savannah, wetlands), main infrastructure (roads, irrigation schemes, markets), types of agricultural land (fields, fallows, grasslands), and main weeds, pests, crops and animals. This information forms the basis for a hypothesis about the links between the different factors and agricultural practices.

Interviews with experienced farmers, usually older individuals, can provide a great deal of information about the past and present agricultural situation and begin to provide an understanding of the reasons for change, such as landscape transformations, technical adaptations or socio-economic trends.

A homogenous zone is defined as a sub-region where similar transformations on similar ecological and socio-economic conditions have led to a similar situation. At a regional scale, the survey of agrarian systems leads to a zoning map that shows a limited number of different homogenous zones.



Zone 1

1 Logging, NTPF on forests

Zone2 Foot hills

2 Home garden
3 Garden fertilised with manure
4 WS Paddy rice on small clay area
5 Grazing area under pine and broadleaf forest

Zone 3 Lowlands and small hills

6 WS Paddy rice
7 DS Paddy rice
8 Slash and burn rice
9 NTFP and grazing on fallows and forests
10 Grazing area on grasslands
11 Fisheries on river and natural ponds
12 Drawdown garden

At zone level: *understanding the organisation and the functioning of the agro-ecosystems and identifying the diversity of farming systems.*

A homogenous zone does not mean that all parts of the agro-ecosystems are the same or are used in the same way by farmers. It is essential to define and characterise the different parts of agro-ecosystems (forests on the hills, fields in flooded lowlands, grasslands on slopes etc.), the farmer's uses of these areas (e.g. slash-and-burn rice cultivation in forest, paddy rice and fish culture on flooded land or cattle raising on grassland) and the rules attached to these different areas (such as private property, or community management with prevalence of the first user). These elements are important in themselves, but the links between them are often more relevant. Once again observations and open discussions with experienced farmers are often the main source of information.

The Nakai Plateau zone

Except on its mountainous border, the Nakai plateau zone in Khammouane Province is characterised by lowlands and small hills. The plateau can be divided into four agro-ecosystem units:

- On a marginal area far away from the river, farmers have invested in developing wet season paddy fields. This area can sometimes be flooded and part of the production lost, depending on the duration of the flood.
- Forest fallow and slash-and-burn rice cultivation occupy the numerous non-flooded small hills and the largest cultivated surface.
- Other fallow and slash-and-burn rice cultivation fields are located on the lowest land, but only short cycle varieties are cultivated to avoid losing the entire production to floods.
- Grasslands occupy the rest of the lowlands. They are 'maintained' by annual or biannual fires to feed more than 4,000 buffalo.

Source: IRAM, 2004

Farming systems in northern Phongsaly district

There are many types of farming in northern Phongsaly but three are particularly interesting when compared:

- Type 1: farming systems of rice fields cultivated on forest slash-and-burn long fallow, with maize and opium cultivation, buffalo herding, family labour force and handtools.
- Type 2: the same as type 1, except that rice is cultivated on savannah with draught animals.
- Type 3: the same as type 2, except that rice is cultivated in lowland rainfed paddy fields.

Farmers themselves say that farming system 3 is better than type 2, which is better than type 1. Analysis of each system shows that this is not because of the supposed superiority of paddy cultivation.

In this zone, paddy rice gives about the same gross added value per worker as the other rice fields, but the fact that no work is needed in the paddy fields during the poppy cultivation season seems to be the real reason why farmers prefer farming system 3. Indeed, whereas the forest has to be slashed at the same time as opium is being collected, and the savannah fields have to be ploughed during poppy weeding, type 3 farmers can use their entire labour force for the operations that usually limit the acreage of poppy fields. They can, thus, double the surface cultivated and produce about twice the quantity of opium otherwise produced!

Source: Baudran 2000

It is also important, at this stage, to categorise the farmers who exploit the different parts of the agro-ecosystems. This diversity can be surveyed by considering a limited number of farmer types, who carry out similar activities with similar means of production and a similar evolution.

At this scale, for each zone, the agrarian systems survey leads to a better understanding of the organisation and functioning of the different areas composing the agro-ecosystem. It also leads to a typology of farming practices by different farmers.

At farm level: *understanding the coherence of each farming system and identifying their problems.*

Understanding the utilisation modes of the different parts of the agro-ecosystem unit and identifying the different categories of farmers is only the first step.

It is then necessary to analyse in detail the organisation, the functioning, the performance and the evolution of the farming systems implemented by these farmers. This can be defined as a combination, within the farm, of productive activities (plant or animal production, agro-processing), and means of production (land, tools and equipment, labour force, capital, etc.) in time and space.

Once more, the range of farming systems can be surveyed by analysing a limited but diversified number of situations. The sample should be chosen in order to have several farms from each category as case studies. It is not a random sample, as often used to avoid bias, but it will ensure that less representative farming systems, i.e. those that may be adapted to future conditions, will be interviewed.

Semi-structured interviews with each farmer, and/or his wife, should be conducted and should gather the following information:

- A census of the available production means (land, tools and equipment, herds, labour force, capital, etc.) which, by detailing their characteristics, quantity, value and uses, provides information about farm resources. This gives a basis for understanding the farmer's choices.

- The family and farm history, which indicate the settlement of the farm, the production means currently available, the inherited goods, the purchases, the credit that could have enriched the farm, the evolution of the labour force, the technical and activity changes and so forth. This data can be used to identify the issues involved in the farming system transformation and the major trends (diversification, specialisation, capitalisation, impoverishment, etc).

- A detailed analysis of each sub-system composing the actual farming system, by detailing the cropping systems, the animal husbandry systems and the processing systems. At the plot or at the herd level, it is important to understand the different operations and techniques in relation to the agro-ecological conditions (e.g. soil fertility and structure, weeds and pests, water and light), plus the tools and labour force required.

- A detailed analysis of relationships between sub-systems and especially between livestock and crops: competition, like the use of the same land or the same labour force at the same moment, or complementarities, like the use of crop residues as cattle feed, manure production

and transfer of fertility, animal workforce for ploughing, etc.

- An economic appraisal of each cropping system, each animal husbandry system and the whole farm by calculating: Average Added Value as a measure of the whole wealth produced; agricultural income as a measure of the farming system profitability; added value per worker or per hour as a measure of labour productivity; added value per hectare as a measure of land productivity, and so on. The agricultural income will be matched and discussed with the needs of the family.

At the farm level, the survey and interviews lead to an understanding of each farming system and a comprehensive identification of the problems and constraints faced by farmers. Following this, the frequency of occurrence of each farmer and farming system category can be calculated.

Agrarian system survey tries to understand how and why rural communities exploit the natural resources of their agro-ecosystems by agricultural practices.

Such a survey should then provide policy, programme and project designers with zones of different agricultural situations and trends, and a clear understanding of the main factors affecting farmers' choices. Taking these different agricultural developments into account, project designers can then propose public interventions adapted to each zone in order to improve the farm environment.

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Agro-Ecosystem Analysis

Agro-ecosystem analysis (AEA) is a methodology for zoning and analysing agricultural systems in order to plan and prioritise research and development activities in the fields of agriculture and natural resource management. It uses a holistic or systems approach to gather bio-physical and socio-economic information and, within the ecosystem, to identify key issues or problems that will be useful for rural development, extension and research programmes.

AEA can be conducted at any level, province, district or zone depending on particular needs. In the Lao PDR the preference is for district or development area levels because these are the key levels for rural development planning. AEA is undertaken by multi-disciplinary teams which bring to the exercise a range of different skills. For example in the exercise carried out by the Lao Swedish Upland Agriculture and Forestry Research Programme (LSUAFRP), the teams included land use planning, farming systems, forestry, socio-economic, and geographic information systems specialists.

The analysis relies heavily on secondary data, both bio-physical and socio-economic information. Examples of bio-physical data are topography, climate, water resources, geology, soils, communications, infrastructure, and land use. Examples of socio-economic data are agriculture systems, agro-forestry systems, ethnicity, markets, poverty status, and opium addiction. Information is gathered during workshops and using Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) tools.

A manual has been prepared to assist field staff with AEA and agro-ecological zoning with a focus on upland areas in northern Laos. It is based on field experience from pilot AEAs conducted by LSUAFRP in 2004 in Phonxay District, Luangprabang Province, and Namor District in Oudomxay Province. Copies are available from the Information Management Division of NAFRI (info@nafri.org.la).

Reasons for conducting AEA

The main reasons for conducting AEA are to:

- Describe upland land-use systems of selected study areas.
- Identify, demarcate and map agro-ecological zones of selected study areas.
- Describe the physical and socio-economic characteristics and conditions of agro-ecological or forestry zones identified.
- Identify agricultural, forestry and socio-economic issues and problems existing in the zones so that they can be addressed by extension or research programmes.
- Provide district authorities with information that can be used to plan development activities to address poverty.
- Strengthen district skills and capacities in agro-ecological zoning and rural development planning.
- Match available agricultural and forestry technology options with identified agricultural sub-systems or recommendation domains.
- Promote co-operation and linkages between research and development.

The purpose of defining agro-ecological zones is to define areas with fairly homogenous biophysical and socio-economic conditions or characteristics. A description and analysis of each zone can then be undertaken. The analysis reveals key agricultural, forestry and socio-economic issues and problems for each zone, for which solutions can be proposed, some through research and others by extension and development.

Options for implementing AEA

AEA may be conducted for agro-ecosystems at different levels, such as province, district, district development area or development zone. The LSUAFRP experience indicates that the district and development area levels are preferable because the analyses are most useful to district planning authorities in setting development and extension priorities within the zones of a district. The analyses at this level also provide useful information on key research issues and problems that can be addressed by farming system researchers working at district, development area or village levels, as explained below and in Table 1.

Agro-ecosystem analysis procedures

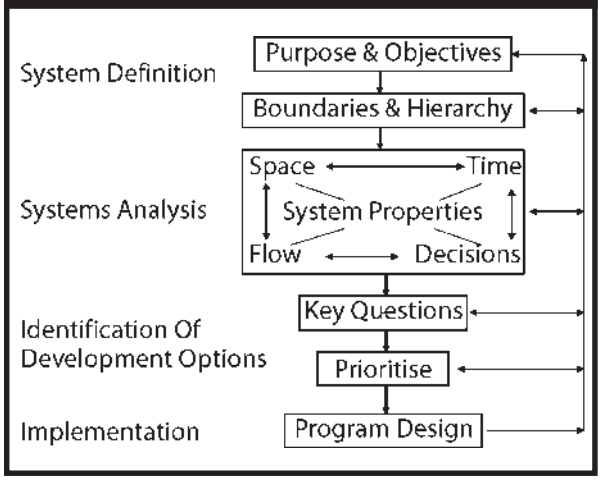
AEA is based on the concepts of systems, hierarchies, agro-ecosystem zones, and the system properties of productivity, stability, sustainability and equitability.

As shown in Figure 1 and Table 1, AEA follows a step-by-step procedure to decide on the purpose of the analysis, to define precisely the system(s) of study, identify its boundaries, its position in the hierarchy of other systems and its major components and their key interactions. As an understanding of the system is developed, a limited number of key issues begin to emerge which are then used to guide later analysis and to plan further follow-up studies in the field. As these issues are clarified and understood, key questions and hypotheses are proposed, elaborated and used to identify research and extension priorities.

Table 1: Brief explanation of AEA procedures

Stage	Description
Systems definition	Agree on the purpose and objectives of the analysis. Precisely define the system(s) to be studied. Clearly identify and delineate the systems boundaries (physic al, social, administrative, etc). Describe its position in the hierarchy of other systems.
System analysis	Identify and describe the major agro-ecological zones (agro-ecosystems) within the system and the important interactions among them. Analyse each zone in regard to: 1. Space: spatial diversity, sub-systems and key relationships 2. Time: long-term (trends) and short-term (cyclical) changes in the system over time. 3. Flow: the movement of materials, money, information, etc. within, into and out of the system. 4. Decisions: the decision-making process and choices/options for key decision makers (farmers, government, projects, etc.) . Identify the key attributes of the system that contribute either positively or negatively to the productivity, stability, equitability and sustainab ility of each agro-ecosystem. Identify the key processes determining the overall performance of each agro-ecosystem.
Identification of development options	As an understanding of the system is developed, a number of key issues, problems and development opportunities begin to emerge. These are further developed and elaborated into hypotheses or key questions for further analysis. System properties analysis is used to identify those attributes of each agro -ecosystem that impact positively and negatively on productivity, stability, equitability and sustainability. The results of this are used to further develop the key questions. The key questions are interfaced with available technologies to identify appropriate solutions or development options for each question.
Research, design and implementation	Proposed development options are assessed using innovation assessment techniques. This provides a rating for each which is then used to set development priorities. High priority development options will include proposals for research, extension and management (district planning) interventions. These are used by the appropriate agency (NAFRI, NAFES or district authority) to develop appropriate implementation plans. Once these activities have been implemented, their results should be re -assessed in the context of AEA and any new lessons used to modify plans.

Figure 1: AEA steps



Agro-ecosystem analysis outputs

The most important and useful outputs that AEA provides are:

- The delineation and description (bio-physical and socio-economic) of distinct agro-ecological zones at the agro-ecosystem level chosen, i.e. District or Development Area.
- An improved, holistic understanding of the major farming and livelihood systems of each zone.
- A prioritised list of important problems and opportunities for each zone.
- A prioritised set of research, extension and development proposals to solve the problems.
- Enhanced interdisciplinary cooperation and improved research and extension linkages.

Agro-ecosystems analysis tools

AEA uses a variety of tools to assist with the analysis of space, time, flow and decision-making. Many are similar to PRA tools and all emphasise simplicity, participation and objectivity.

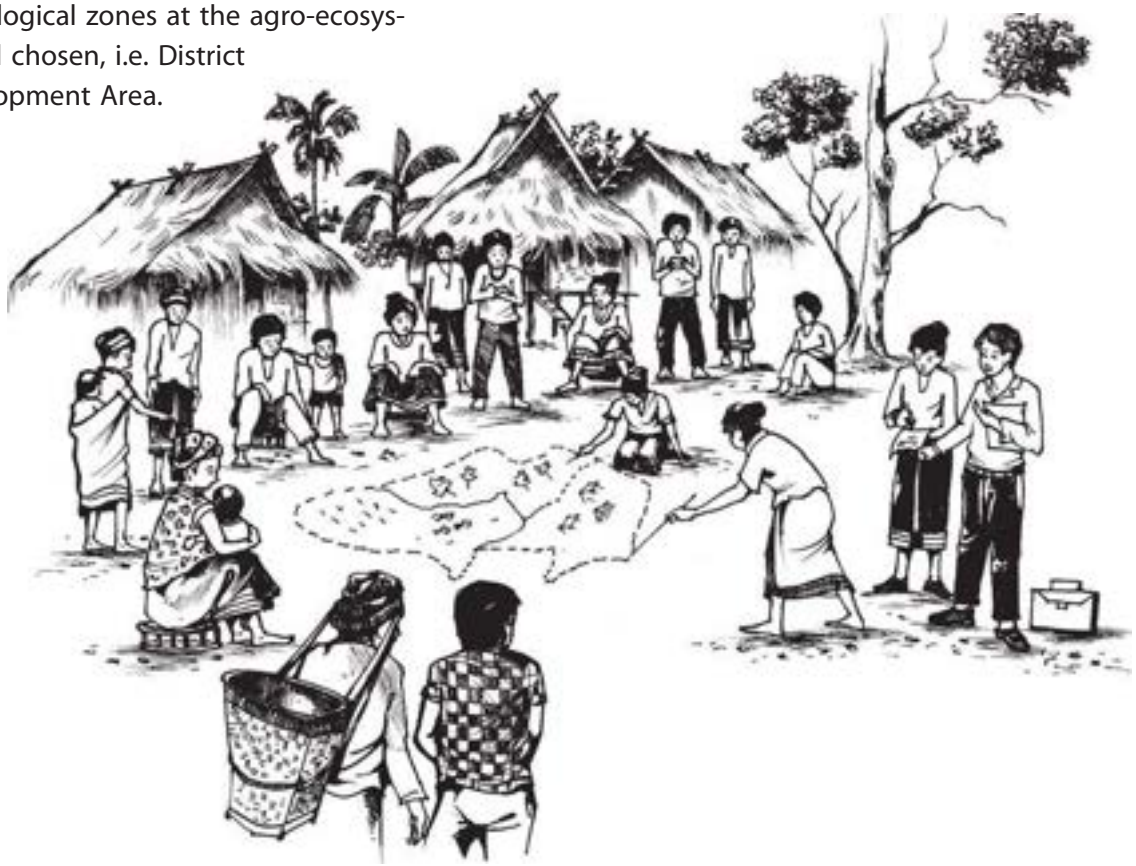


Table 2: Explanation of AEA implementation stages		
Stage	**Main activities**	**Location and duration**
Stage 1: Planning and preparation	• AEA team formation and organisation. • Inform and brief partner institutions (district authorities, development area leaders, research institutions, etc). • Arrange logistics for meeting rooms, materials, supplies, transport, etc. • Prepare spatial data at central level: digital maps on topography, elevation, slope, geology, soils, climate, land use, watersheds, rivers, administration boundaries, village locations, roads, and so on. • Explain secondary data collection needs and request district staff to prepare preliminary numeric data.	Vientiane (NAFRI GIS unit) Intermittently over three weeks by core AEA staff
Stage 2: Staff orientation and agro-ecosystem definition	• Staff orientation on AEA: procedures, methods and expected outputs. • System definition; defining AEA study area and boundaries. • Explanation of agro-ecosystem hierarchies. • Definition of AEA purpose and objectives. • Forming work groups and designating responsibilities for data collection.	District or development area 1-2 days
Stage 3: Secondary data collection and organisation.	• Explanation of secondary data needs (using prepared data list). • Collating initial secondary data including socio-economic and biophysical information for the study area. • Preparation of secondary data spread sheets using Excel program.	District or development area 2-3 days
Stage 4: Agro-ecological zoning	• Explanation of digital maps used in agro-ecological zoning. • Explanation of zoning methods and tools. • Identification of initial boundaries in the agro-ecosystem zones.	District or development area 2-3 days
Stage 5: Preliminary system analysis	• Identify key issues/problems regarding land use and livelihoods for each zone. • Identify important missing information and data for each zone. • Assign responsibilities and prepare for follow-up fieldwork.	District or development area 1 day
Stage 6. Fieldwork in the study area	• Organise sub-group responsibilities for each agro-ecosystem zone. • Prepare tools for field activities: i.e. historical profiles, agro-ecosystem base maps, transects, seasonal calendars, flow diagrams, Venn diagrams etc. • Gather additional data to complete zone descriptions. • Verify and explore key issues with farmers and local stakeholders. • Identify key problems and opportunities with farmers and local stakeholders using problem census meetings.	District or development area 1-2 days
Stage 7. Completion of systems analysis	• Explain tools for describing agro-ecological zones. • Prepare a general description of district agro-ecosystems using a transect table. • Prepare the information on time, flow, space and decision-making for each agro-ecological zone. • Prepare detailed description of each agro-ecological zone. • Present and analyse the information in plenary sessions. • Analyse the system properties for each zone (system properties table). • Key issues and problem formulation and recording. • Key issue and problem solution analysis. • Key issue prioritisation and problem solution ranking (innovation assessment).	District or development area 2-3 days
Stage 8. Reporting and write-up	• Draft report for presentation to key stakeholders. • Presentation of findings to key stakeholders. • Incorporation of feedback from presentation into an AEA report. • Finalise and translate report.	Vientiane 3-4 weeks
Stage 9. Use of the outputs	• District implementation of priority programmes with help from LSUAFRP. • Use of adapted AEA methodology elsewhere in Laos (AEA user manual). • Hold dissemination workshop on AEA methodology for potential users. • Plan replication of AEA methodology for other areas.	District On-going

Major analysis tools

Transect diagrams (space analysis tool):
Transect diagrams are used to describe and compare each agro-ecological zone according to a number of key agro-ecological and socio-economic parameters. Transects help to ensure that all relevant information is collected and clearly organised for each agro-ecological zone; they also assist in the analysis by facilitating comparisons and identifying important relationships among the zones.

Historical profiles (time analysis tool):
Historical profiles or 'timelines' are used to identify key events and analyse changes and trends over the longer term. They review major occurrences over a number of decades and usually rely heavily on local knowledge. Their purpose is twofold: firstly, to try to identify longer-term trends, for example changes in forest cover, trends in rice yields, changes in livelihood systems, etc. Secondly, they are used to assess the robustness of the agro-ecosystem to major perturbations such as flood/drought, pest outbreaks, market-price fluctuations, etc.

Seasonal calendars (time analysis tool):
Seasonal calendars are also used to analyse time related changes for each agro-ecosystem, but over the shorter term (within-year). Climate, cropping patterns, major agricultural operations, labour use, price movements, social activities, etc. are presented by month so that comparisons can be made and key periods identified.

Flow diagrams (flow analysis tool):
Flow diagrams are used to analyse the flow of materials, money, information, labour, etc. both from outside and within the system. Flows occur both up and down the hierarchy, i.e. from village to district to province, and from one agro-ecosystem zone to another, e.g. grazing-cattle migration from zone to zone in different seasons. Various schematic means of representing these flows exist and can be selected according to participants' needs and capacities.

Venn diagrams (decision analysis tool):
Venn diagrams are used to analyse relationships among agro-ecosystem communities, and projects and agencies providing support to them. They are useful in identifying potential development partners or detecting where

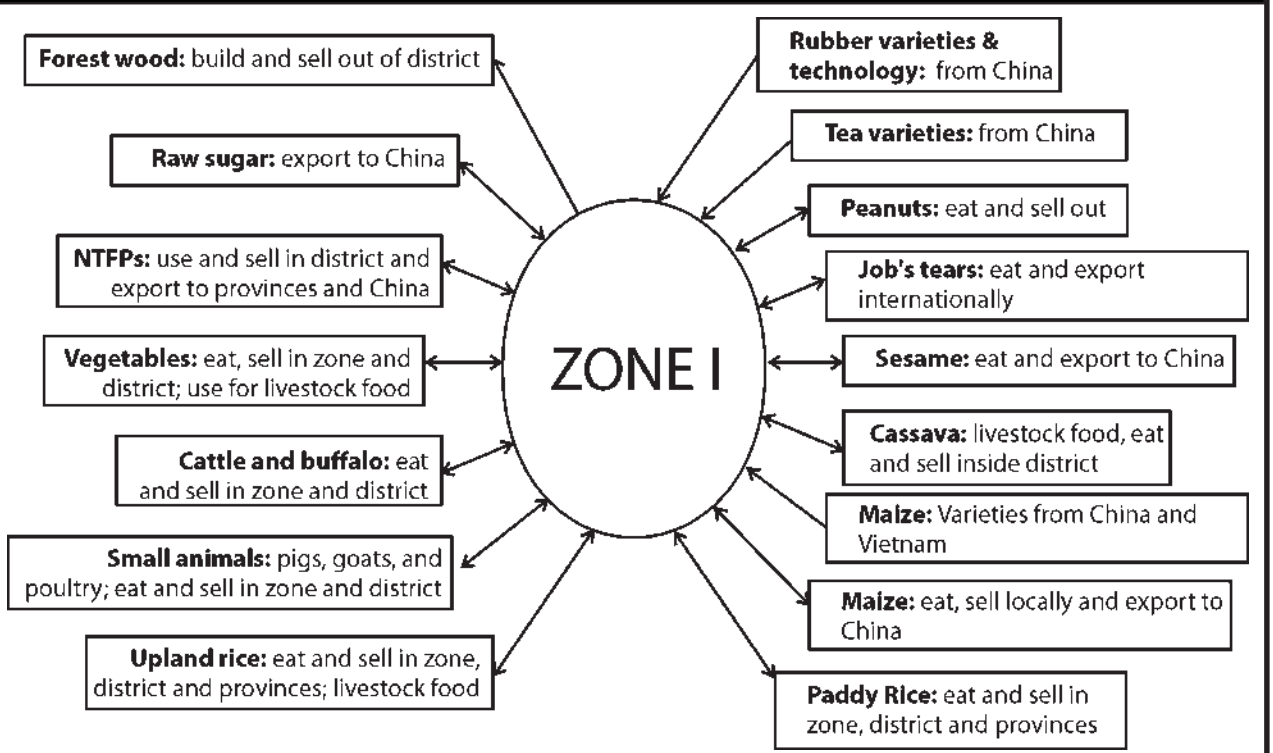
inter-agency cooperation could be improved. In Venn diagrams, overlapping circles represent good cooperation, touching circles represent some cooperation and non-touching circles represent poor or no cooperation.

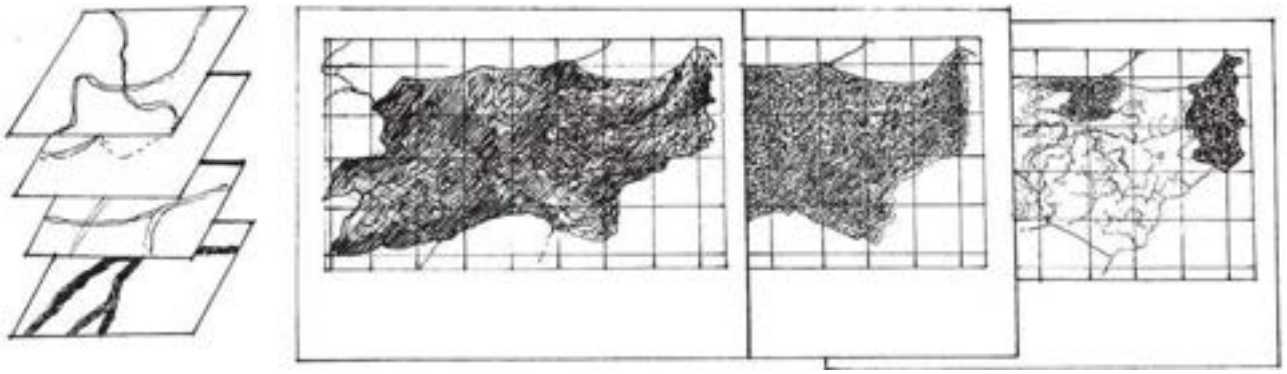
Problem-cause diagrams (decision analysis tool):
Problem-cause diagrams or 'problem-solution trees' are used to analyse the causes of problems, identify the linkages between them, understand the way farmers cope with the problem, and identify appropriate solutions. Problem diagrams begin with a broad statement of the overall problem, which is then broken down into component problems, and eventually the root causes; these are then examined to identify farmer responses to the problem, and finally, alternative solutions are proposed.

System properties tables (system properties analysis tool):
The four system properties of productivity, stability, sustainability and equitability are analysed for each agro-ecological zone using a system properties table. Analysis proceeds by listing those attributes of the agro-ecosystem, which have positive and negative effects on the four system properties, and explaining the way this occurs. This identification of the important elements in each system encourages a more balanced analysis than the traditional focus on productivity would provide.

Pair-wise ranking (prioritisation tool):
Pair-wise ranking provides a means of objectively ranking or prioritising issues, problems and solutions. Objectivity is improved if multidisciplinary groups conduct the ranking, as it then incorporates a variety of different per-

Sample flow analysis: agriculture & forest products - Zone 1- Na Mo

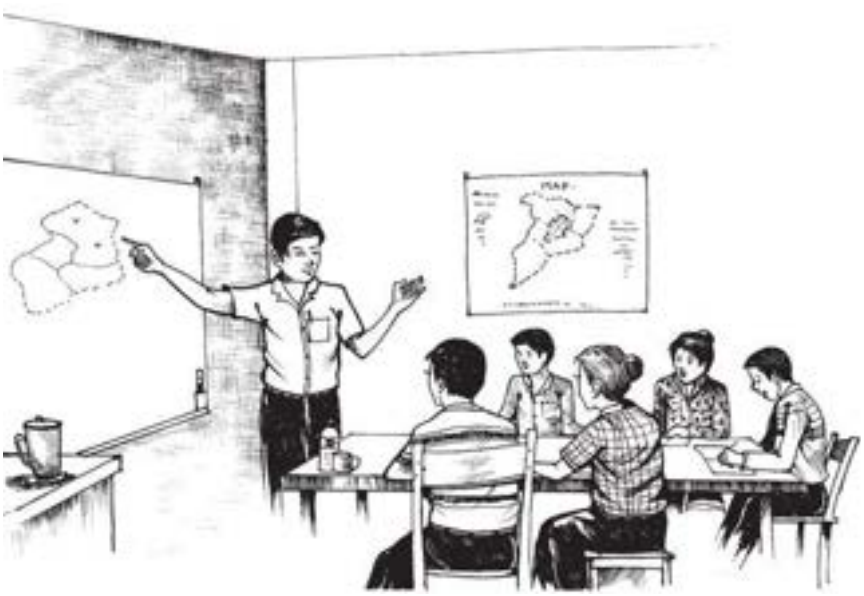




spectives and points of view. Pairwise ranking proceeds by listing the problems to be compared, and then comparing each problem with every other problem, in turn. When all comparisons have been completed, the scores are totalled to provide a ranking of the relative importance of each.

Impact assessments:
Once proposed solutions to the key problems have been generated by AEA, a simple assessment technique can be used to assess the impact of each proposed solution on important cross-cutting issues such as gender, poverty and the environment. These assessments are used to modify each solution in order to enhance positive impacts and reduce potentially negative impacts in regard to these cross-cutting issues.

Innovation assessment or problem solution ranking (prioritisation tool):
When designing development programmes it is necessary to have some means of setting priorities for the set of proposed solutions to key problems generated by AEA. Innovation assessment is used to assist with this by allowing participants to set priorities in a rational and objective manner. Innovation assessment proceeds by scoring each of the proposed programmes according to a sub-set of selected factors. These factors are chosen according to the objectives of the study, but will commonly include the effect of the proposed programme on system productivity, stability, sustainability and equitability; its cost and time taken to implement; its overall feasibility; and its impact on poverty, gender and the environment.



Key issues and proposed solutions

Example issues and problems arising from agro-ecological zoning and system analysis	
KEY QUESTIONS	**PROPOSED SOLUTIONS**
Lower elevation, potentially productive upland agro-ecosystem - Zone 1	
Some people in the zone in Viengthong, Buakkham, Na Ngiou, and Phou Samay villages gather NTFPs and hunt wildlife in the Phou Khoum and Phou Sa areas of the Nam Et-Phou Loei NBCA.	• Conduct LUP-LA in the 3 villagers that utilise the forest and land resources in the NBCA to designate the forest and land areas they have rights to access • Prepare Village Forest and Land Use Agreements for these villagers in consultation with NBCA staff at district and provincial levels • Delineate a buffer zone in the area between the villagers and the NBCA boundary
There is a lack of school teachers and school materials and equipment.	• Secure funds from outside sources, international donors, NGOs, and the private sector to support school construction and equipment and upgrade teacher skills
Villagers lack funds for family production activities.	• Develop village based savings and loan groups to support production inputs (GOL and villagers); low interest rates on inputs to create incentives
Village merging is incomplete in some places, ie. Sop Kuan and Hat Saang, land allocation has not been undertaken.	• Assess the need for village merging before proceeding • Assess the availability of land in proposed village merging locations for proposed new settlers • Delineate village boundaries and land use zones before proceeding with land allocation
There are many disease outbreaks (epidemics).	• Secure funds from outside sources, international donors, NGOs, and the private sector to support health centre construction; District Health Service undertakes training on hygiene, sanitation, and disease prevention
Road access between villages is lacking/inadequate.	• Expand the road network between villages; involve villagers in the road network expansion; also extend electricity to villagers in the future
Villagers still practise a lot of shifting cultivation.	• Training and demonstration of improved conservation farming methods; study tours/exchange visits to outside areas
Many villagers still consume a lot of opium; a total of 149 persons in the zone (138 males and 11 females).	• Conduct education programs on the risks/impacts of opium addiction; conduct detoxification clinics at the district centre
Depletion of stream fish populations.	• Prepare village agreements and management rules to help villagers manage the fish resources

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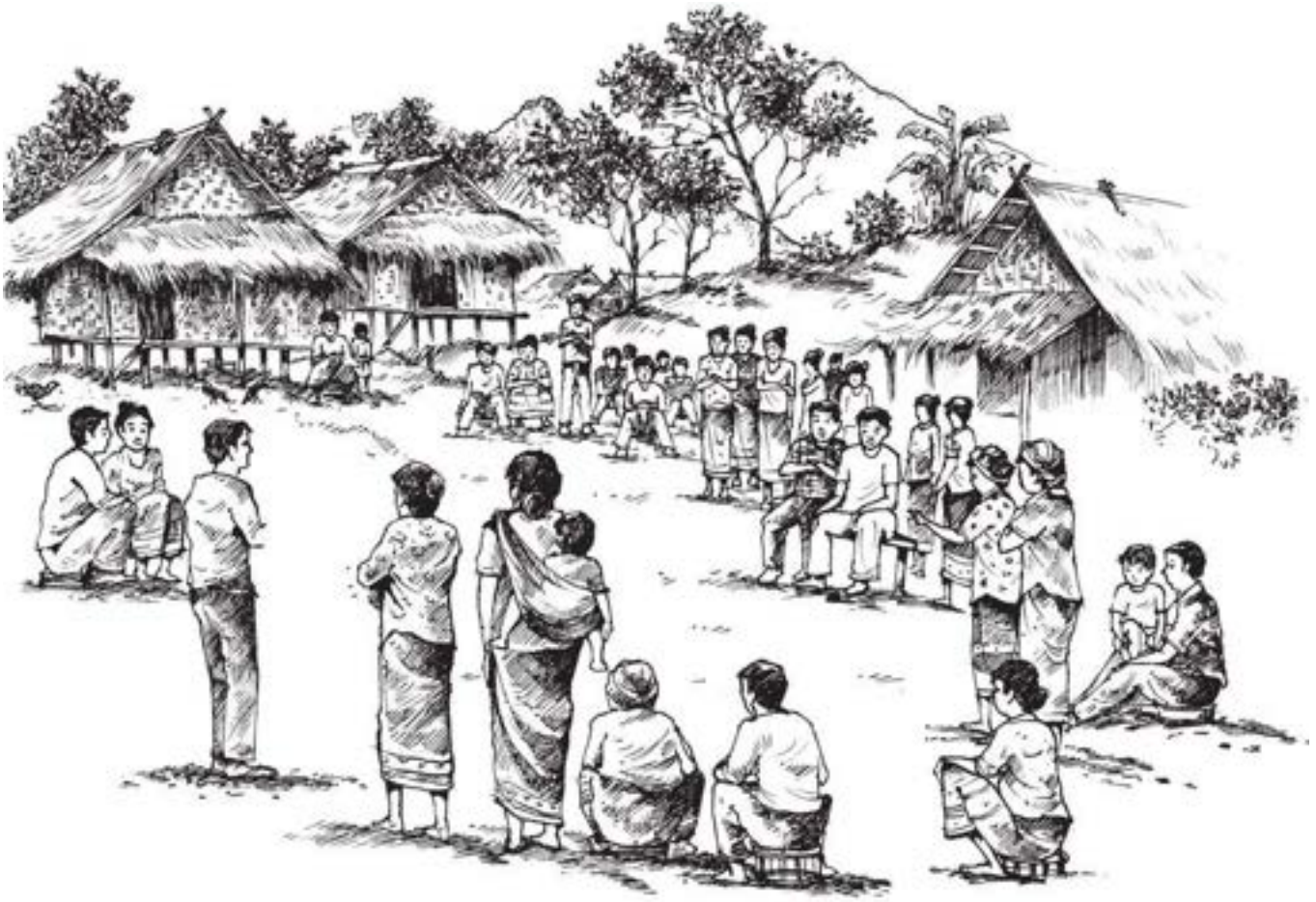
Village Banking in Upland Communities



The role and relevance of village banking

Attempts to increase income are often related to an investment. Labour, money, know-how and other inputs have to first be supplied in order to obtain a return, which is expected to be higher than the value of the invested goods. An initial accumulation of assets is thus a necessary precondition. Increased economic security, too, is obtained by accumulation of assets, which, in times of need, will cover indispensable expenses like food or medical treatment.

Assets can be accumulated either by forgone consumption (saving) or by repayment of borrowed assets (loaning). Poor people tend to focus on buffering their fragile livelihoods by saving or borrowing small amounts. The better-off can afford to make bigger investments, or deposit bigger amounts.

The formal bank system in Laos so far has little outreach into poor rural areas. Where there is no project intervention, villagers depend on relatives and moneylenders for credit. Relatives can lend only limited amounts, while moneylenders are very expensive, at monthly interest rates of 10% or more. For savings, people have to rely on in-kind savings (e.g. jewellery or livestock) and cash stocks kept in the house, which is both unproductive and insecure.

The Lao-German Programme for Integrated Rural Development of Mountain Areas in Northern Laos (RDMA) aims to stabilise and possibly increase household income in target villages by creating opportunities for micro-savings and credit that are accessible at village level. In its search for a financially and organisationally sustainable solution, the Village Bank model has been chosen and adapted to local conditions.

Village Banking is not a remedy for poverty and its various symptoms, but is rather a facility to be used in alliance with other business and infrastructure services. Carefully implemented, it can have a considerable stabilising and increasing effect on the income of both poorer and better-off households.

Village banks: A specific type of micro-finance

A Village Bank is a tiny cooperative bank normally run by the community of a village. Its customers, who are at the same time its members and owners, can deposit money in their savings accounts, or borrow small and medium funds for various purposes. The income obtained through interest on credit is, after deduction of costs, redistributed to savers as a yearly dividend. There is no common fund, only savings privately owned by its member-customers. Thus these banks mobilise internal resources and responsibility and optimise the feeling of ownership.

Because of the low level of development in the target villages selected, the RDMA project offers a grant facility to increase the impact of Village Banks.

Generally, the establishment of a sustainable and socially compatible financial system is the main priority, rather than the stimulation of particular activities (like agricultural production) or the pursuit of particular group interests (such as 'credit to the poorest'). The philosophy is that a well-designed and well-developed system will be able to support the needs of the broadest possible range of people.

The Genesis of a Village Bank

RDMA aims at a minimum of regulating, and a maximum level of self-management and self-determination among its Village Banks. From the very beginning, and with a few exceptions concerning the payment of project grants, decision-making is left to the villagers, and the role of outside support is limited to facilitation, counselling and provision of a project grant. The preparatory process leading to the foundation of a Village Bank needs time – three to seven months - and consists of a partially formalised but highly flexible process. This includes '10 Steps' of continuous village meetings, a study tour to a village with a well-run Village Bank, and finally training in management, organisation and accounting for future committee members.

Just as crucial to success is the careful follow-up of newly-founded Village Banks. Coached by the project team, the community, the committee and the single members learn by doing. All the actors gain experience in their new options and responsibilities, seeing that problems are to be solved before they become big. It takes from six months up to several years, before a Village Bank is mature and does not rely on regular outside support anymore.

Striving for sustainability, RDMA hopes that the Village Banks will become independent from both project and government. The plan is to initiate a Village Bank Association that will be responsible for future servicing of the Village Banks, helping mainly with accounting, supervision, problem solving and lobbying. It is envisioned that this association may grow to be a type of cooperative bank, replacing the VBs themselves.

So far the RDMA has set up 36 village banks in Sing and Nalae Districts, Luangnamtha Province. Table 1 highlights a number of relevant figures.

Key elements of Village Banking

- Village Banks are owned and managed by village members through a members' assembly, which is the highest decision-making body.
- An elected Village Bank Committee conducts day-to-day management.
- Except in emergencies, members pay in or withdraw on monthly service days.
- Initial 'outside' start-up advice and periodic methodological support is required. This responsibility is ultimately to be transferred to an independent Village Bank association.
- Interest earned on credits by the bank must, in the long term, cover all costs including future servicing, remuneration for Village Bank Committee Members (VCMs), and yearly dividends.
- Members agree on a minimum compulsory savings amount, which must be small enough not to exclude the poorest groups. In most instances, this is 2,000-5,000 Kip per month. Besides that, members can save additional, voluntary amounts.
- Villagers agree on criteria and activities suitable for loans.
- Interest on credits must be paid monthly. Delay of payment without notice attracts a penalty - normally double payment next month! Interest rates normally depend on the activity related to the loan, these range from 0.5 to 5% per month. Loans for emergency cases are normally interest-free for a two to three months' period.
- Priority is given to saving withdrawals over new credits (if funds are limiting).
- Provision of credit for long-term and low return investments, e.g. large animal raising and plantations, has to wait until the demand for short-term, high interest rate loans is saturated, and money is no longer scarce
- Credit ceilings are put in place to diminish the risk in case of loan default, and ensure that more members can get loans during the start-up phase. Loans are commonly limited to a duration of five or six months. As the bank's capital grows, ceilings are extended, with additional collateral demanded for bigger loans.
- Credit is protected through various social and economic mechanisms such as social pressure and guarantees given by relatives, as well as physical collateral like livestock and the loan-taker's saving deposit.

Table 1: Village Banks in Luangnamtha (part of RDMA project area) as of April 2005	
Item	**Total**
Number of Village Banks:	16
Percentage of family members to total amount of families (range):	86.2% (69- 100)
Total equity:	187,977,500 Kip
Percentage of internally created capital to total capital:	32% (18 - 59)
Project grant (5 times the amount of money initially saved by each family): up to max. amount per family, paid in two instalments	max. 300.000 Kip
Repayment Rate	100%

Case study: two Village Banks in mountainous areas

The two neighbouring villages of Ban Longmounechomgaeo and Ban Longmounexingxai, both Khamu Youane villages, started out with similar economic situations after resettlement in 1999. Both villages set up Village Banks in 2004. Today however, the way these villages, their village banks and the villagers that support them have developed is markedly different.

Reasons cited for the success of the Village Bank in Ban Longmounechomgaeo are that leadership is strong and many villagers engage in more profitable and diverse activities other than shifting cultivation. Money seems not to be a serious bottleneck, as there are many savers but few loans. A considerable amount

Table 2: Village Banks in Longemounechomgaeo and Longmounexingxai		
Item	**B. Longmounechomgaeo**	**B. Longmounexingxai**
Number of families	78	6974
Number of VB members	78+5 individual memberships	69
Equity (at 25/9-04)	38,700,000 Kip	11,600,000 Kip
Internally created capital	70%	38%
Current number of credits	14	40
Average credit amount	2,360,000 Kip	342,000 Kip

Ban Longemounechomgaeo

Ban Longmounexingxai

has been paid in credit to outsiders. The much poorer Ban Longmounexingxai is described as having weak leadership and villagers continue to rely on traditional slash-and-burn upland rice production. They take many small loans, mostly for emergency cases.

Lessons from the field

Experience to date shows that sustainable financial services are an essential and viable supplement for upland villages in their progression towards a market economy. Villagers can access saved money and take credit as an insuring safety net for emergency situations, and for investments which need an accumulation of initial capital such as agricultural or off-farm activities, or for private investments like weddings and house construction.

Cohesive communities with strong leaders and committed, educated committee members will quickly conceptualise and manage the Village Bank with minimal outside help. Weak village communities with low-skilled and inexperienced committee members need longer term support before being able to work independently. The relative success of banks is directly related to the type and character of leadership involved.

Poor people save small amounts and take small loans, which they mainly use in emergencies such as during periods of sickness or rice insufficiency, or for income-generating activities like small animal raising. Better-off people deposit bigger amounts and take bigger loans, which may be used for large animal raising, trade or for private purposes. Poor people are

often more reluctant to borrow money for production purposes, as it increases risk.

Scope and conditions for village banking differ from village to village. Poor villages and villages with poor market access will deal with smaller amounts of money than better-off villages close to a major market. At the same time, this fact makes them relatively more expensive to service.

In some village banks there is a cash surplus. In others, immediate demand for credit exceeds the available funds. As long as money is scarce, and there is a continuously unsaturated demand for short-term, high-turnover loans (emergency, trade, small-animal raising), bank capital is too little and the interest rate normally too high to serve bigger, long-term loans e.g. for large animal raising or perennial crops.

The majority of farmers will not use loans to invest in 'new' alternative productions, because credit increases risk and hence vulnerability. They prefer to stick to their indigenous investment practices: new technologies are tested at a micro-scale and with minimal financial investment, and are gradually adapted to the conditions. If successful, the profit is re-invested, and thus production increases slowly.

Micro-finance is about attitudes and social skills as well as economic issues. A successful Village Bank will strengthen the whole community and its members in their capacity to find local solutions to a range of problems. The investment attitude of villagers towards concepts such as loans, savings, risk assessment and re-investment, is stimulated. Thus, skills development occurs alongside savings, and credit increases.

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Entrusting Animals: A Revolving Livestock Fund Concept from Phongsaly

Livestock plays an important livelihood role for many upland rural people. While Phongsaly is one off the poorest regions of Lao PDR, the abundance of potential grazing areas in Phongsaly is a comparative advantage: elsewhere in the region, demographic pressure is limiting the areas available for forages. However, since most of the available grazing areas in Phongsaly correspond to fallow re-growth after upland rice, this advantage could become uncertain in the future as shifting cultivation areas are reduced.

Promising markets are developing, for example in Thailand. Livestock are easy to move, and can be traded without major logistical difficulty even from a famously

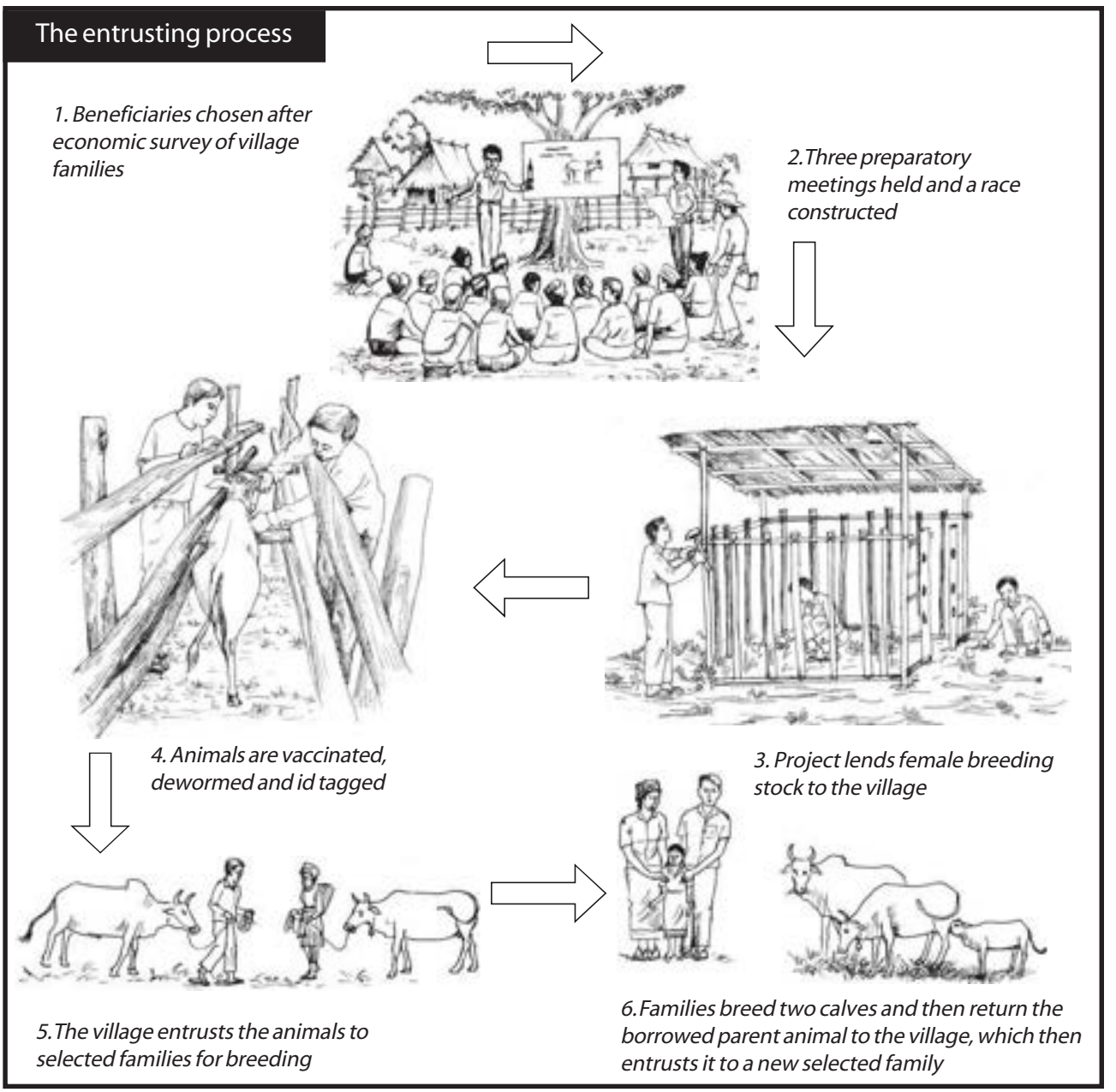
The Project for Rural Development in Phongsaly District, or PDDP, is co-financed by the Lao Government and the French Development Agency (AFD). The project's objectives are the harmonious economic development of the target area, the improvement of farmers' living conditions and incomes, and the stabilisation of shifting cultivation. Interventions are designed to develop commercial exchanges: secure access to rice and increase trade.

remote area such as Phongsaly. Presently, no official export is authorised from Phongsaly district, but the developing markets undeniably form potential outlets for cattle and buffalo trade.

Besides securing livestock through health improvement, the project is also accelerating development of herds by introducing breeders through a credit system. The system is called 'entrusting' as the project entrusts a family with a cow or buffalo that is raised for a few years before being given back. The recipient farmers keep the products of this animal husbandry - the calves born during the trust period.

The advantages of the system are:

(i) A lower risk of fraud compared to conventional systems, where farmers pay back interest.



(ii) A relatively short lending period at the livestock family scale, as there is no sharing of what is produced from entrusting.
(iii) A greater number of beneficiaries since one animal can be entrusted to several families.

Entrusting is organised on a contract basis, first between the project and the village and then between the village and recipient families. The project first lends the female breeders to the village, which becomes the owner after a probation period. The village then entrusts the animals to the beneficiary families, chosen after an economic survey of all families of the village. Preference is given to families who do not already own large livestock and each family can choose between cattle or buffalo.

Three preparatory meetings and the construction of a pen, also known as a 'race' or 'crush' precede the delivery of animals. The animals are female at reproduction age and are in good health. When they are delivered they are herded into the race so they can be vaccinated, dewormed and fitted with ear tags (rings) for identification.

As part of follow-up, project technicians undertake regular monitoring while a Village Veterinary Worker records information on each animal and ensures that it is well looked after by the villagers. The entrusted family must ask for preventative treatment every six months at their own expense: vaccination against Haemorrhagic Septicaemia and deworming. The family returns the animal to the village after the birth of two live calves, and thus have the opportunity to start their own herd.

A safeguard system based on rationing and social pressure minimises the risk of fraud. The project initially allocates animals to only half the chosen families, while the other beneficiaries must wait. This second group will monitor the first group's use of the livestock and apply social pressure to suppress any possibility of fraud.

Conclusions

Entrusting animals to farmers has been designed to stimulate the development of large livestock in Phongsaly district. The performance so far is satisfying when compared with other breeding projects in similar areas. Among the villages using the entrusting scheme for at least one year, 61% of families who obtained at least one calf are starting to raise large livestock. Some families have sold the products (26% of families) of the scheme (i) to buy food, (ii) to buy poultry and pigs, and (iii) to cover debts or treat sick family members.

Beneficiary families were selected on the single criterion of non-possession of large ruminants. According to present results, questions can be asked about the adaptation of families with high level of food insecurity and families who have not yet reached the stage of capital accumulation in the form of poultry or pigs. Families who did not already possess chickens or pigs tend to sell much more of the products obtained from entrusting. Despite these limitations, the livestock entrusting scheme is well on course to reach its objective of enabling poor families to start raising livestock.

By the end of August 2004, 634 animals had been entrusted to 1,268 families from 64 villages. 834 families (80% of those participating) are raising or have raised an entrusting female breeder. These husbandry results are considered good for Phongsaly, where animals are left to graze freely with very little supervision, and are partly due to the animal husbandry practices promoted by the project (preventative treatment, assisting during delivery of calves etc).

Husbandry performances

Female breeders: 634
Births: 974

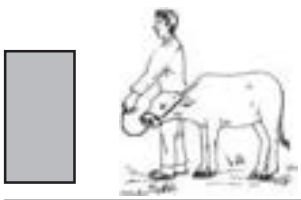
	Fertility rates	Mortality rates before weaning
Cattle	74%	24%
Buffalo	50%	21%

Family results

(Families which are raising or have raised an entrusting female breeder)

325 families (39%) have bred one live calf

281 families (34%) have already bred two live calves



371 families (44%) presently own at least one calf

Some calves die, while around 31% of surviving calves are sold.

Note: *This system of entrusting was conceived for the local and specific conditions in Phongsaly. Livestock credit requires significant financial investment, and before each undertaking, methods must be chosen and adapted to ensure maximum benefits for the people in each particular location.*

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Improving Livelihoods in the Uplands of the Lao PDR was produced in 2005 by NAFRI, NAFES and NUOL.

Quick Surveys: A Form for Village Profiles

Forms are often needed as tools for quick village surveys when formulating rural development projects. Different formats can be prepared according to the specific needs of each exercise, but here is an example of a two-page form that was field-tested and used in 30 villages of Savannakhet province during the formulation of the Lao-Belgian Village Development Programme in 2001. This form should not be considered as a blueprint but may serve as a source of inspiration for those who need to plan a quick village survey for multi-sectoral development.

GENERAL

Date of visit: _____

Village name: _____ Ethnic/sub-ethnic group: _____

District: _____ Sub-district: _____

Altitude & location: _____

Year of establishment & brief history: _____

_____

_____

Number of Households: _____ Number of people (total & women): _____

_____

Economic category (rich or poor?): _____

Number of months with rice shortage: _____

Main farming system (lowland, upland or mixed lowland/upland): _____

Village committee composition: _____

_____

_____

HEALTH

Major health problems: _____

Water boiling (proportion of families): _____

Birth spacing (proportion of families): _____

Mosquito nets (proportion of families): _____

Mothers who died giving birth during last 4 years (number): _____

Children under 12 months who died during last 4 years (number): _____

WATER

Water supply type (well/bore hole/spring/gravity/stream/river/rain water): _____
_____ Distance to water source: _____
_____

Sufficient water supply all year round? _____
Type(s) of containers used for carrying water? _____
Who carries the water in the family? (+ daily amount of water used): _____
How often do villagers take a bath (per day, per week)? : _____
Number of latrines (wet or dry, donors): _____

EDUCATION

School in this village or neighbouring village? (yes/no, type, where?): _____

What grades? _____
Number of students from this village (total, male/female): _____

Number of teachers (total, male/female): _____
Total number of school age children in village? (between 6 and 14): _____
Non-Formal Education activities (number of pupils/volunteer teachers/when is literacy class held/how long have they been doing it/ number of graduates/learning materials/incentives for teachers): _____
_____
_____

OTHERS

Access to main road: _____ Access to market: _____
Access to credit: _____
Access to district extension services: _____
Access to electricity: _____ Number of rice mills: _____
Number of TVs: _____ Number of bicycles: _____
Number of motorbikes: _____
Number of families weaving (cotton/silk, use?): _____
Hiring out labour (proportion of families/Where/For what?): _____

CROPS

Wet season lowland rice (total area *Na Pi*/average yield): _____
Upland rice (total area *hai*/fallow period): _____
Irrigation scheme (yes/no, size, WS/DS?): _____
Other important crops: _____

Use of agricultural inputs? (yes/no, fertilisers/insecticides?): _____
Number of handtractors: _____
Main problems and potential in crop production: _____

_____

LIVESTOCK

Cattle (Number, use): _____
Buffaloes (Number, use): _____
Pigs (Number, use): _____
Goats (Number, use): _____
Chickens (Number, use): _____
Using vaccines: _____ ; Feeding some animals? _____
Main animal diseases and problems: _____

_____

FISHERIES/AQUACULTURE

Fishing from river (how much?): _____
Fishponds (number/main fish species): _____
Problems and potential for more fishponds: _____

_____

FORESTRY, AGROFORESTRY & NTFPS

Main timber & bamboo species exploited by villagers: _____

_____

Main NTFPs collected by villagers (names, quantity, uses): _____

_____

Land allocation (completed or not?): _____
Wildlife (how much? main species?): _____

_____

MAIN REPORTED PROBLEMS & PRIORITIES FOR DEVELOPMENT:

_____

_____

ADDITIONAL USEFUL INFORMATION, REMARKS & COMMENTS:

_____

_____

Compiled by: Dirk Van Gansberghe, dirkvangansberghe@yahoo.com

Improving Livelihoods in the Uplands of the Lao PDR: A Sourcebook

Volume 1: Initiatives and Approaches

Click here for Volume 1

Chapter 1: Annual and Perrennial Cropping Systems

top

Chapter 2: Livestock and Fisheries

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Chapter 3: Forests and Natural Resource Management

top

Opportunities for Intensifying Rice-Based Upland Systems

This research is being carried out by NAFREC/NAFRI through the Integrated Upland Agriculture Research Project (IUARP).

Increasing population pressure is reducing fallow periods in the traditional slash-and-burn rice-based upland systems of the Lao PDR. Short fallow periods have rendered these systems unsustainable as soil erosion, weed pressure and labour inputs have increased; and soil fertility and yields declined. The end result is lower returns on productivity and increased poverty. This situation has created a demand from both farmers and government agencies for sustainable agricultural technologies to improve upland farmer livelihoods.

Although over the years considerable research effort has been devoted to the development of sustainable upland technologies, adoption by farmers has been limited. One reason for slow adoption is the high diversity encountered in the uplands:

- Biophysical diversity (as seen in differences in climate and soils).
- Socio-economic diversity (such as ethnic and cultural diversity and large differences in opportunities and constraints between individual households).
- Market diversity (particularly market opportunities and market access).

With such diversity, technology recommendations will necessarily be site specific. This diversity also requires participatory and adaptive research approaches, through which researchers and farmers can develop technologies suited to local conditions.

Lao upland rice systems - in peril

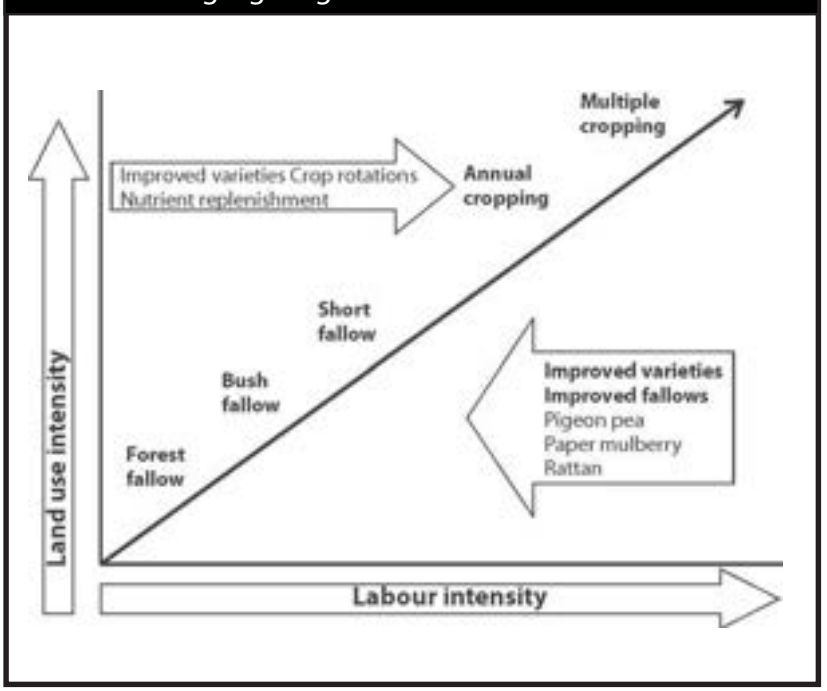
Rice is the most important crop in the Lao PDR and accounts for about 70% of total calorie intake across the nation (Maclean et al. 2002). Although at the national level Laos is sufficient in rice, northern Laos suffers a rice deficit, a situation that has either not improved since 1975 or is getting worse (ADB 2001). This deficit is linked with increasing population pressure, putting stress on the fragile slash-and-burn systems in much of northern Laos and resulting in declining upland rice yields and increasing poverty.

Experience from other Asian countries suggests that farmers are much more likely to diversify into other crops once they have achieved self-sufficiency in rice. Thus rice sufficiency is a platform for diversification.

Intensification of rice-based systems

In general, land use and labour intensify as systems move from traditional slash-and-burn systems with forest fallows to annual cropping systems. In Laos however, despite shortening fallows, traditional upland rice production practices have not changed. This has led to declining productivity.

Pathways for the intensification of shifting cultivation - highlighting some of the research areas



In order to address these issues of declining productivity there are a number of alternatives for short fallow systems.

Varieties

Traditional upland rice varieties are grown extensively in the uplands of Laos. In fact, no known improved upland varieties are being grown. Diversity is high, with most villages growing ten to twenty different varieties and single farmers growing two or three varieties on average (Appa et al. 2002).

Where villages have undergone land allocation, farmers typically have three plots of land; therefore the maximum fallow is two years. In alignment with this policy, research has focused on developing alternative upland rice-based systems for zero (annual cropping) to two-year fallows. A multifaceted research approach is used that combines the development of suitable varieties with alternative rice-based cropping systems.

These varieties have been selected for long fallow conditions and are generally not suited to the short fallows that many farmers are currently experiencing.

Since 1991, the Lao-IRRI project has been collecting and preserving traditional Lao rice varieties. There are currently over 13,000 accessions in the Lao gene bank, with about half of these being upland rice varieties. The variety improvement programme is screening these varieties to identify early and medium duration varieties that are suited to short fallows. Final testing and evaluation of varieties is done through Participatory Variety Selection trials under farmer management, conducted in all the northern provinces. This programme has identified two upland rice varieties (*Nok* and *Makhinsoung*) which yield 0.3 - 0.5t/ha more than local varieties (an 18-27% increase in yield).

While much of the research has focused on glutinous rice varieties, the programme has started evaluating non-glutinous rice varieties that may be more preferable to certain ethnic groups. On-farm testing of these varieties, which come from Laos and other countries, began in 2003.

Opportunities for short-fallow systems

For systems with only two or three-year fallows to be sustainable, some form of fallow enrichment is required. Shrubby legumes are often suggested as possibilities as they add nitrogen to the system by nitrogen fixation and other nutrients due to deep rooting depths. Farmer participatory research began in 2001 by testing a number of promising fallow species:

- Leucaena *(Leucaena leucocephala).*
- Pigeon pea *(Cajanus cajan).*
- Crotalaria *(Crotalaria anagyroides).*
- Paper mulberry *(Brousonnetia papyrifera).*

All are legumes except paper mulberry, which was included since it is an indigenous fallow in northern Laos. Crotalaria and pigeon pea performed the best in the first year (data only available for fallow species establishment) but farmers prefer paper mulberry and pigeon pea because of the potential economic benefits, especially for paper mulberry.

Promising Upland Varieties

Nok is an early duration variety that has good yields and receives high farmer preference ratings due to its large seed and panicle, ability to perform in poor soils and high quality (aroma and softness).

Makhinsoung is a medium duration variety that also receives high farmer preference ratings although the grain quality is lower than Nok.

A role for shrubby legumes

The challenge for research is to not only identify species that suit these criteria but ones that also address the long term challenge of sustainability so that yields are maintained, soil fertility is replenished, weeds remain under control and soil erosion is reduced.

Leucaena

Pigeon pea

Paper mulberry

Crotalaria

Based on these results, the requirements of a good fallow or rotational species are that it:

- Provides some economic benefit.
- Is easy to grow and maintain.
- Requires minimum labour.
- Maintains or improves rice yields (through nutrient replenishment and reducing nematode pressure).

Rice - pigeon pea

Pigeon pea has been evaluated as a potential rotational crop with rice since 1991. It has shown good promise in terms of its ability to suppress weeds, reduce nematodes (Roder et al. 1998) and maintain rice yields. It also has economic potential, although this has so far been limited by the market. Where there is market potential farmers have shown strong interest.

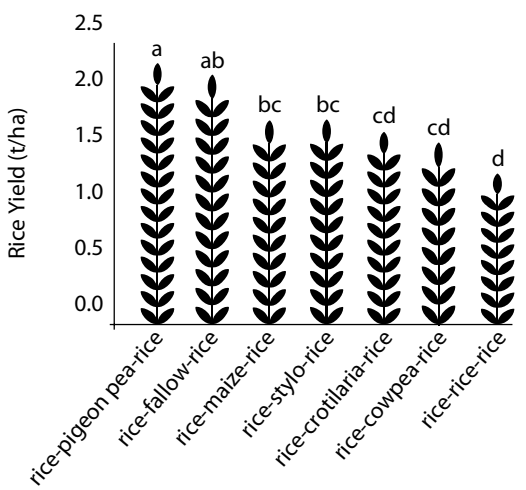
Pigeon pea is usually planted three to four weeks after rice at a spacing of 1.25m x 1.25m. The late planting and wide spacing reduces competition with rice. The pigeon pea grows along with the rice and continues to grow after the rice has been harvested. Pigeon pea is a perennial and pods can be harvested once a year - usually in March and April. Grain yields range from 0.3 to 1.0 t/ha. The pigeon pea remains in the field (it can survive for two to three years) until the field is ready to be prepared for the next rice crop, when it is then cut. While in the field, pigeon pea can be used to raise stick-lac. When planting the next rice crop, pigeon pea will need to be planted again.

The rice - pigeon pea system is being evaluated for different length fallows. In two separate three-year studies involving one-year fallow systems (one year between rice crops) rice yields after pigeon pea were highest compared to all the other treatments, including natural and enriched fallows.

Pigeon pea

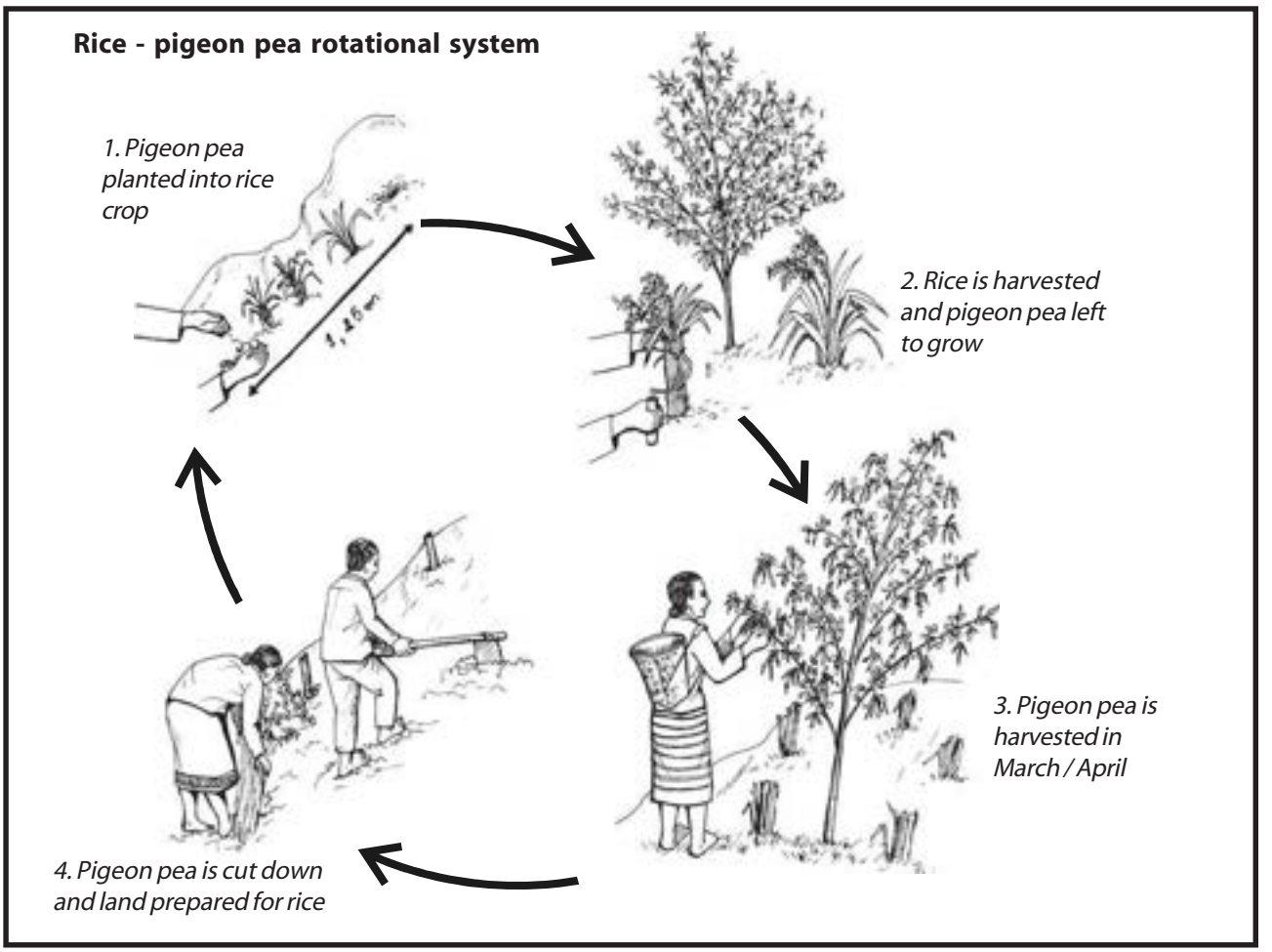
Evaluation of potential fallow species to be grown with rice*					
	Leucaena	Pigeon pea	Crotalaria	Paper mulberry	Natural Fallow
Survival 1 month after planting	73%	88%	82%	35%	
Rotational height Species (cm)	38 cm	171 cm	165 cm	81 cm	
Rice yields (t/ha)	1.61	1.76	1.56	1.83	1.60
What farmers said they liked ✓	Eat leaves and pods Impove soil Fire wood Timber for the hut	Improve soil (dark colour and wet) Eat grain Fire wood Animals do not like to eat Can raise stick-lack A lot of leaf and good cover	Improve soil Suppress weeds Fire wood Fast growth A lot of seed	Sell bark Use leaves as feed for pigs, buffalo Does not shade the rice Improve soil Conserves soil moisture for rice	
What farmers said they did not like ✗	Slow growth Damaged by insects Rats like to eat	Shades the rice	Cannot eat Lodging	Cannot grow well in some soil Slow growth if not planed on time Animals like it too much	

This evaluation was conducted during the first year when the fallow species were established with rice.



Rice grain yields in the third year of continuous cropping
In each case there was a different crop/fallow in the 2nd year. In the rice-stylo-rice system, rice and stylo were grown together in the first and third year and stylo only in the second year.

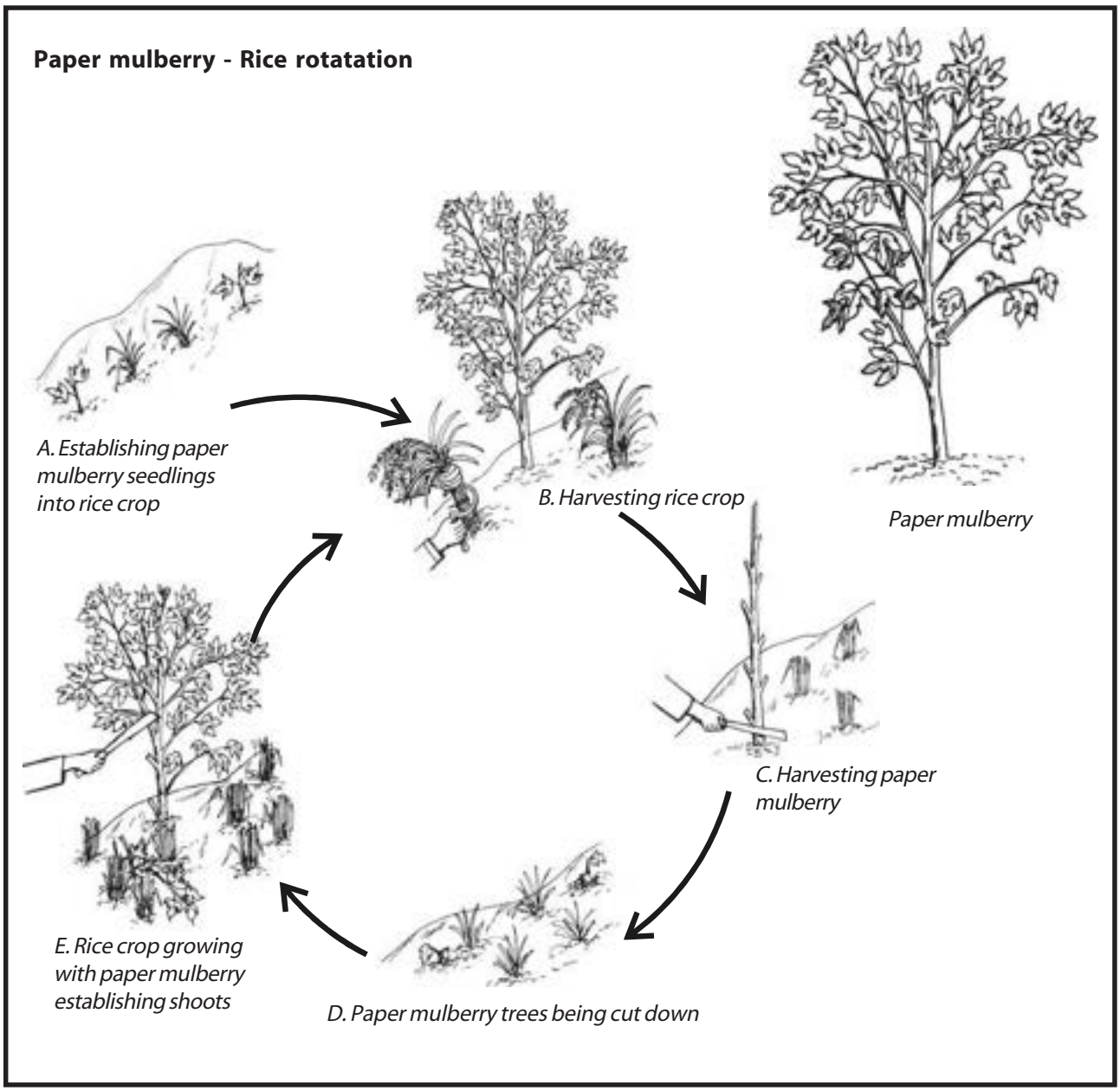
Key: columns that have values with the same letter (a, ab, bc, cd, d) are not significantly different (P<0.05)



Rice - paper mulberry rotations

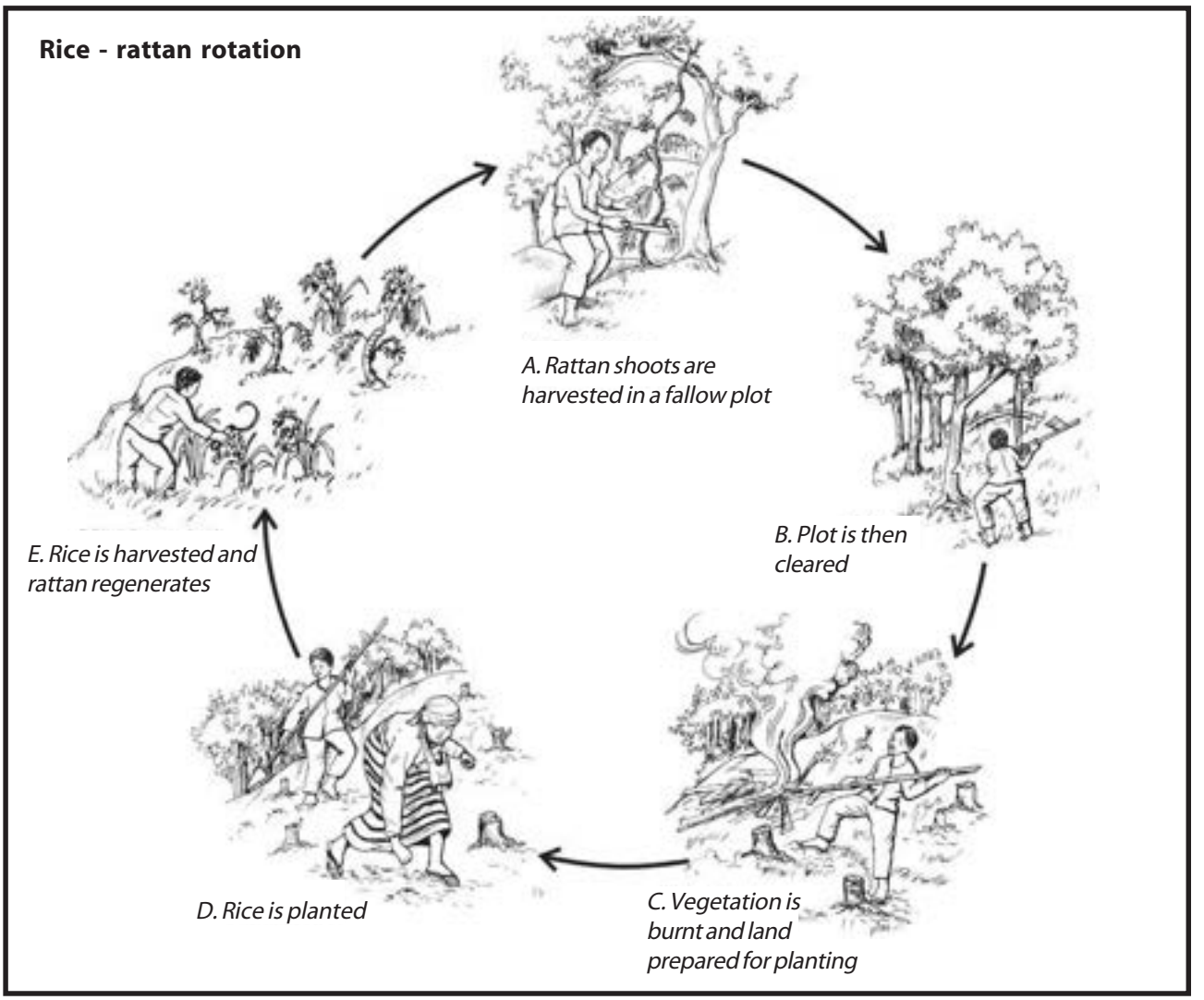
Paper mulberry, an indigenous fallow species, has become an important cash crop in northern Laos. Its inner bark is harvested and used for paper production. Research has focused on the feasibility of intensifying paper mulberry as a rotational crop between rice crops. After being established in upland rice, paper mulberry will continue to grow after the rice has been harvested. The paper mulberry is harvested one and a half to two years after establishment, and harvesting can continue until the next rice crop, at which time all the paper mulberry is harvested and the trees cut down in order to prepare the field for rice. The paper mulberry will regenerate from roots, stems and seeds during the next rice growing season to continue the cycle.

While the rice - paper mulberry system is indigenous to Laos, not many farmers have attempted to intensify the system by planting and closely managing the paper mulberry. Instead they let a few trees come up and then harvest those. As long as the market remains good for paper mulberry this system has potential. It is also attractive in that most of the labour requirements for paper mulberry are during periods when labour demand for rice production is low. The main limitation to this system is livestock control. Cows and buffalo graze on paper mulberry leaves and prevent good establishment unless the area is protected.



Rattan

An upland rice-rattan system was observed in Luangnamtha, where rattan is an indigenous fallow crop between rice crops. In this system, rattan is harvested just before slashing the fallow vegetation in preparation for burning and land preparation. The rattan survives the cutting and burning and farmers allow it to regenerate during the upland rice cropping period. After the rice is harvested, the field returns to its natural fallow vegetation, with rattan remaining as one of the species. Due to the short fallows the rattan is harvested for edible shoots (as opposed to furniture material). Only certain species of rattan (possibly *Daemonorops jenkinsiana*) can survive both cutting and burning and this deserves more research.



Opportunities for intensifying annual systems

Development of improved annual upland rice-based systems presents a unique challenge compared to other cereal crops grown in similar environments. For reasons that are not well understood, rice yields decline rapidly when continuously cropped. In a five-year experiment conducted in Luangprabang, upland rice yields declined from over 3t/ha to 0.5t/ha when rice was grown every year. Such results are seen elsewhere in Laos. Current research is focusing both on understanding the cause as well as developing sustainable upland rice-based systems.

Varieties that perform well under short fallows (*Nok* and *Makhinsoung*) do not necessarily do well when continuously cropped. One variety (*Chao mat*), however, does seem to do well in continuously cropped systems, yielding 2.0 t/ha even in fields where rice had been grown every year for seven years. This compared to yields of only 0.5 t/ha for the local varieties.

Ongoing research is screening Lao varieties based on their local names. Names like 'garden rice' and 'win over weeds' may suggest an ability to do well under continuous cropping. However, although choice of variety is important, these varieties will still need to be integrated into appropriate farming systems.

Nutrient limitations

Research has shown that lack of nitrogen is the most limiting nutrient deficiency to rice growth in the uplands. In some cases, lack of phosphorus is also a problem. Rice yields increase when these chemicals are applied. While applying fertilisers to upland rice is not recommended at this stage, sustainable intensification of upland systems will require the addition of these nutrients to the system. This can be achieved through improved fallows and crop rotations.

Crop rotation

Pigeon pea has shown promise for rotational cropping with rice. It is not a host for nematodes and, if planted properly, can limit the growth of other weeds that may be alternative hosts for nematodes. Other crops such as stylo and rice bean are also being examined as potential crops to rotate with upland rice.

Nutrient replenishment from companion plants

Growing rice continuously in hedgerow systems is not a sustainable option because rice yields decline when grown between leucaena, crotalaria or gliricidia hedgerows. However, if alternative crop rotations are used between them, the hedgerows may provide a valuable source of plant nutrients. Cover crops also have potential for upland rice. Although little research has been undertaken on the topic, several factors must be taken into consideration. The cover crop:

- Should not compete with the rice for water, light and nutrients. Crops that can be established into rice late in the growing season, and then become a dry season fallow crop may be the most successful.
- Needs to provide some form of economic benefit to the farmer.
- Should not require a lot of labour to establish, manage and harvest.

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This paper is adapted from: "Improving Rice-Based Upland Cropping Systems for the Lao PDR" in *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland livelihoods*. NAFRI 2005.

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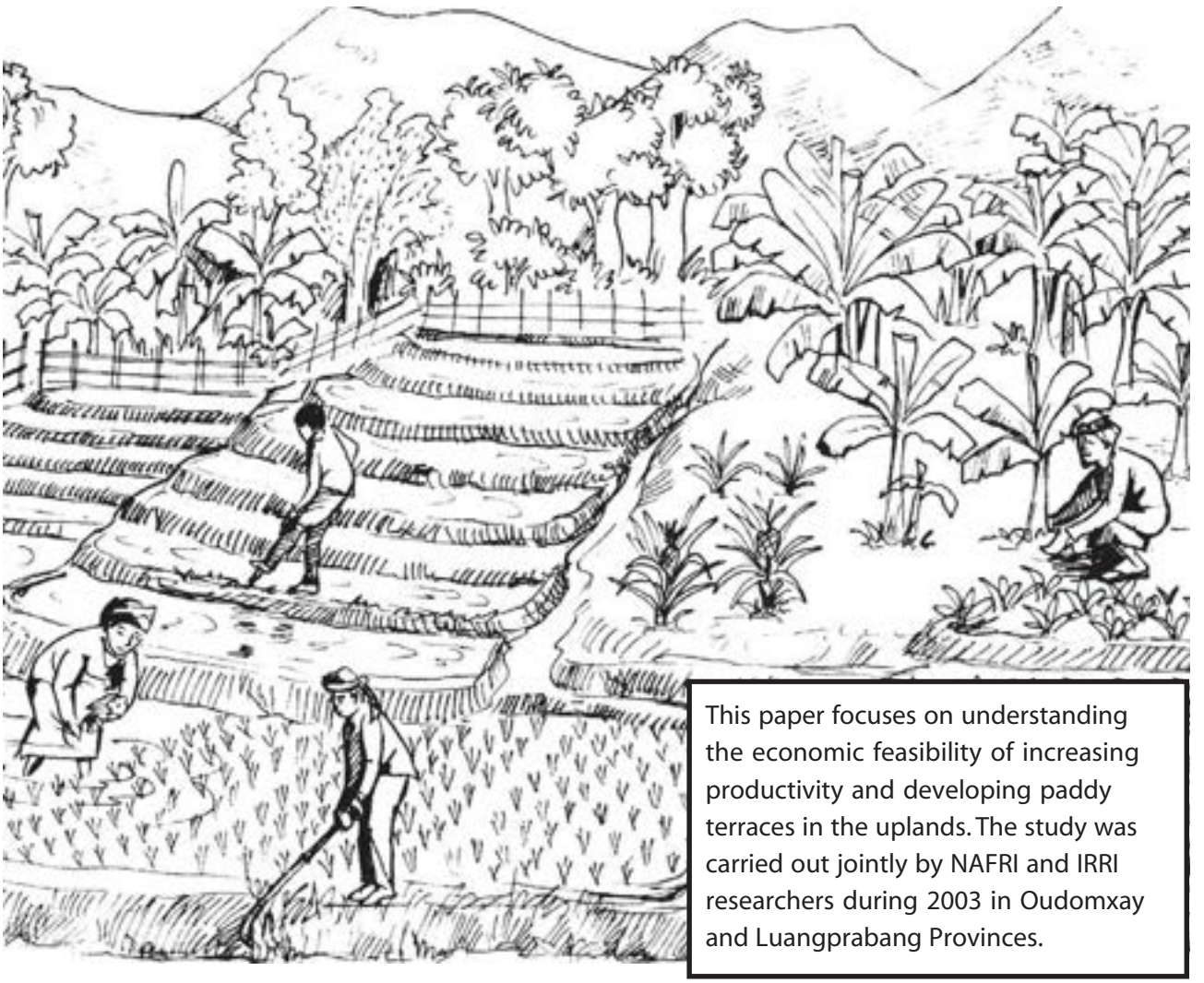
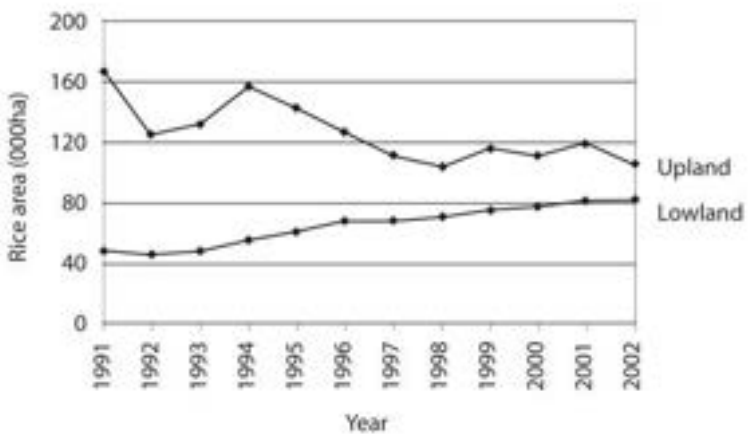
The Role of Highland Paddy Rice



This paper focuses on understanding the economic feasibility of increasing productivity and developing paddy terraces in the uplands. The study was carried out jointly by NAFRI and IRRI researchers during 2003 in Oudomxay and Luangprabang Provinces.

Intensification of land use in the Lao uplands is reinforcing a vicious cycle of low productivity, environmental degradation and poverty. One potential strategy for breaking out of this cycle is to improve the productivity of highland rice paddies or develop such paddies where conditions are suitable. Highland paddy yields have been found to be almost double those of upland rice, and the cost of converting sloping lands into rice terraces can be recouped in a few years. With paddy fields helping to satisfy basic food needs, farmers can use sloping lands to diversify production and generate income, so reducing the area under shifting cultivation.

Area of lowland and upland rice in northen Laos



Highland paddies provide a more favourable environment for rice production than swidden fields. In a survey conducted in 2003 in nine villages in Luangprabang and Oudomxay, farmers indicated that, compared with upland rice grown under shifting cultivation, paddies give higher yield, reduce labour requirement and production instability, and permit farmers to grow rice every year on the same piece of land (Troesch 2003). According to Roder (2001), lowland paddies require 122 person-days/ha compared to 294 person-days/ha for upland rice.

In the villages studied, the level of household food self-sufficiency was found to be directly correlated with size of paddy land endowment. Households with a larger endowment of paddy land were found to have fewer food shortages than those with smaller endowments of paddy. Almost a quarter of the farmers surveyed indicated that they were able to grow more cash crops as a result of expanded paddy. Obviously, for farmers with more paddy land, the importance of upland rice in satisfying domestic consumption requirement was less than for farmers with limited or no paddy land. Interestingly, even those farmers who have more paddy land considered the production of upland rice important. This may be due to the inadequate production of rice in the paddy fields and/or due to higher price and better quality of upland rice.

According to the farmers surveyed, the two major constraints to expanding paddy area are the lack of suitable land and the lack of water for irrigation. The high labour and cash

Effects of a shift from upland rice to lowland rice cultivation on livelihood activities

Effects	Percentage of respondents
More cash crops are grown	24
Better food security	19
Increased livestock production and fish farming	19
Stopped upland rice cultivation	16
More time for trading	11
Expansion of paper mulberry plantation	8
More time for working as wage labour	3
Total number of respondents:	37

Source: Troesch (2003)

requirements for developing the paddies came only third in ranking, indicating that farmers would like to develop paddies wherever topographical conditions are suitable.

Costs and Benfits

Costs of paddy development are incurred in the first few years while the benefits accrue over future years (see box).

A worthwhile investment

Farmers are clearly aware of the benefits of paddy land. Households with more paddy land are more food secure, are wealthier, and produce more cash crops. Farmers value the paddy land not only for its higher yield but also for the possibility of continuous cropping, the more stable yields, and the lower labour requirement compared with the production of upland rice. Despite this, access to paddy land remains limited mainly to a small group of farmers.

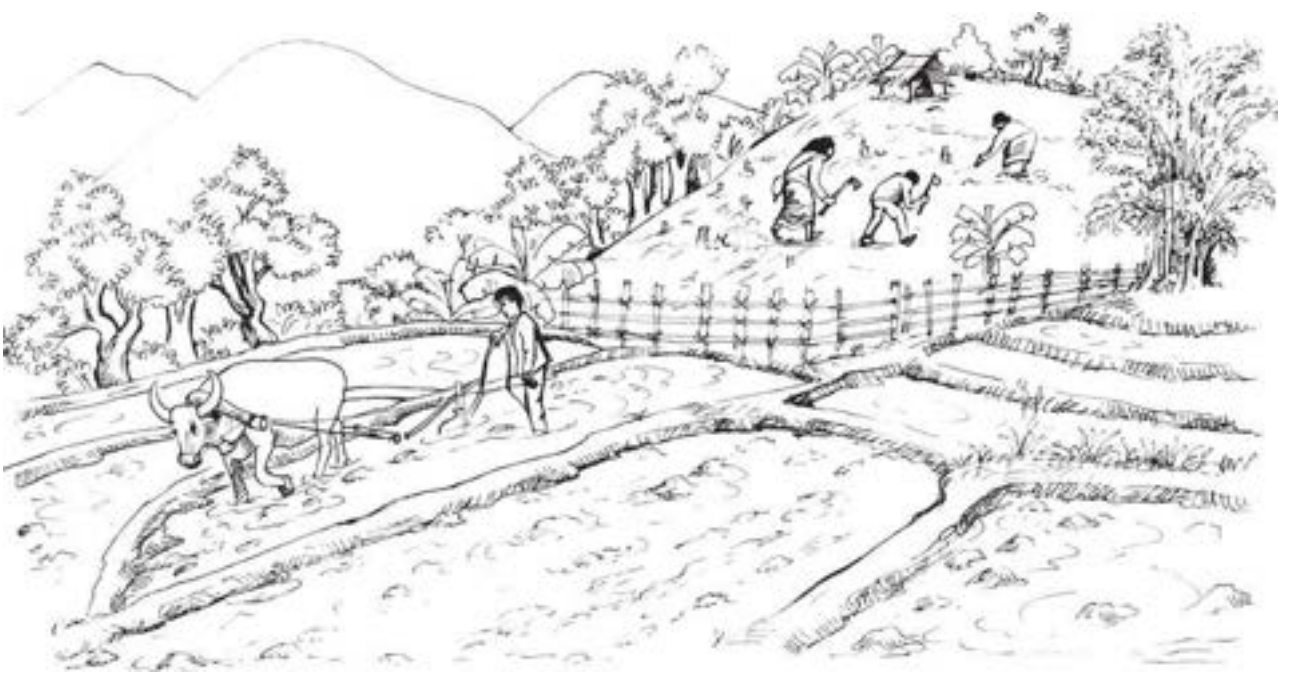
Major Benefits

- Labour saved during rice production
- Increased yield
- Increased frequency of cropping
- Labour released may be used for income generation or other livelihood activities.

Major Costs

- Constructing the terrace, weirs and canals needed for irrigation
- Opportunity cost incurred in the initial years while the terraces are being constructed
- Annual costs for stabilising and maintaining the terraces, at least during the initial years.

The cost-benefit analysis indicates that the economics of paddy development are generally favourable, but can be increased substantially with better technology. The labour released by switching upland rice production to paddies and the cost of constructing terraces are the two major factors affecting the profitability of terrace construction.



The role and importance of upland rice

Despite the potential role of highland paddies, it is unlikely that upland rice production will be replaced completely. Farmers still like to grow upland rice even when paddy land can produce enough to meet the household consumption requirement. This is for several reasons:

- Farmers value upland rice for its earlier harvest during the 'hungry months' when paddy fields are yet to be harvested.
- Upland and lowland rice have different growth durations: production of rice in both the uplands and paddies staggers labour needs.
- Upland rice is perceived to be of better taste and quality and fetches a higher price.

Even when all potential areas for paddy have been developed, a large number of highland farmers may still have no or limited access to these paddies. Terrain characteristics and water availability determine which land can be developed, and in areas with unsuitable characteristics, farmers may continue to grow upland rice for subsistence. Hence, rice grown in both the uplands and paddies is likely to coexist both at the household and landscape levels. This implies that research and technology development for both ecosystems are likely to remain important in addressing food and environment concerns. Nevertheless, highland paddies can play an important role in improving livelihoods for farmers while also protecting the environment.

Better construction techniques and a faster stabilisation of rice yield in terraces after the initial soil disturbances would greatly favour the economics of terracing. Mapping of suitable areas for paddy construction, dissemination of this information and technical support can help reduce the cost to farmers. Research aimed at speeding up the productivity growth in newly constructed terraces would similarly help generate positive benefits.

Technological support needed

The development of highland paddies provides an opportunity to augment food supplies through expansion of area. However, additional improved technologies that further increase and stabilise the productivity are needed, as the rice yield in these highland paddies is currently relatively low and yield gaps are high.

Productivity constraints:

- Pests and diseases.
- Poor nutrient availability.
- Excessive flow of water.
- Low temperature during the dry season.

Rice technologies which have been found to be successful in the irrigated lowlands could potentially be applied in highland paddies. Any technical fix will need to be suitably modified to fit the specific environments and farming systems found in different parts of the uplands.

Better technologies for the construction and stabilisation of terraces, improved rice technologies adapted to the conditions of these paddies, and some assistance to farmers during the initial years of terrace construction are likely to encourage further expansion of paddies. Household livelihood strategies in the uplands are based on the integrated management of various livelihood assets, including

upland and lowland cropping systems. Improved technologies and other interventions are hence needed to improve the productivity of both these land types.

Although the development of paddies can be expected to reduce the environmental degradation associated with shifting cultivation systems, new environmental problems may arise if intensive rice production in the paddies leads to misuse or overuse of chemicals. To avoid this possibility, it is important to develop environmentally friendly technologies for the highland paddies and support such technologies with suitable policies.

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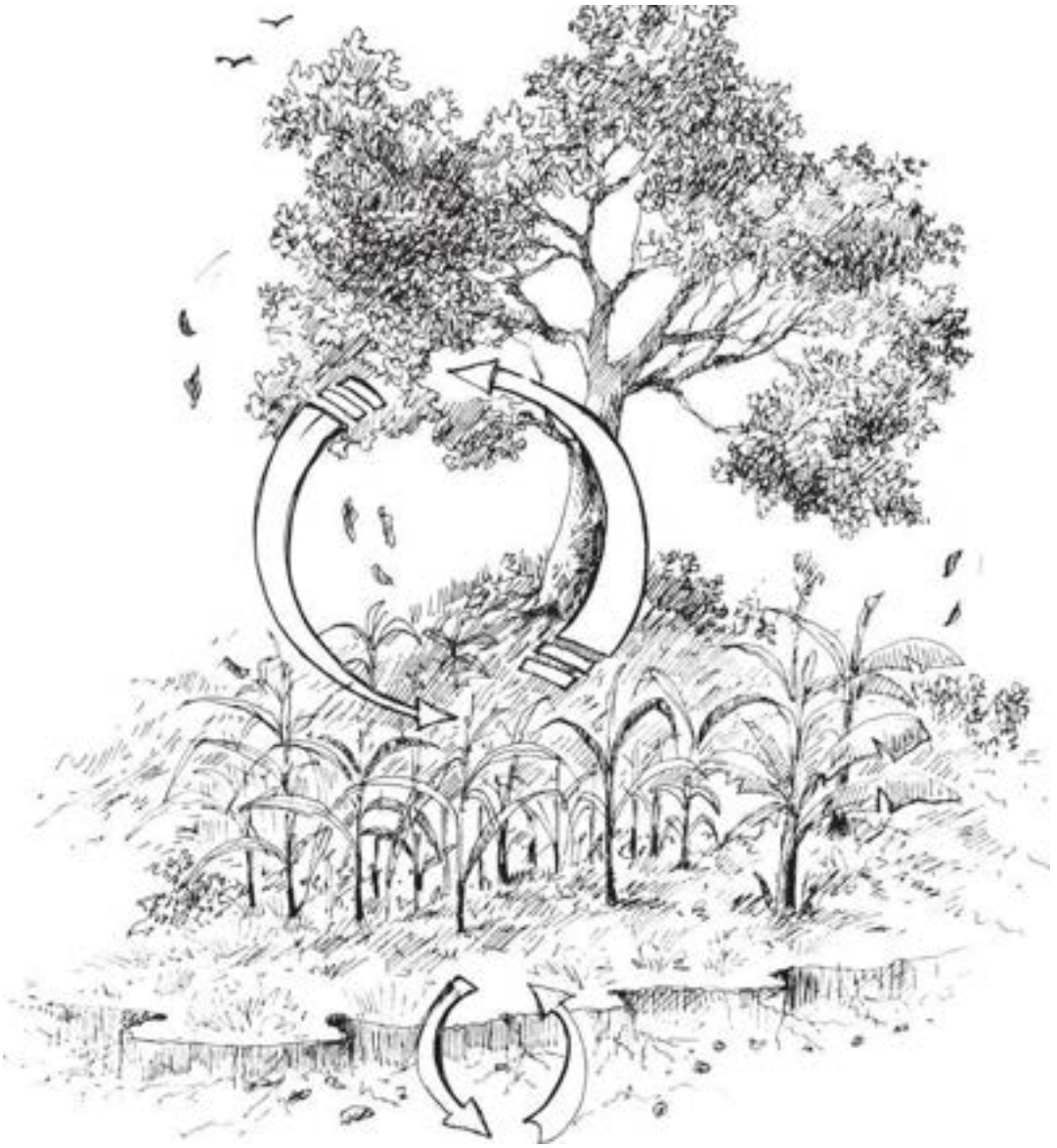
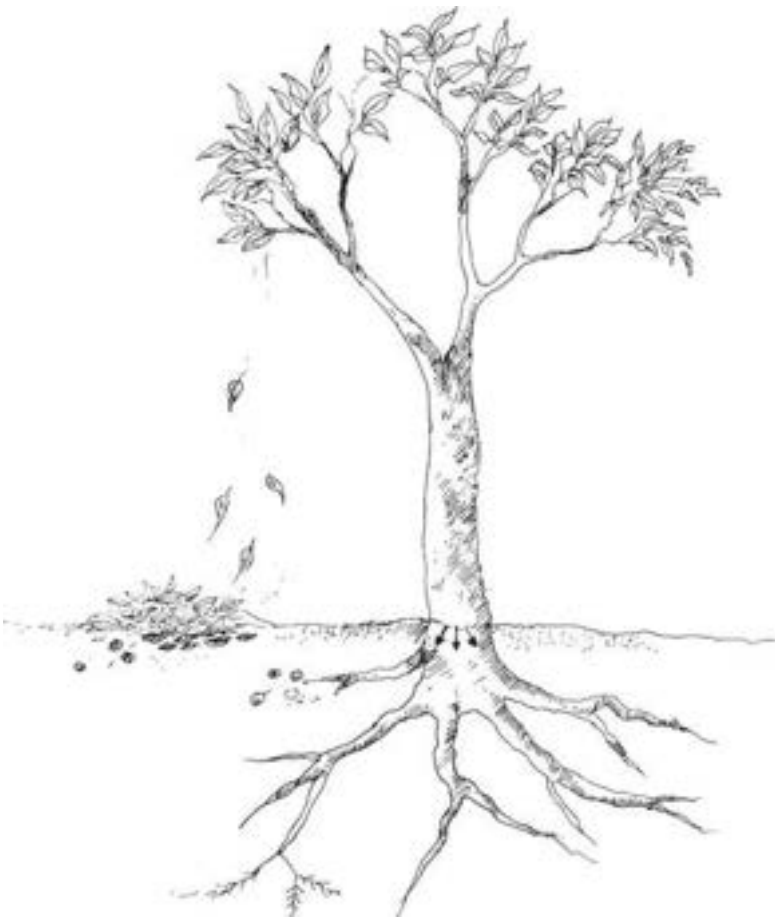
Managing Soil Resources in Southern Xayabury



Since the 1990s in the southern districts of Xayabury province, where market forces are prevalent, shifting cultivation systems have given way to a more conventional high input agricultural system based on burning residues, ploughing on steep slopes, and using herbicides. Although this system has allowed for cultivation of large upland areas, it has also resulted in increased soil erosion, fertility loss, yield decline, and chemical pollution. In order to convert this resource degrading practice to a stabilising plant-soil system, soil conservation technologies using direct seeding mulch-based cropping systems (DMC) are being implemented and adapted with and by smallholders.



Using the natural ecosystem as a reference

The main idea is that the agro-ecosystem should mimic the functioning of the natural ecosystem, replicating its main biophysical functions. A natural ecosystem is sustainable because soil is continuously created and protected by the diverse flora and fauna that interacts with the soil. Certain agricultural practices aimed at managing soil resources mimic natural processes. The expectation is that these practices can be productive, profitable, diversified, pest resistant, and help to ensure soil, water and nutrient conservation.

An iterative approach conducted with and by smallholders

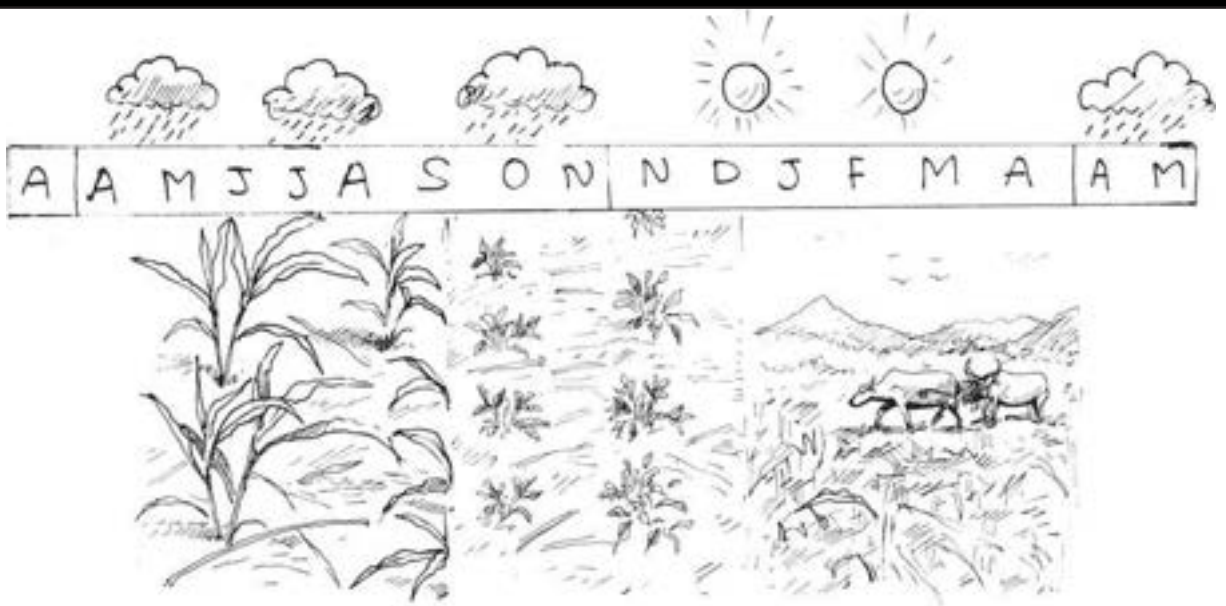
An iterative approach, using the main principles of natural ecosystems, has to be implemented in order to maintain a balanced system of plants and soil. Above and below ground, biophysical and chemical functions generated by residues and cover crops enhance the stability and resilience of plant-soil systems and create the conditions that allow the system to persist. In this way, DMC systems are tested in southern Xayabury. Two approaches are described below.

1. Crop residue management to reduce losses of soil and mineral elements

Loss of soil and mineral elements occurs when crop residues are burned or when animals feed on them. Using crop residues as mulch on soil can help reduce these losses. Burning residues like straw at the end of the dry season is quite widespread. This practice decreases the number of weed seeds present in the topsoil seed bank, hence making manual weeding easier. However, mineral elements contained in straw represent a great part of the total elements produced above the soil (straw and seeds) for nitrogen, phosphorus and potassium. Results for maize showed that for 4t/ha of grains, straw contained 32-68 kg/ha of N, 16-20 kg/ha of P_2O_5 and 40-80 kg/ha of K_2O.

Therefore, using straw residues as mulch limits the usual loss of nutrients caused by burning. Moreover, using straw residue as mulch to cover the soil significantly reduces soil erosion. Crop residue management can be a first step in this iterative approach towards reducing losses of soil and mineral elements, as well as increasing net income and labour productivity (Figure 1).

Figure 1: Maize and rice-bean direct seeded on crop residues



Maize direct-seeded on residues | *Rice-bean direct seeded on Job's tears residues* | *Free grazing of livestock*

Rice-bean and Job's tears (*deuay*), which are common in large areas of southern Xayabury, are key crops for residue management due to:

- High dry matter production and good weed competition, particularly for rice-bean, which limits seed production of weeds.
- Low rate of residue degradation due to a high lignin content (particularly for Job's tears), which enhances soil protection and reduces both evaporation and weed pressure (particularly for rice-bean).
- Low rate of Carbon/Nitrogen for rice-bean residues, thereby avoiding mineral/nitrogen competition between the crop and micro-flora at the beginning of the rainy season.
- Low level of grazing by animals relating to the low palatability of both species.

However, specific practices have to be used, particularly:

- Use of a hand-jab seeder (Figure 2) in order to decrease drudgery and labour when sowing on mulch;
- Weed control at the beginning of the rainy season with the use of a systemic herbicide (glyphosate). Alternately, slashing weeds at flowering time will limit seed production and weed development.

Figure 2: Hand-jab seeder

2. Relay cropping and cover crops

The amount of residues remaining on fields at the beginning of the rainy season is relatively low (less than 3.5 t/ha) due to limited dry matter production, biomass weathering and/or exportation by animals. The use of relay cropping and cover crops can serve as a mulch and compensate for this lack of crop residue. Relay cropping and cover crops also reproduce the biophysical processes of a natural ecosystem and therefore help protect the soil. The rooting systems of cover crops replace mechanical action by biologically improving the soil structure. In order to take advantage of these biophysical processes, DMC systems should be progressively improved with rational crop rotations, relay crops and cover crops.

The use of a relay-cover crop diversifies production, reduces economic and climatic risks, and optimises the main functions of DMC systems through adequate use of main crops and cover crops. Another option is an integrated cropping and livestock production system. Two main systems are being tested in southern Xayabury:

- Grain production system based on two crop sequences (Figure 3) - a main crop of short cycle, e.g. peanuts (*thua din)* or sesame (*man ngar*), followed by a relay crop for small animal feeding, e.g. sorghum (*khao farng)* or finger millet. The aim of this system is to use annual species that produce grain, have a high amount of dry matter, and have a sufficiently strong rooting system to replace mechanical action and prepare the soil for the next crop.

- Rotational system with direct-seeded grain crops, such as maize or Job's tears, followed by forage production for grazing (Figure 4). Species like *Brachiaria ruziziensis* are sown at the first weeding stage by seed broadcasting in order to limit additional working time. After two or three years, crops can be direct seeded on forage mulch after control of the *B. ruziziensis* by systemic herbicide

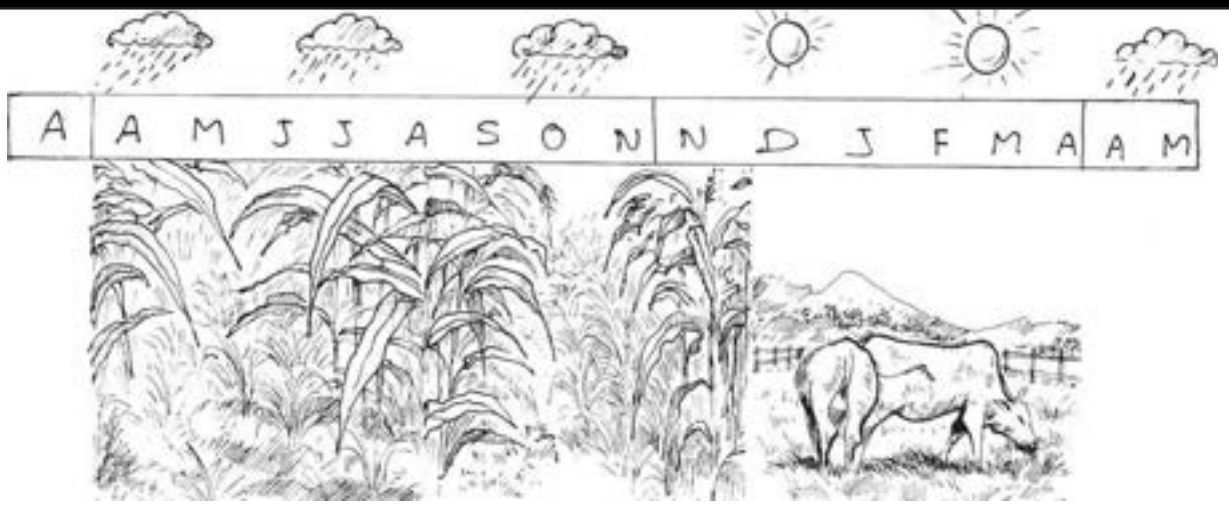
Figure 3: Annual crop sequence with sesame and sorghum

Sesame crop direct seeded on rice bean mulch

Relay crop of sorghum direct seeded after sesame harvesting

Drought tolerance of sorghum during the dry season

Figure 4: Rotation with direct-seeded maize crop followed by forage production for grazing.



Maize direct seeded on residues and sowing of 'B. ruziziensis' 20 days after maize emergence

'B. ruziziensis' at maturity stage of maize crop

Grazing on 'B. ruziziensis '

(glyphosate). Legumes like rice-bean and cow-bean are preferable in this system because they prevent mineral nitrogen immobilisation by micro-flora at the beginning of the rainy season and rid the seed bank of remaining *B. ruziziensis*.

Conclusion

Alternative approaches should be based on the use of local resources, with minimal external inputs. Soil conservation technologies should mimic, as much as possible, the biophysical functions of the natural ecosystem. Moreover, an iterative approach with incremental changes is important because it allows farmers to develop alternative practices that meet their context specific needs.

Soil conservation technologies, such as residue mulching and cover crops, have to be attractive and generate short-term profit (cash or labour) for smallholders. DMC systems are most likely to be adopted when their uses address specific opportunities (fodder, grain for small animal feeding) and have rapid short-term pay-offs for smallholders. Changing conventional practices and implementing alternative systems will require the involvement of all stakeholders (i.e. farmers, researchers, extension workers and the private sector) in order to promote and to scale-up these alternatives.

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Concepts of Integrated Pest Management

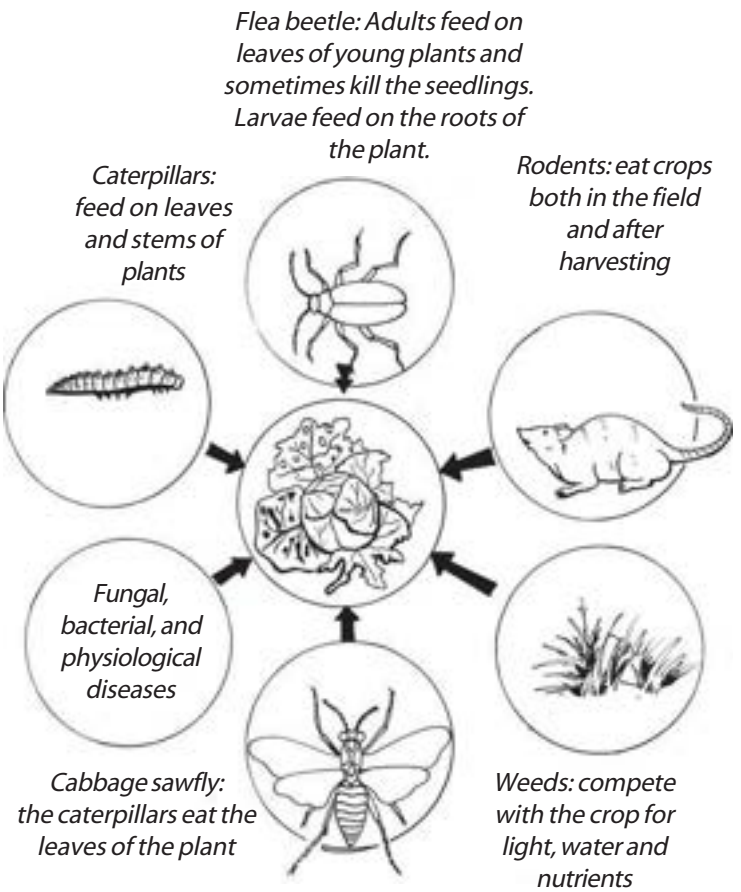
Over the years, Integrated Pest Management has taken on many different meanings. A number of people mistakenly understand that IPM is simply a method to control insects. It is important to understand that:

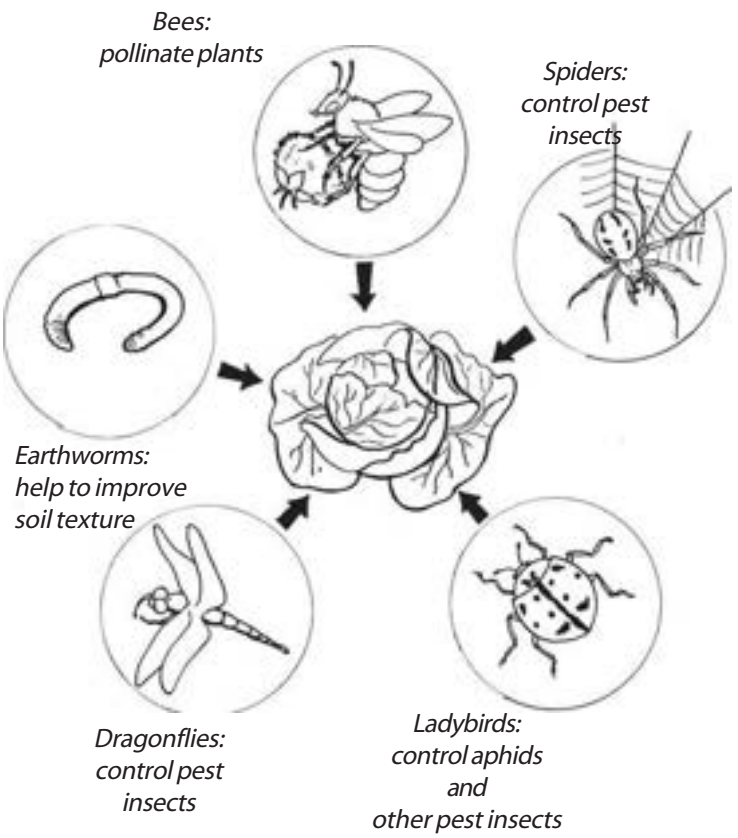
Most insects are not pests	**A pest is anything that hinders a crop's development**
Many serve to pollinate the crop, loosen the soil, feed fish and frogs, control other insects that are pests, and other beneficial purposes.	Pests can include diseases, weeds, rodents, etc, as well as insects.

Management is not the same as control

Growing a good crop depends on many different factors, including soil fertility, water, cultural methods and seed variety. Each of these factors influences and is influenced by other factors: the cropping system is integrated.

Each cropping system has its own ecosystem. These ecosystems are constantly changing according to the specific crop or crops, the season, and even the weather on any specific day. Perhaps the largest immediate influences on a crop's ecosystem are the inputs or crop management practices undertaken by farmers. In this sense, rather than just providing inputs to the crop, or even managing the crop itself, farmers must be able to manage the crop's ecosystem.





Instead of focusing on the control of a pest as an isolated problem, IPM seeks to manage the ecosystem of the crop in an integrated manner. Because of this broader and more holistic approach, IPM is also often known as Integrated Pest and Production Management or Integrated Crop Management. Perhaps it could also be called integrated ecosystem management.

IPM and pesticides

Another common misunderstanding is that IPM means no chemical pesticides. This is not wholly true. Just as the human body sometimes needs medicine, so pesticides might occasionally be the only viable option for a specific crop problem. However, two points should be noted:

- **Prevention is better than cure.**

Like a healthy body, a healthy ecosystem is far more able to defend itself. Pesticides upset the ecosystem's balance, killing beneficial insects, known as natural enemies, as well as pests. The weakened ecosystem often results in even more pests, which can lead to even more pesticides, much as a drug addict needs more and more drugs to achieve the same effect.

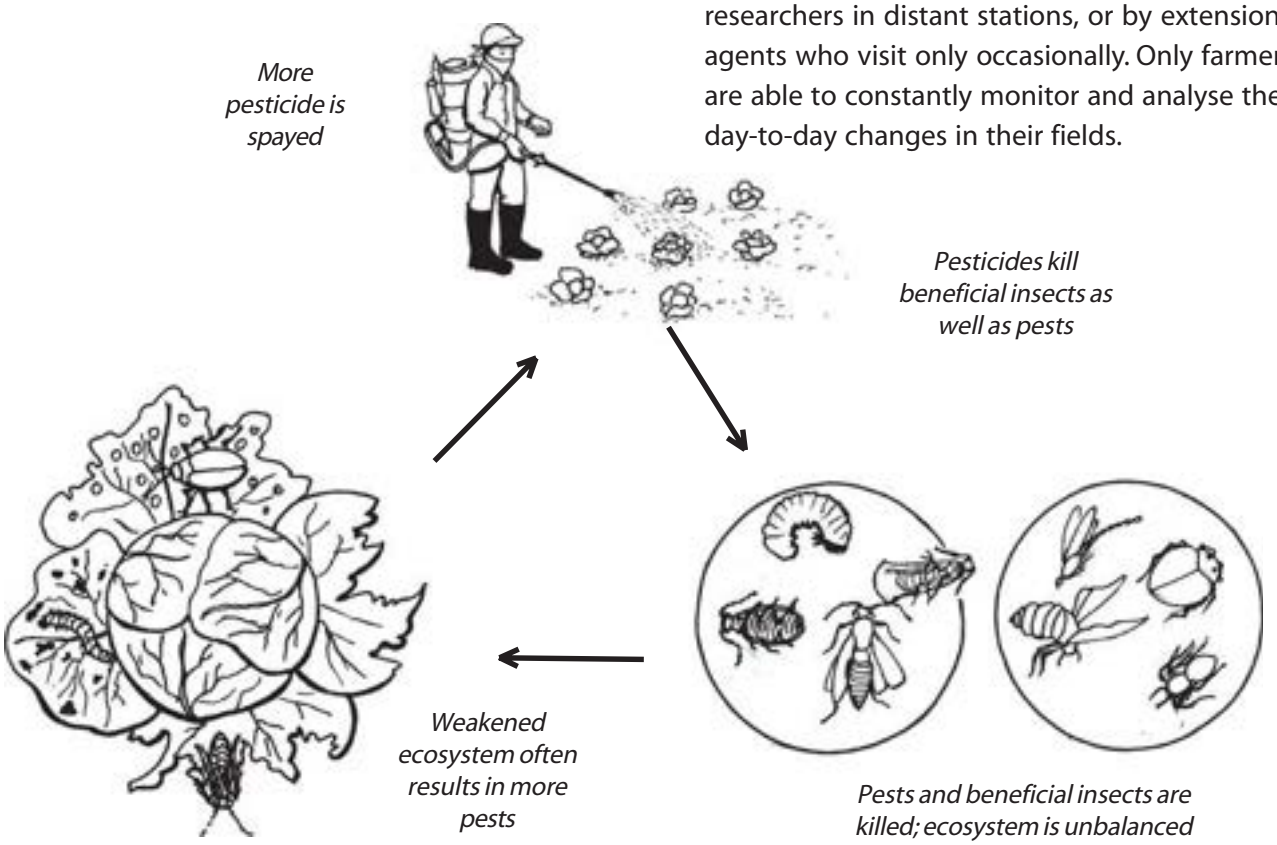
Ecosystems, Diversity and Balance

Our human ecosystem means everything we need to sustain life. This includes such basic things as air, water, and food. If there is too much water, we will drown. If there is not enough water, we will die. We also need food, and food needs water, soil and sunlight.

Therefore, our ecosystem must not only have many different components, but these components must be in the proper proportion to sustain each other. In other words, our ecosystem requires both diversity and balance.

- **Farmers themselves must make the decisions regarding management of the crop's ecosystem.**

This includes the possible use of pesticides. These decisions cannot be made by chemical companies who want to sell products, by researchers in distant stations, or by extension agents who visit only occasionally. Only farmers are able to constantly monitor and analyse the day-to-day changes in their fields.



IPM and Farmer Field Schools

Because cropping ecosystems are highly complex and dynamic, those promoting IPM found that conventional agriculture extension approaches were not sufficient. Hence, the Farmer Field School (FFS) was developed to assist farmers in understanding and managing their crops' ecosystems. In an FFS:

- The 'school' is the field itself.
- 20 to 30 women and men meet each week for an entire cropping season to study all aspects of the crop's ecosystem, including the plant's development, soil conditions, pest problems, and how these are related.
- The group analyses their findings together and decides what management practices to apply in the IPM trial plot.
- The results of these practices are compared to those in a second local practice plot, which is managed according to common practices undertaken locally in the past.
- Facilitators help guide the process, but the real 'teachers' are other farmers, and the crop itself.

In addition to the main field study described above, FFS often include additional hands-on activities and experiments such as:

- Field studies to compare seed varieties, fertilisers, planting density, soil preparation, and other cultural practices.
- Rearing insects to study their behaviour, life cycles, and the relationships between pests and natural enemies.

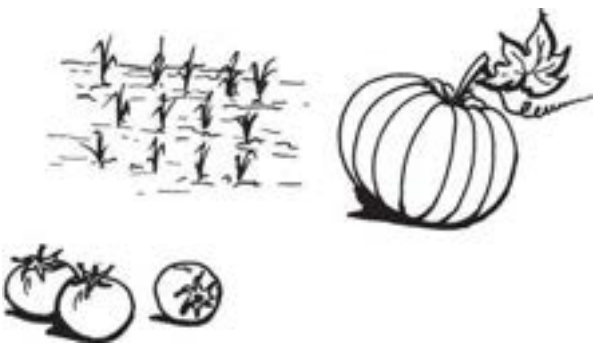
The phrases **learning-by-doing, seeing is believing and action research** are often used in describing quality FFS and the central strategy of FFS should always be:

a hands-on and experiential learning, with focus on a single crop.

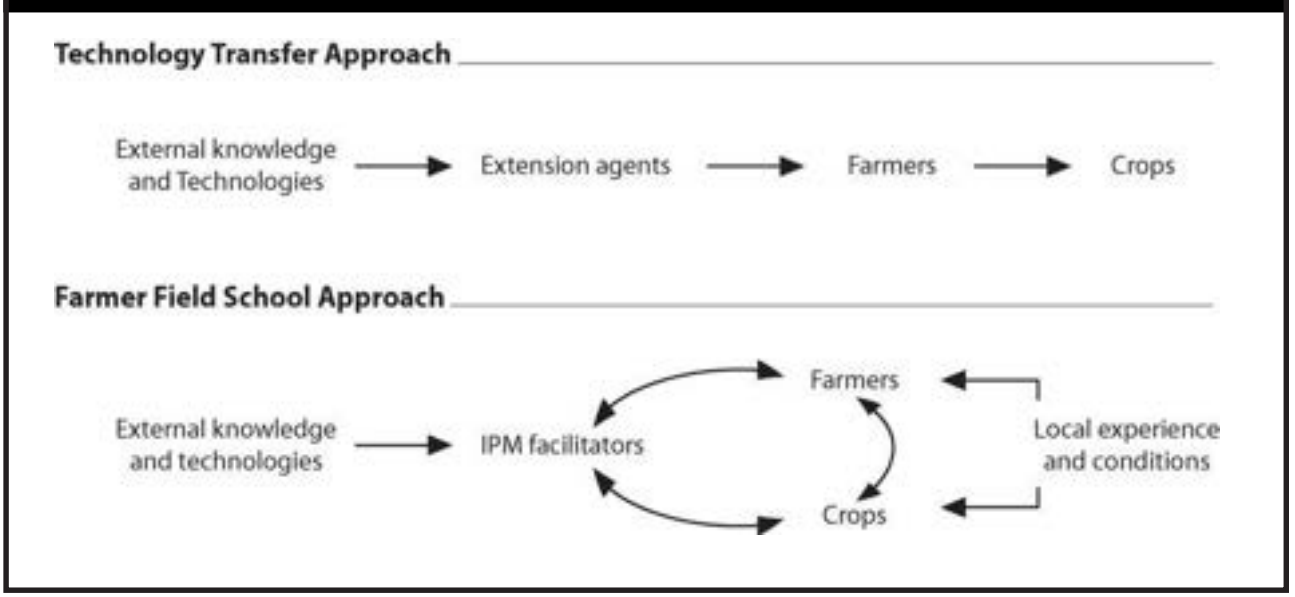
Attempts have been made to incorporate many different topics (livestock, fruit trees, vegetables, etc.) into a single FFS, but results are usually quite limited, as the approach shifts from one of applied, hands-on learning, to top-down instruction and technology transfer.

IPM in the Lao PDR

IPM activities began in Laos 1996. Initial work focused on rice, reflecting the crop's vital importance to the country. In 1999, the programme expanded to include vegetable crops as well. To date, nearly 100 government officials have attended a full-season training of trainers courses in vegetables and rice. In nine provinces across the country, over 200 vegetable and 400 rice Farmer Field Schools have been conducted.

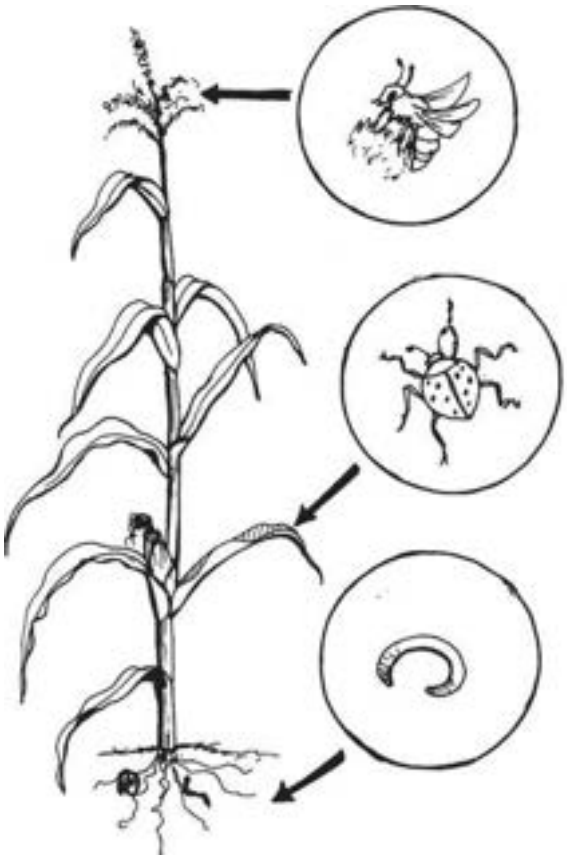


Comparing FFS and conventional technology transfer approaches to agricultural extension



In addition to this core training work, additional activities have included:

- Farmer Trainer training workshops.
- Soil ecology and nutrient field schools for rice and vegetables.



- Field schools focusing on variety studies and bacterial wilt resistance for off-season tomato production.
- Numerous technical workshops on topics ranging from rice bug and bakane disease, to the use of biological control agents.
- Workshops and continuing follow-up to backstop and monitor field activities.

IPM and upland agriculture

IPM activities undertaken in Laos have so far been targeted at lowland cropping systems. For rice IPM, the focus has been on paddy production, and vegetable IPM activities have been directed primarily toward those areas near larger cities and vegetable markets. In other words, there have not been any concerted efforts to develop or promote IPM approaches and methodologies for upland agriculture. Although such efforts would be highly worthwhile, they are far beyond the scope of this article. However, it should be noted that villages in upland areas also cultivate upland paddy rice and vegetables; therefore experience from the lowlands can also be relevant for the uplands.

Pesticide Caution

In 2003, the FAO Vegetable Integrated Pest Management (IPM) Programme conducted a case study on pesticide use in Laos (Van der Borght et al 2004). Interviews, discussions and surveys included officials, farmers and markets in Champasak, Savannakhet, Vientiane Capital and Vientiane Provinces. The study found that pesticide use is relatively low in Laos compared to in other countries of the region, and that active promotion of pesticides is not widespread. However, the study also found that pesticides are widely available, and that most of those for sale are highly toxic. Folidol, a class 1a pesticide, was found to be the most widely available and used pesticide, even through it is officially banned.

Of significant concern is that a clear trend toward increasing use of pesticides was noted, particularly by farmers producing for urban markets. Although these farmers are aware of the dangers, they repeatedly stated that they know of no other way to meet the demands of the market, consumers and middlemen, other than to use more pesticides. The study concluded that merely not promoting pesticides is not enough, and that more concerted policies, strategies, and action are urgently needed.

Important points to remember:

- **New crops, cropping systems, or management practices change the ecosystem:** a healthy crop requires a diverse and balanced ecosystem. Changes or new inputs can upset this balance. This often leads to additional problems, including the unnecessary use of or continuous dependence on pesticides, even if chemicals are not actively promoted.
- **There are no standard IPM technologies or solutions:** IPM focuses on the management of ecosystems. Ecosystems vary widely from location to location, and change constantly over time. This means that there are no easy answers that are universally applicable.
- **Farmers are the crop managers:** because conditions change constantly, no one is able to manage the crop better than farmers themselves. If new inputs or methods are not understood, accepted and trusted by farmers, they have little or no value at all.
- **Farmer Field Schools are not for everybody:** FFS depend on strong farmer commitment and significant experience with the crop studied. As a result, FFS are not very suitable for introducing entirely new crops or cropping systems. Although the benefits can be considerable, FFS require considerable investments of time, human and financial resources to work effectively.

Four principles of IPM

1 Grow a healthy crop

2 Preserve natural enemies

3 Visit and observe fields regularly

4 Farmers become the experts

Selected references

Van der Borght, D., Litthamalay, S. & Khampouvong, P. 2004. *The Path to Pesticides...? A case study on trends and tendencies in the Lao PDR*. FAO. Inter-Country Programme for IPM Vegetables in South and Southeast Asia. Vientiane.

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Lessons in Fruit Tree Development

The Upland Agriculture Development Centre (UADC) was initiated in Hinhurp, Vientiane, in the early 1990s to help the government decrease slash-and-burn agriculture. Since 1998, the centre has been concentrating on the introduction of fruit growing in the uplands as a means of decreasing slash-and-burn agriculture. Fruit tree cultivation is often promoted as being one of the most promising, sustainable and viable alternatives to slash-and-burn agriculture. From the experience gained by the UADC centre in cooperation with the German Development Service (DED), the following has been established:

- Most fruit trees planted in the Lao PDR are not from improved sources.
- Marketing problems hardly occur within the target districts in which the UADC operates.
- In order to make fruit growing a success with farmers, extension activities (field visits) are of utmost importance, possibly more so than training before planting.

Fruit tree production: findings from a farmer survey

A survey undertaken in 2003 in three target districts of Vientiane Province (Kasy, Hinhurp and Vangvieng) interviewed nearly 150 farmers who had, at some point in the past, started growing fruit trees. Findings included:

- Farmers who establish fruit orchards have a high degree of rice self-sufficiency.
- At least two-thirds of the orchards are derived from unimproved seedlings.
- Most fruit growers have never received training.
- Most of the respondents reported having Citrus spp. orchards, with only two other fruits (mango and rambutan) being represented in significant numbers.
- The average size of orchards is just over 100 trees per orchard.
- Main problems perceived by respondents were diseases/pests (36%), pruning (24%) and irrigation (19%).
- Marketing is perceived as a problem by only 1% of respondents.

The UADC centre

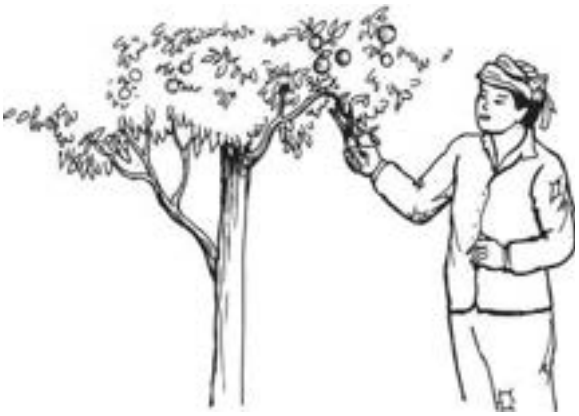
The centre is currently expanding its ability to produce a greater variety of fruit seedlings as well as improving seedling quality. Staff at the centre now possess better skills in producing quality seedlings and in providing farmers with advice regarding crop management and pest and disease control. Farmers are trained both before and after planting and are slowly gaining more knowledge through extension. In this improved extension method, orchards already planted by farmers are more frequently used for demonstration purposes. This results in better adoption of techniques.

Gaps in orchard management knowledge

Lack of expertise is apparent in most nurseries: rootstocks, which are needed for good root growth, are seldom used, and few farmers know how to graft superior varieties. The consequence is that inferior trees are planted, resulting in poor growth, poor fruit setting and/or poor fruit quality. Many government and project nurseries focus on quantity rather than quality, meaning that grafting is not carried out. Hansen (1998) also mentions that inputs (seedlings) are of poor quality and, as such, result in low viability of fruit orchards.

Once fruit trees are planted, project inputs are mostly completed. It is possible that monitoring missions may be held a year or so later to see how many seedlings are still surviving, but farmers are seldom advised on how to improve their orchards.

Pruning is necessary to keep the trees manageable and to open up the canopy to allow better air circulation. This decreases disease incidence and increases the fruit growing area. Farmers, extension staff, project staff as well as



large-scale growers are not yet familiar with this cultivation technique. Farmers also lack knowledge on the following issues:

- Application methods of compost and/or fertiliser.
- Possibilities for intercropping and/or livestock grazing under fruit trees.
- The use of mulch to increase soil fertility and decrease irrigation needs.
- Pruning diseased branches to improve fruit quality.
- Weeding in order to decrease competition, thereby increasing fruit quality.
- When confronted with disease/pest problems, neither farmers nor extension staff are able to obtain solutions.

Land/labour availability

Another factor influencing orchard management is the availability of land. The more pressure there is to seek alternatives to traditional slash-and-burn agriculture (due to factors such as declining productivity and the need for higher levels of income), the more farmers are interested in establishing good fruit tree orchards. Essentially, the labour returns for traditional slash-and-burn are insufficient. Land pressure near the UADC is high and consequently orchards are generally better managed than in districts where land availability, especially for irrigated rice paddies, is better.

Major considerations for managing different fruit orchards

	Obtaining seedlings	Growing conditions	Management	Marketing
Citrus	Though it is possible to get improved varieties, adequate rootstocks are seldom used.	Adaptable but places where soil moisture is above average are preferred.	Pruning essential; excellent response to additional irrigation.	Excellent, as the fruiting season is extended or, for lime, year-round.
Mango	Preferred choice should be grafted seedlings, from varieties common in Thailand and with little incidence of anthracnose.	Widely adaptable.	Pruning essential; chemical treatment for anthracnose required.	Planting different varieties within the same orchard spreads the season.
Rambutan	Grafted seedlings essential.	If possible small-scale sprinklers should be used.	Pruning required.	Demand for local tasty types grown under local conditions rather than imported fruits.

Even though the list is brief, it will help avoid making many mistakes when commencing a fruit-growing programme.

Marketing

Though fruit tree cultivation is generally acknowledged as one of the more viable alternatives to slash-and-burn agriculture, there are some problems with marketing:

- "Lack of market is a serious constraint to horticultural production and opportunities for upland farmers to integrate trees and other perennials into their farming systems are limited" (Roder et al. 1992).
- "Fruit trees, except for home consumption, are inappropriate if markets do not exist" (Roder et al. 1995).
- "Slow returns and the uncertain market are probably the main constraints (of fruit growing)" (Hansen 1998).

Most fruit tree growing projects concentrate on small-scale farmers. The amount of fruit produced by these farmers under low-input circumstances is often small, and the farmers who first start cultivating fruit trees hardly produce more than the surrounding market demands.

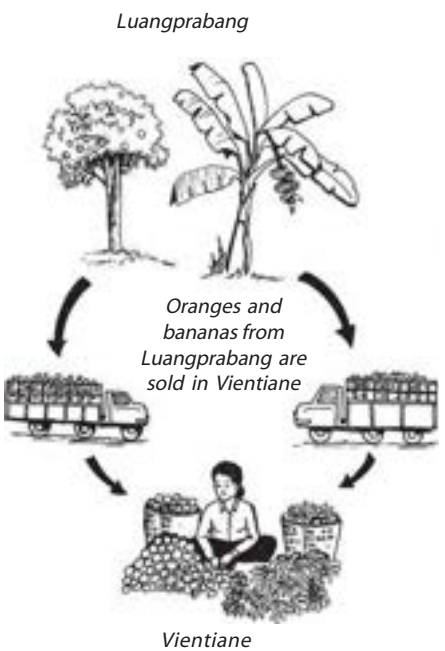
The conclusion is that marketing is not a problem for projects that focus on small farmers.

Hansen (1998) points out that in northern Thailand large-scale road construction helped overcome many marketing problems. This may be the same for Laos. However, even under current poor road conditions, fruit travels far.

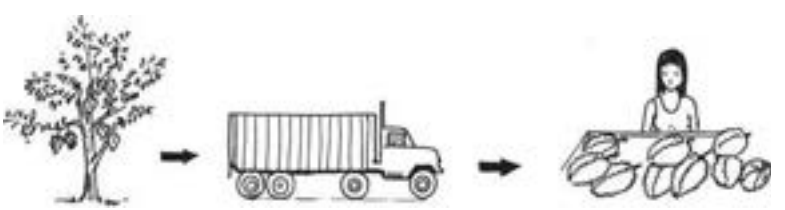
However, marketing situations in Laos are set to change in the near future. Most research efforts have focused on the national market (Vientiane), which is currently supplied by Thailand. With import duties set to drop to zero in 2008, Lao farmers will be forced to produce better quality fruit or accept lower prices.

Extension techniques

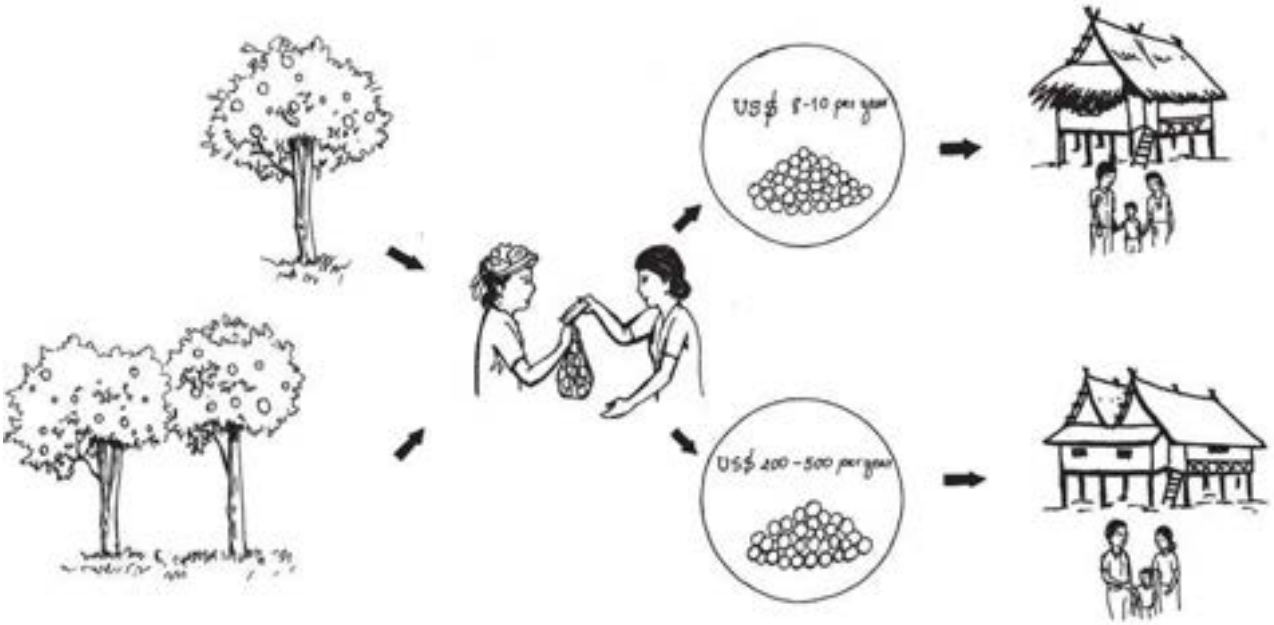
The need to use farmers' orchards within training is essential. Experiments in 2003 were carried out using a 'farmer's orchard school' whereby local farmers meet each other on a monthly basis at different orchards.



Oranges from Borikhamxay are sold in Pakse



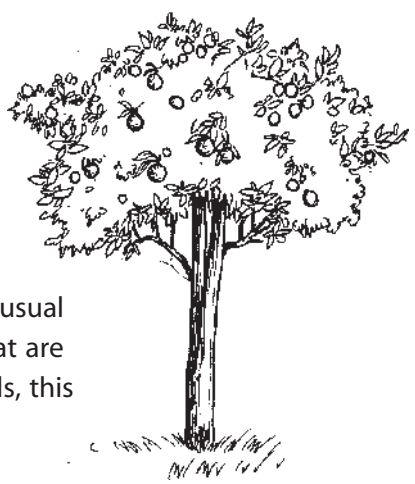
Durian from the Bolovens Plateau are sold in Bangkok



Some of the principles of 'Farmers Field Schools' (as used with Integrated Pest Management in rice) were tried but lacked both the single crop approach (as a variety of crops were grown) as well as the community approach.

In this respect the experience was successful. However, in hindsight, it may be better to use the term 'practical fruit study group' rather than a 'farmer's orchard school'.

Training sessions on management practices were also held in farmers' orchards so that not only practical skills were acquired but also other matters such as fertiliser application and disease/pest control could be discussed. Again, when compared to usual training sessions that are held in meeting halls, this practical approach proves to be much more effective.



Extension work and field visits during 2003, under cooperation between DED and UADC, gained valuable feedback from the field:

- **Orchard maintenance by farmers during the first two to three years following planting is poor.** Follow-up programmes can contribute to improved management during this time. Pruning during the first few years is essential as otherwise the trees will grow too tall and become unmanageable.
- **Farmers have little knowledge of management beyond planting**. They lack know-how on pruning, small-scale irrigation and disease/pest control. The same can be said about front line extension staff.
- **Farmers who live in relatively densely populated areas** are more inclined to plant and invest labour in the management of orchards.
- **Farmer-to-farmer extension methods**, whether approaching a subject before planting or after, will increase farmer motivation and result in a much higher adoption rate.

Lessons learnt

- Marketing, although important, is not an impediment to expanding orchard areas in most upland areas.
- Most of the fruit trees distributed so far are derived from unimproved materials. This results in inferior orchards.
- Lack of extension expertise in general is more of an impediment to expanding the upland fruit-growing sector in the Lao PDR than perceived marketing problems.
- Farmer-to-farmer exchange of experience is essential in any fruit-growing programme.

Nambak oranges

Nambak District, Luangprabang Province is famous for its oranges. Nambak orange is an uncommon type that produces excellent juice. In 2004 390 ha of orange trees were grown by over 800 families in 20 villages. Despite low management levels, these families were able to generate roughly US$ 700, 000 from sales in 2003. The district is located a three-hour drive from the nearest substantial market (Luangprabang) and nine to ten hours from Vientiane. Despite this, farmers have not faced market problems and their produce is exported to Vietnam and China. However, the farm gate price is very cheap, at only 1,000 - 1,100 Kip (10 US cents) per kg.

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This paper is adapted from: "Fruit Growing as an Alternative to Slash-and-Burn Agriculture: Findings and Discussion" in *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland livelihoods*. NAFRI 2005.

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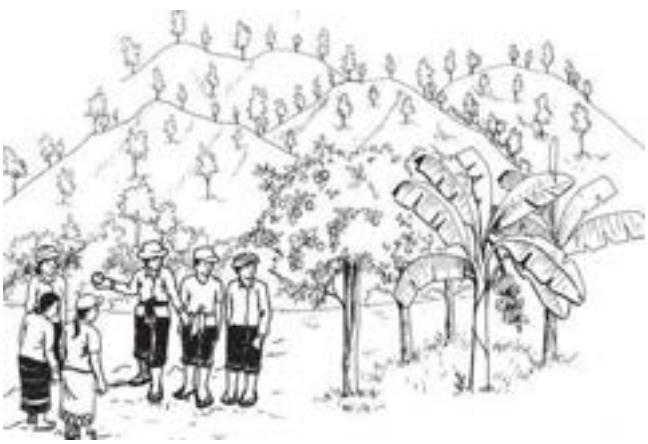

Apart from providing a location for specific training, orchards were also compared and farmers became more motivated to improve their own orchards

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Integrated Fruit Tree Systems

Downward spiral in the uplands

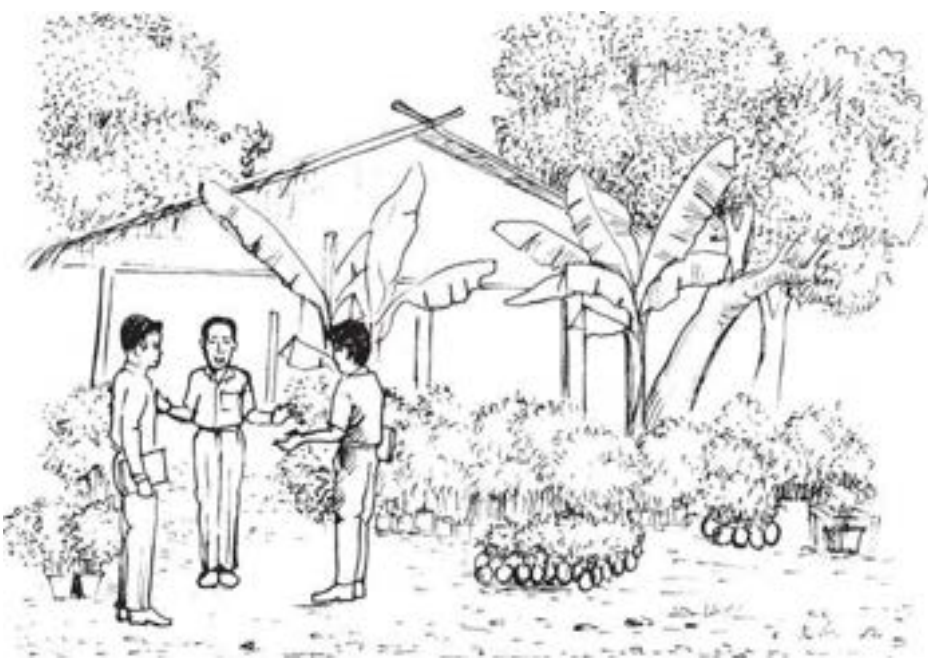
Shortened fallow periods in the Lao uplands have rendered many slash-and-burn systems unsustainable. Soil erosion, weed pressure and labour inputs have generally increased while yields have declined, fuelling the increasing incidence of poverty in the uplands. This downward spiral has created a demand from both farmers and government agencies for sustainable technologies and processes to improve upland farmer livelihoods.

Over the years, a considerable amount of research has been conducted to develop suitable upland technologies. However, adoption by farmers has been limited. The high diversity encountered in the uplands - in terms of biophysical, socioeconomic and market conditions - is one key reason why adoption has been slow. With such wide diversity, as well as changes induced by external factors, technology recommendations must be site specific. This points toward the use of participatory and

adaptive research and development approaches through which researchers, extensionists and farmers can work together to develop technologies and processes appropriate for specific conditions.

In 1999, NAFRI teamed up with several international agricultural research centres (IRRI, ICRAF, CIAT, IWMI and ACIAR) to establish the Integrated Upland Agricultural Research Project (IUARP) with the objective of developing sustainable upland livelihood systems through an integrated and participatory research approach. The IUARP works in seven villages in Park Ou district, Luangprabang province, northern Laos. These villages show wide ethnic, socio-economic and market diversities.

Farmer nurseries



To meet the increasing demand for fruit tree planting materials, some farmers were trained in nursery development. Since then, three farmer nurseries have been established, mainly to produce fruit tree seedlings.

These nurseries have proven to be a very good entry point to working with farmers. Tangible benefits - seedlings - can be produced after just a few months. The nurseries provide a useful venue for meetings and training activities. They are also cost-efficient, as local materials can be used or recycled (e.g. as containers for growing the seedlings), and seedling transport costs and time are greatly reduced.

Moreover, farmer nurseries may potentially provide livelihoods if there is sufficient demand from villagers and/or projects for the seedlings produced. Ultimately, it is hoped that this process will lead to community self-reliance in planting material production.

IUARP staff helped facilitate meetings between nursery operators and interested farmers to negotiate 'fair prices' that the latter were willing to pay for seedlings. The prevailing market prices in Luangprabang nurseries for fruit tree and other seedlings were provided to the nursery farmers and their potential customers. Then they were asked to indicate their relative preference for the various species, as well as come to agreement on what would constitute fair prices for the farmer-produced seedlings. On average, the agreed prices were about 60% of the market prices in Luangprabang. The fruit trees in highest demand were rambutan, litchi, sapota, mango, tamarind, lime and guava (see table below).

The IUARP team has helped interested farmers by providing training, planting materials and follow-up support for fruit tree production. During 2001 and 2002, a range of planting materials was provided to interested farmers, including fruit tree seedlings (1,560), pineapple suckers (60,400), banana suckers (1,000) and paper mulberry seedlings (6,600). To date, pineapple has emerged as the most popular medium-duration fruit. By 2003, some farmers who had planted pineapple in 2001 were able to harvest fruit to sell on local markets.

Seedling preferences and fair prices

Species	Preference**	Market prices in Luangprabang	Farmer agreed 'fair prices'
		---------- Kip ----------	---------- Kip ----------
Rambutan	5	15,000	10,000
Sapota	4	10,000	6,000
Litchi	5	5,000	3,000
Mango	4	15,000 3,000*	5,000 1,700*
Sweet tamarind	4	10,000	7,000
Lime	4	5,000	3,000
Guava	4	5,000	3,000
Pomelo	3	6,000*	4,000*
Jujube	2	10,000*	6,000*
Longan	1	5,000	2,500
Jack fruit	1	5,000*	3,000*
Custard apple	1	5,000*	3,000*
Papaya	1	300	200
Paper mulberry	3	200	200

**non-grafted; **1=low,5=high*

Sucker banks

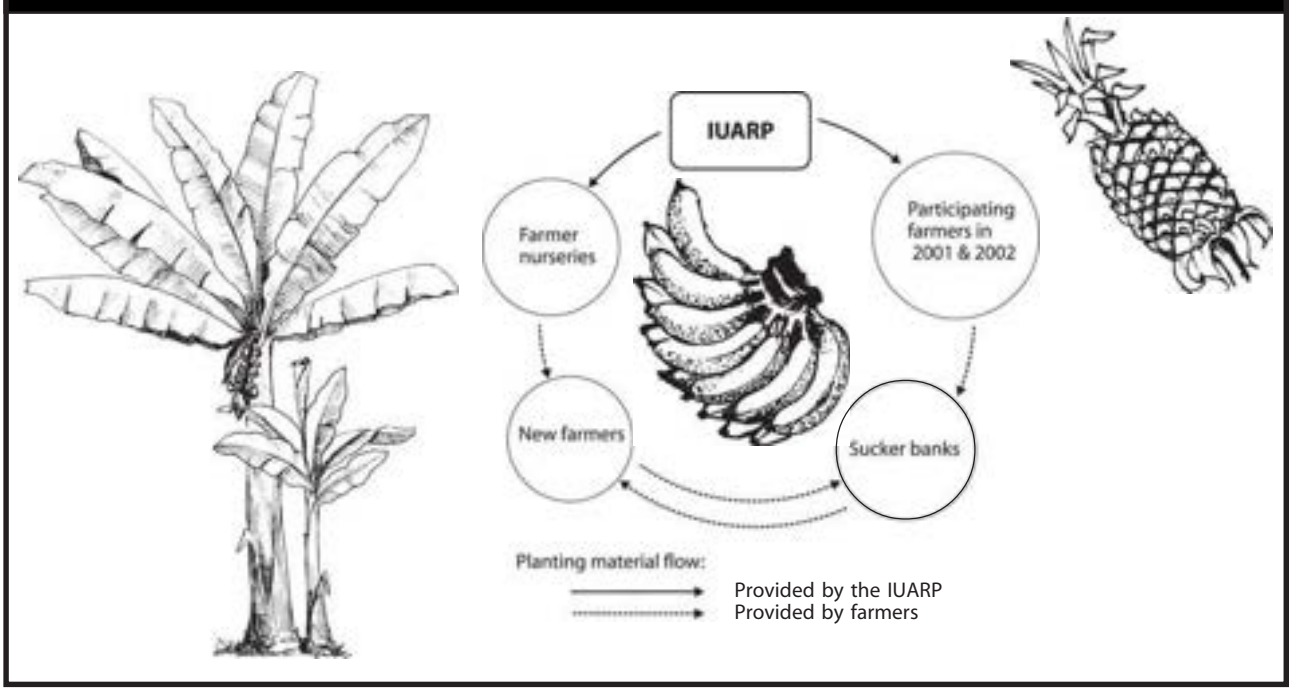
To enable the expansion of medium-term fruits, a 'sucker bank' system was conceived. Suckers are fruit-bearing shoots that can be used as planting material. In this system, farmers who received pineapple suckers from IUARP as planting material agreed to provide, after three years, the same number of suckers to interested farmers. Thus, a sustainable source of planting material has been established, ensuring that more farmers can develop such systems on their own in the future.

After considerable debate and discussion, the farmers reached consensus on the following arrangements:

- The 2001 and 2002 farmers will give back to the sucker banks 50% of the pineapple suckers they initially received within three years of receiving them, and 100% of the banana suckers in two years.
- The new farmers starting in 2003 agreed to give back all the pineapple suckers they received to the sucker banks in three years, and all banana suckers in two years.
- The suckers will be distributed to new farmers between April and May.
- Old farmers will take responsibility for gathering the suckers, but not for their transportation. Therefore, the new farmers will come to collect the suckers.
- The distributed pineapple suckers should be root suckers, not from the top of the pineapple fruit.

By successfully negotiating the terms for farmer-produced seedling prices and the sucker banks, a system has been established that can potentially provide sustainable sources of planting materials for farmers, as well as a livelihood option for the farmer nursery operators. The general concept of this system is illustrated below.

General concept of the farmer planting material production system



Will farmers invest?

In order to scale-up integrated fruit tree systems to other farmers and villages, as well as to enable the farmer nurseries to become sustainable and profitable without further IUARP inputs, interested farmers will have to be willing to invest.

Based on the experience thus far, farmers usually start with a small area - say 0.1 hectare - for establishing and evaluating fruit tree gardens. If these become successful, farmers then may decide to expand their gardens in subsequent years.

A farmer would have to be willing and able to make the following investments to establish a 0.1 ha integrated fruit tree garden:

- Invest about 125,000 Kip (or US$12) as start-up capital to purchase fruit tree seedlings (assuming 6 x 6 m spacing and average seedling cost of 5,000 Kip from farmer nurseries)
- Have access to pineapple and/or banana planting material from sucker banks
- Be able to collect material (seed, cuttings) for hedgerow establishment from local sources
- Be willing to provide the necessary labour inputs.

Future considerations

As outcomes emerge - fruit is harvested and sold - and additional relevant information becomes available in the coming years, careful monitoring and evaluation are needed to provide answers to the following questions:

- Can farmers produce high-quality seedlings (e.g. grafted fruit tree seedlings)?
- How much income can they generate from selling seedlings, and who will buy?
- Will farmers be willing to invest to start integrated fruit tree gardens (see above)?
- Will the 'sucker banks' be able meet the growing demand of farmers for pineapple and banana suckers?
- What will happen to prices in future years as pineapple and other fruit production expands?
- Can farmer seed production (e.g. stylo) be feasible and profitable in the IUARP area?
- What types of further support are needed by farmers (e.g. training and follow-up on grafting techniques, provision of updated market information)?

Integrated fruit tree systems have clearly emerged as one of the most promising interventions for upland farmers in northern Laos, as in many other parts of Asia. As economic corridors, post-harvest processing facilities and marketing opportunities further develop and improve in the future, these systems may become even more attractive and profitable alternatives for upland farmers.

Rambutan

This paper is adapted from: "Irrigated Fruit Tree Systems in Luangprabang: Scaling-up Sustainable Technologies and Processes" in *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland livelihoods*. NAFRI. 2005.

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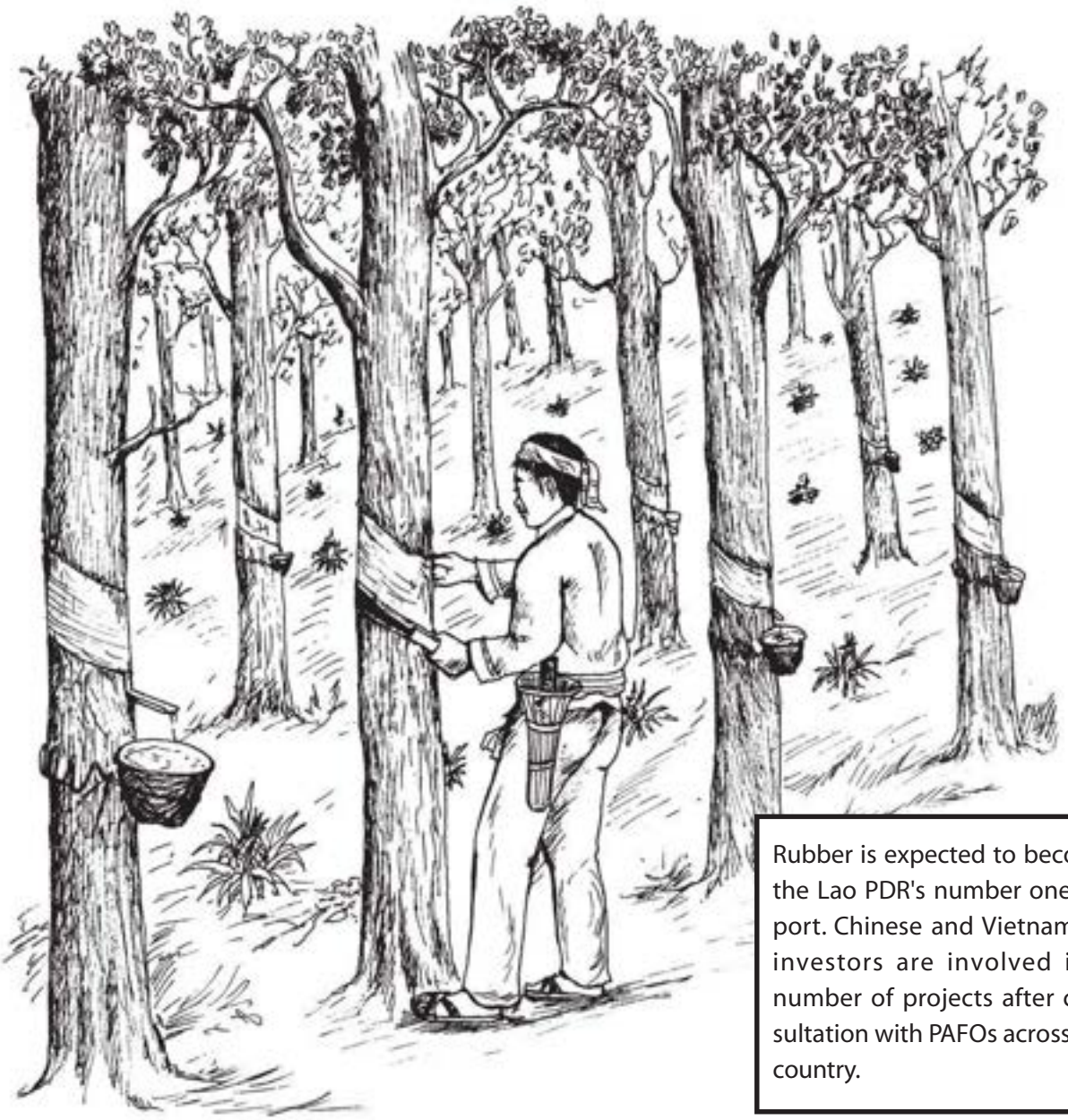
Intercropping with Rubber for Risk Management



Rubber is expected to become the Lao PDR's number one export. Chinese and Vietnamese investors are involved in a number of projects after consultation with PAFOs across the country.

The rubber boom in the Lao PDR and elsewhere in "New Asia"

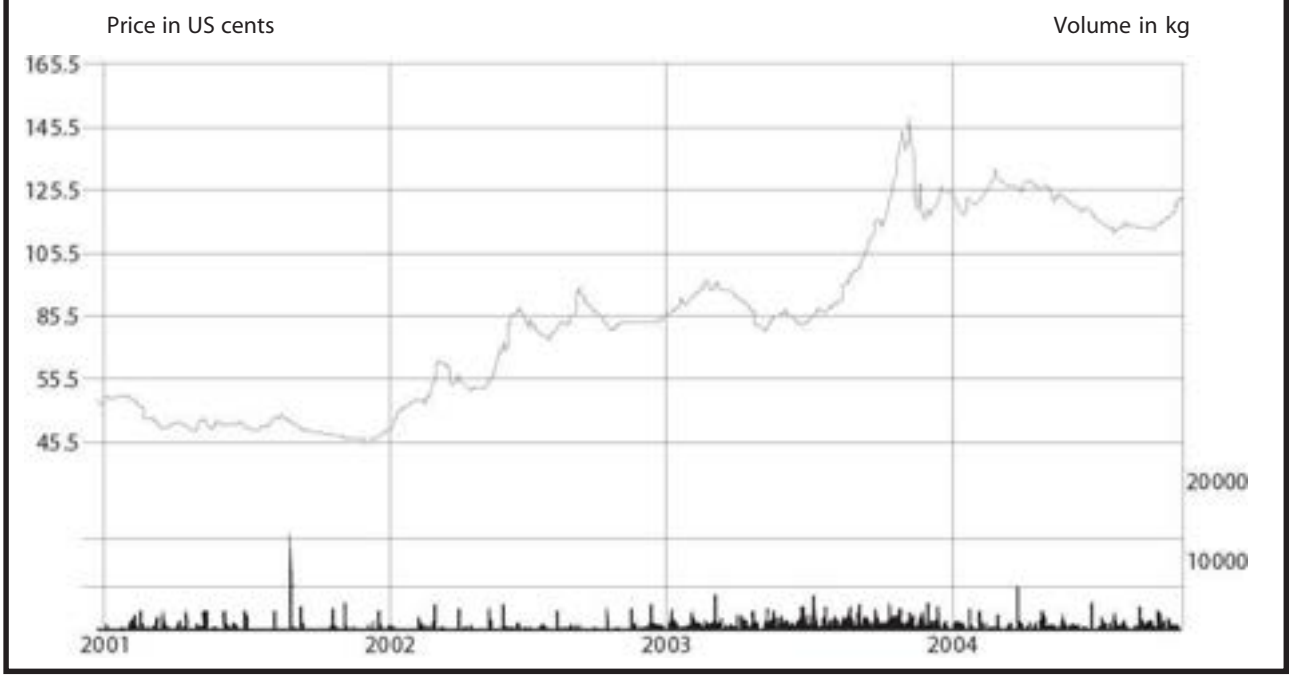
The market for rubber in developed countries is saturated and not expected to grow, but in "New Asia" (China, India and the ASEAN countries) rubber is booming. After a long decline, the rubber price rose in 2002. The rising price is caused by surging demand, especially in China where in 2003, rubber imports rose almost 24%. Rubber replanting programmes are on again in established rubber producing countries and there is an opportunity for new rubber plantations close to the Asian demand centres.

Estimated area of rubber to be planted in selected provinces			
Province	**Area (ha)**	**Comment**	**Investing Country**
Champasack	13,000	To be planted	Vietnam
Luangnamtha	4,000	Total area to be increased to this level	China
Saravan	1,500		Vietnam
Oudomxay	1,100	To be planted	China

Source: *Vientiane Times*, 21 September 2004

As shown below, the price of rubber has consistently risen in the past few years. Unless the Chinese economy stalls, natural rubber is likely to remain in high demand over the next decade.

Rubber price on the Singapore Commodity Exchange



Opportunities for smallholder rubber

While smallholder rubber growers benefit from current high prices, price fluctuations are a risk. The 2004 price on the Singapore Commodity Market was about US$1.25/kg and the projection is that it will rise to about US$1.75 by 2010. Thereafter, like other commodities, it will fluctuate around a slightly lower equilibrium price.

Even at lower prices, the economic benefits of growing rubber are attractive for smallholders. It is easy to grow and provides abundant employment in tapping. A recent survey of northeast Thailand rubber farmers reports that they are better off with rubber than without it. The rate of return for rubber plantations is around 17-20%. A favourable characteristic of rubber in northern Laos is that farmers can adopt it with other things they need - extension, marketing and finance. Arrangements may vary but the "joint venture" model in Luangnamtha gives an indicative glimpse of how it might be done.

The Luangnamtha Rubber Development Co. is a joint venture between the Sino-Lao Rubber Co. and the Luangnamtha PAFES. The company's capital is US$1 million, and PAFES was given a 40% equity stake by the Chinese government. The company provides rubber seedlings, technology extension and marketing and operates a research facility to support new northern rubber varieties. Since 1994, the province has given low-interest loans to villagers for seedlings and other costs. Presumably, it will continue to do so (Phouyyavong et al. 2004).

The need for risk management

While opportunities in rubber are currently good, risk management is needed to protect farmers from price instability and the environmental risks of rubber monoculture.

Price fluctuations are normal for any commodity and rubber is a volatile commodity. Major rubber growing countries like Thailand have sophisticated financial instruments providing price fluctuation insurance to farmers. These programmes require complicated rural banking arrangements, well-organised markets and large amounts of capital. More achievable risk insurance for Laos might be crop diversification. If they have a diversified farm economy, farmers can concentrate on other crops and stop tapping rubber until the price rises again.

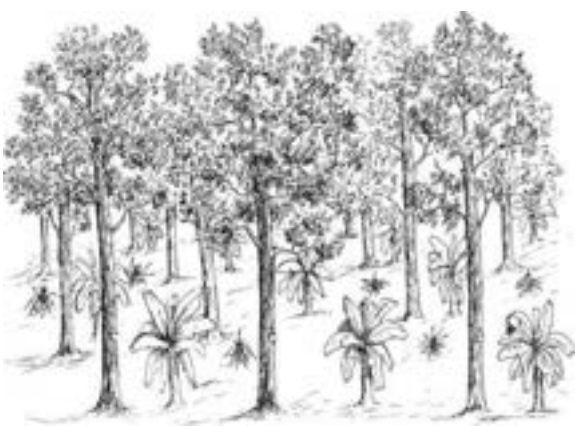
Main environmental risks of rubber monoculture

- Clearing forests to plant rubber results in less biodiversity, increased soil erosion and reduced watersheds.
- Erosion and soil fertility decline on sloping land under rubber monoculture, which has 42 times more annual soil loss (erosion) than forested land.

Risk management through rubber intercropping

Rubber's great potential for intercropping is a key factor that makes it different from other plantation crops. Examples of rubber intercropping systems in Asia are:

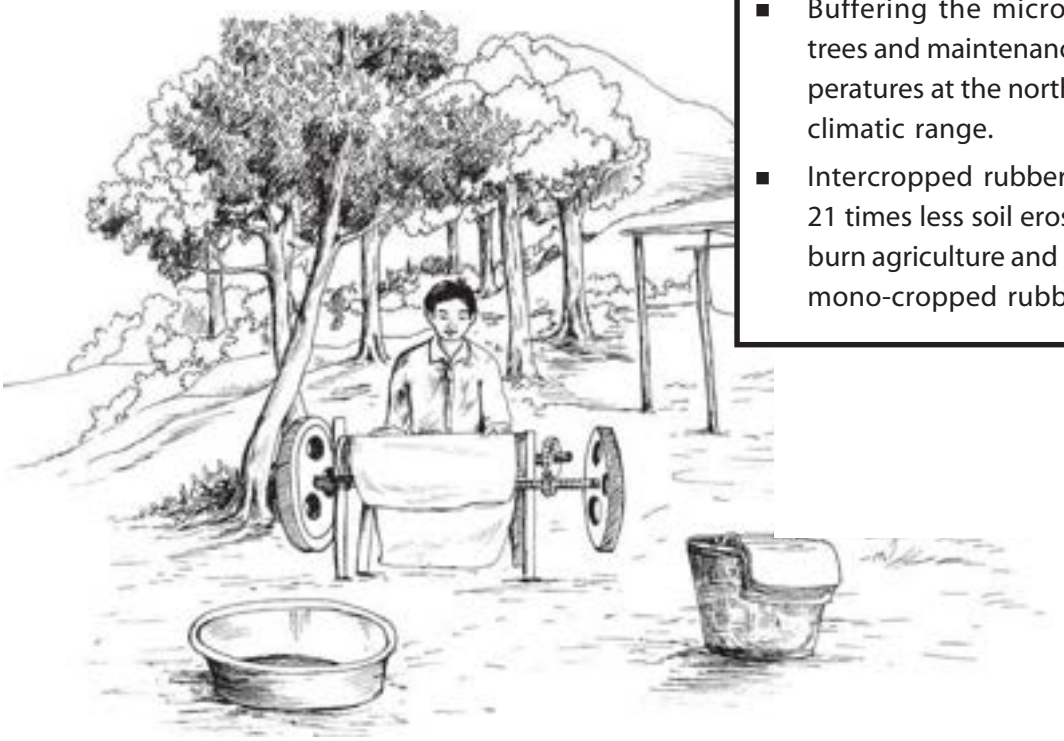
- Rubber and livestock.
- Rubber and food crops (rice, maize, cassava, peanuts and banana).
- Rubber and cash crops (tea, coffee, sugarcane, pineapple, chilli, cardamom and medicinal plants).



Two interesting systems for Laos are the rubber-cardamom agro-forestry system and the rubber-tea agro-forestry system. Because there is no data on the rubber-cardamom system at this time, the rubber-tea system is used as an example of what is possible.

The advantages of intercropping

- Increased income and income stability.
- Improved ecological sustainability and rubber yield because of reduced runoff and soil erosion.
- Buffering the microclimate for rubber trees and maintenance of moderate temperatures at the northern end of rubber's climatic range.
- Intercropped rubber has approximately 21 times less soil erosion than slash-and-burn agriculture and about 17% less than mono-cropped rubber.

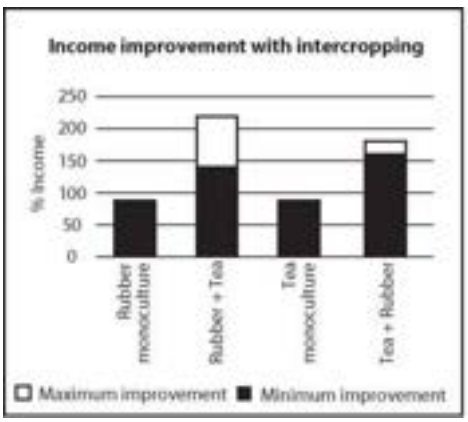


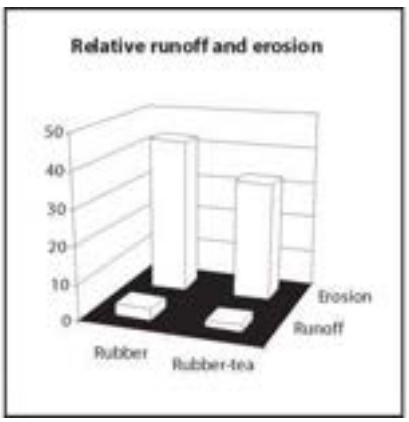
The rubber/tea agro-forestry system in China

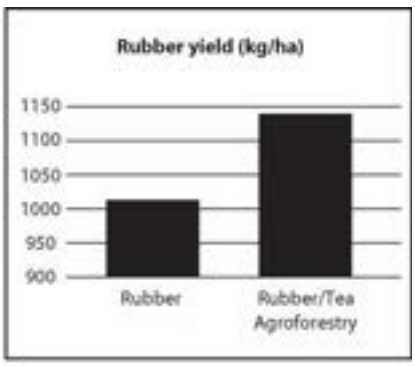
The cropping sequence

1. Plant and fertilise rubber tree seedlings (the goal is to provide 30% shade for tea). One effective spacing is double rows of rubber trees at 2 m between rows and 2.5 m in-row spacing, with 18 m between the rubber hedgerows and 0.4-0.6 m between tea bushes (spacing of 2 x 12 or 2 x 15 m in single rows with corridors for rubber tending are alternatives).
2. Plant upland rice, maize, peanuts and other leafy crops between the rubber trees.
3. Harvest the rice and other ripe crops at the end of year one and plant pineapples in spaces previously occupied by harvested crops.
4. Harvest peanuts in year two and pineapples in years 2 to 4.
5. Replant spaces previously occupied by pineapples with tea in year four (rubber trees at this time are tall enough to provide enough shade for tea plants).
6. Tap the rubber trees in years 6 to 30.
7. Harvest tea in years 7 to 30.

The rubber/tea system operates effectively for 30 years, after which the rubber trees must be replanted and the whole system started again. Income from the system is 58-131% higher than rubber monoculture and 75-96% higher than tea monoculture. Additional benefits include increased longevity of the system because of continuous vegetative soil cover, reduced runoff, and reduced erosion. Other intercropping systems offer similar benefits.







Reported benefits of other rubber intercrops		
Intercrop	**Direct benefit from intercrops**	**Benefit to rubber**
Coffee and pineapple	Pineapple harvested years 2-7 Coffee harvested from year 4	Enhanced rubber growth
Lemon grass	Harvested until canopy closes	Reduced runoff and erosion
Sugarcane	Harvested until canopy closes	Enhanced rubber growth
Amomum	Harvested years 8-30	Reduced runoff and erosion
Banana	High yield on good soil	Reduced runoff and erosion
Pepper	150-300 kg/year	Reduced runoff and erosion by more than 50% + benefits from fertilizer added to pepper
Note: Some of the reported benefits may not materialize in dry climates where there is significant moisture competition between the intercrops and rubber. The benefits will also be less under low input systems where no additional inputs are given to the intercrops, but many low-input rubber intercropping systems still give much higher returns than low input upland rice farming.		

Policy support

Laos should not establish policies that discourage intercropping, as happened in Thailand, where the regulations of the Rubber Replanting Fund favoured monocultures and blocked the greater economic and ecological efficiencies of intercropping.

- It is important for Laos to adopt a policy that discourages forest clearing for rubber plantations and instead encourages rubber growing on the farmer's own degraded shifting cultivation land. This is consistent with government policies on reduction of deforestation, poverty and shifting cultivation.

- If an intercropping and forest-friendly rubber planting policy is adopted and supported by giving credit to farmers for purchasing high-quality rubber seedlings to plant on degraded fallow land, then low-productivity shifting cultivation will be phased out naturally. The table below shows the advantages of converting degraded shifting cultivation land to intercropped rubber agro-forests.

- The employment opportunities in the new rubber agro-forests will act as magnets for the rural population, relieving pressure on forestland, restoring watersheds and regenerating biodiversity.

Agro-forestry intercropping with rubber seedlings

Land Use	Labour (man-days/ha)	Returns (relative to minimum wage)	Equivalent Population Support (pop/km)
Rubber agro-forests	150	1.0 - 1.7	80
Rubber monoculture	133	1.7	71
Traditional rubber agro-forests	157	1.0	59
Intensive short fallow upland rice	98-104	1.05	54
Extensive long fallow upland rice	15-25	0.75	11

Note: This is indicative data from Sumatra, Indonesia. Equivalent data is not available for Laos. The estimate of population support capacity is based on an assumption of 150 workdays/person/year and 80% of the land available for productive use. The corresponding numbers will be different for Laos but the relative differences should be the same.

Adapted from Murdiyarso et al 1998

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Cultivated Vegetable Options for the Uplands

Vegetable growing is often neglected in upland development because of its lower economic value compared to livestock, non-timber forest products and cash crops. However, vegetables are important for their nutrition value (balanced diet), both in rural and urban areas and for providing income to the female farmers who sell them to the markets. In Laos, both cultivated and wild vegetables are used, but this article is about cultivated vegetables, which are mainly grown:

- In permanent home gardens, often with fruit-trees.
- In dry-season riverbank gardens.
- In mixed cropping systems with upland rice.
- In irrigation schemes as dry-season cash crops.

At present, Lao farmers lack access to good quality planting material and the technological inputs required to grow high quality vegetables. Lao cities currently import many vegetables, particularly during the rainy season, while most Lao people currently eat much less than the internationally-recommended figure of 70 kg per capita per year. This suggests that there is a good market opportunity for vegetables if farmers are able to produce sufficient quantities at the right price.

Vegetable options for the uplands

Several vegetable species are grown in the various agro-ecological conditions of Laos, and some are suitable for both the lowlands and the uplands. Many are mainly grown in the dry season because of the higher incidence of pests and diseases in the wet season. Wet season cultivation is especially difficult in lowland flood-prone areas, and this fact could give upland farmers a potential advantage for half the year. Hardy varieties are recommended for trial in this respect but no systematic testing has yet been done to identify suitable species for the uplands.

Before introducing and testing vegetable species at a new site, growers should look carefully at the local agro-ecological (soils, topography, altitude, rainfall, temperature) and socio-economic conditions (local traditions, access to markets, seeds, irrigation, support services and other inputs). Vegetable seeds are available at local markets, but not yet in sufficient quantities. Much of the seed comes from neighbouring countries such as Thailand, but is often of poor quality: growers should test seeds before buying large quantities. The seed situation represents another opportunity for upland farmers: seeds can be grown in Laos both for domestic consumption and for export.

Table 1: Some vegetable species as possible options for the uplands

Scientific Names	Lao Names	English Names	Remarks
Lycopersicum esculentum	Mak len	Tomato	Mainly dry season
Cucumis sativus	Mak taeng	Cucumber	Mainly dry season
Allium sativum	Phak ka thiam	Garlic	Dry & wet season
Allium cepa	Phak bua	Onion	Dry & wet season
Allium porrum	Phak pen	Leek	Mainly dry season
Allium schoenoprasum	Phak pen	Chive	Dry & wet season
Capsicum frutescens	Mak phet noy	Hot pepper, chillies	Wet season
Capsicum annum	Mak phet nyay	Sweet pepper	Wet season
Solanum melongena	Mak kheua	Eggplant, aubergine	Wet season
Brassica oleracea	Mak kalampi	Cabbage	Wet & dry season
Brassica chinensis	Phak kat khao	Chinese cabbage	Wet & dry season
Brassica juncea	Phak kat khieo	Mustard leaf	Wet & dry season
Solanum tuberosum	Man falang	Potato	Wet season
Solanum torvum	Mak kheng	Turkey berry	Wet season

Gluts of certain vegetables occur in Laos in varying locations and seasons, and care should be taken to avoid growing the same products as too many other farmers in the same area. Judging which crops will do best at market is just one of the commercial skills that Lao farmers need to develop - help is needed in this area.

Table 2: Vegetables of cucurbitaceae family commonly grown in upland rice fields (wet season)

Scientific Names	Lao Names	English Names	Remarks
Benincasa hispida	Mak ton	Wax gourd	Wet season
Cucumis melo	Mak teng vaan	Sweet melon	Wet season
Cucurbita maxima	Phak eu	Pumpkin	Wet season
Cucurbita moschata	Phak fak	Winter squash	Wet season
Lagenaria vulgaris	Phak nam	Bottle gourd	Wet season
Luffa acutangula	Phak loy	Angled loofah	Wet season
Luffa cylindrica	Mak buap	Smooth loofah	Wet season
Momordica cochinchinensis	Mak ha khao	Spiny bitter cucumber	Wet season
Momordica charantia	Mak ha	Bitter cucumber	Wet season
Sechium edule	Mak saveu	Chayote	Wet season
Trichosanthes cucumerina	Phak ngo ngeo	Snake gourd	Wet season

Table 3: Various vegetables of the Leguminosae family (also known as legume crops)

Scientific Names	Lao Names	English Names	Remarks
Pachyrrhizus erosus	Man phao	Yam bean	Wet & dry season
Arachis hypogea	Mak thua din	Peanut	Wet & dry season
Cajanus cajan	Mak thua hae	Pigeon pea	Wet season
Canavelia ansiformis	Mak fak pha	Jack bean	Wet season
Glycine max	Mak thua luang	Soybean	Wet & dry season
Lablab niger	Mak pep	Hyacinth bean	Wet season
Vigna radiata	Mak thua khiao	Mungbean	Wet & dry season
Vigna umbellata	Mak thua pi	Rice bean	Wet season (cover crop)
Vigna sesquipedalis	Mak thua nyao	Yardlong bean	Wet season (vine)
Psophocarpus tetragonolobus	Mak thua phou	Winged bean	Wet season (vine)

Table 4: Other various types of vegetables (including some tree species, spices, etc.)

Scientific Names	Lao Names	English Names	Remarks
Amaranthus viridis	Phak hom	Amaranth	Wet season
Dioscorea esculenta	Man on	Lesser yam	Wet season
Colocasia esculenta	Pheuak	Cocoyam, taro	Wet season
Zea mays	Mak sali	Maize, corn	Wet & dry season
Lactuca sativa	Phak salad	Lettuce	Dry & wet season
Mentha sp.	Phak hom	Mint	Dry & wet season
Ocimum basilicum	Phak i tou	Sweet basil	Dry & wet season
Hibiscus esculentus	Mak khua nguang	Lady's finger	Wet season
Hibiscus sabdariffa	Phak som podi	Jamaican sorrel, bisap	Wet season
Anethum graveolens	Phak si	Dill	Dry & wet season
Coriandrum sativum	Phak hom pom	Coriander	Dry & wet season
Foeniculum vulgare	Phak si	Fennel	Dry & wet season
Daucus carota	Karot	Carrot	Dry season
Azadirachta indica	Phak kadao	Neem	Perennial (tree)
Leucaena leucocephala	Phak kan thin	Leucaena	Perennial (tree)
Maranta arundinacea	Man sakhoo	Arrow-root	Wet season, higher alt.
Centella asiatica	Phak nok	Asian pennywort	Wet & dry season
Oroxylum indicum	Mak leen mai	Sword of Damocles	Perennial (tree)

Table 5: Some vegetables for valley floors in the uplands (marshy areas, waterlogged soils, etc.)			
Scientific Names	**Lao Names**	**English Names**	**Remarks**
Ipomoea aquatica	Phak bong	Water spinach, morning glory	Aquatic plant
Nasturtium officinale	Phak nam	Watercress	Water stream crop
Dioscorea alata	Man phao khao	Water yam	Aquatic plant
Nelumbo nucifera	Dok bua	Hindu lotus	Aquatic plant
Nymphea lotus	Bua noy/ bua ngeun	Water lily	Aquatic plant
Eleocharis dulcis	Mak chap	Chinese water chestnut	Aquatic plant

Examples of increased vegetable production in upland farms

Increased vegetable production is occurring in several upland areas around the country. This is generally linked to better market opportunities. On the Bolovens Plateau, cabbage and chayote production has increased gradually over the last fifteen years. The vegetables are exported to other Lao provinces and to Thailand. A second example is the general increase of vegetable production (lettuce, cabbage, onion, tomato, etc) in Luangprabang province over the last fifteen years, mainly in response to the

growing demand caused by tourism development. As a result, more and more upland farmers have been generating income by selling vegetables. In 2002 NAFRI researchers began working with upland farmers in Luangprabang's Phonxay district, to choose new varieties and improved production techniques for dry-season tomatoes. As a result, off-season income has increased for the households producing and selling tomatoes in the dry season.

More information on cultivated vegetables is obtainable from:

(1) NAFRI-HRC Hat Dok Keo station. Tel. (+856 21) 360377, 360773, email: hrc@nafri.org.la
(2) Department of Agriculture of the Ministry of Agriculture and Forestry. Tel. (+856 21) 413350
(3) FAO Vientiane office. Tel. (+856 21) 414503

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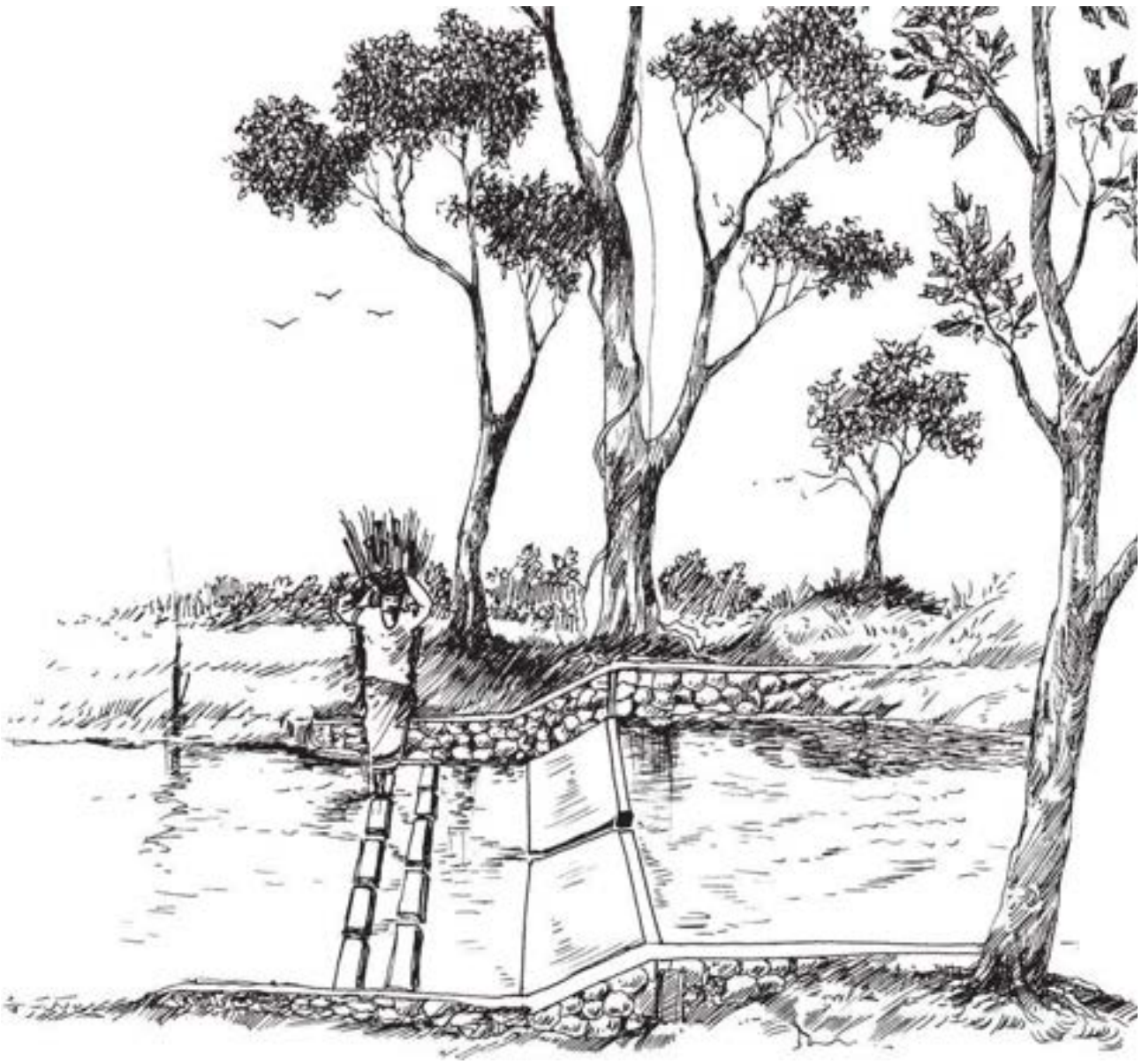
Effective Community-Based Irrigation Systems Development in the Lao PDR



Small-scale irrigation projects have the potential to directly improve the well being of small farmers through increased production and improved food security. Some of the main benefits of irrigation include:

- Improvement or replacement of traditional weirs. This has been shown to improve water control, reduce labour for construction, and improve security of production by dramatically reducing the risk of weir collapse due to flash floods.

- Dry season cropping of paddy areas: this is new for most villagers but it should be realised that the potential area of benefit is limited. Nevertheless this is an exciting development that is just beginning to evolve.
- Other benefits can include improvement to the farming system and use of water to develop fishponds and improve water availability for cattle and buffalo raising.

There are three scales of irrigation: single farm family, community and large scale. The latter two scales are much more complex to set up and manage as they inevitably involve a number of different water users. Whenever a canal serves more than one person, social interaction patterns will be the decisive factor in the utilisation of such facilities.

Irrigation can be defined as the technologies used to convey water from a river or water source to fields in order to increase crop productivity. Irrigation consists of both the hardware (the weir, the canals, water sources and land) and the software (the behaviour of farmers in relation to the planning, operation and management of the scheme). Understanding the latter is the most complex and time-consuming part of the entire project and is often neglected by many engineers. It is however of the utmost importance in any irrigation initiative.

Any effective irrigation project must be demand driven and the beneficiaries should be actively involved at every stage, pre- and post-construction. The beneficiaries must make a commitment in terms of capital cost contribution, and also in setting up a Water User Group (WUG) to manage and monitor the scheme. Involving farmers in system design can also result in a significant cost saving, particularly where farmers themselves are expected to take a share of the building costs.

Manual labour is often the only way of building a system, as using mechanical excavators to construct canal systems in areas with few roads and steep topography can be impossible. Huge efforts are made to hand dig canals along steep hillsides and on rocky soils, sometimes hundreds of metres in length and up to five metres in depth. It is clear that the success of a project relies on the levels of farmer motivation, participation, organisation and understanding of the scheme. With this in mind, effort should be made to ensure these things happen.

Consultation processes are also needed to prevent conflict over the newly diverted water resources. Unilateral technical designs often

lead to inequitable water use in the post-construction phases of a project, so it is important that all those affected by the scheme have a degree of input in design. If people feel that the irrigation systems do not fit with their aspirations, they may lose a sense of ownership and responsibility over the scheme and so refuse to take part in repairs or maintenance of weirs and channels. In a worst- case scenario, a community can totally lose its cohesiveness and may finally abandon the scheme entirely.

Developing community-managed irrigation schemes

In general, community-based irrigation systems comprise three phases: pre-construction, construction, and post-construction.

1. Pre-construction phase

1.1 Site Selection

Preferably, sites should be where the irrigation will result in additional paddy area being developed, thus contributing to 'public good' and justifying external funds. Strategically, it can be good if the initial assessments of feasibility can be made across a number of sites in a particular area. Initially, villages which are able to come to equitable agreements over water use should be selected. These will serve as models, with the expectation that those who were more selfish in the beginning may perhaps change their attitudes for the next round of activities.

1.2 Identify community members interested in participating

It is important to become acquainted with the community, understand the irrigation area and gradually identify potential leaders. At this point it will be important to conduct a series of meetings with local villagers to 1) get their ideas and perspectives about the project and open dialogue with them; 2) build local commitment and capacity to fulfill the shared responsibility of the irrigation scheme.

It is important that communities make prior agreements on (a) contribution for labour and materials for the project; (b) distribution of land following irrigation; and (c) the process for water management and repairs to the system after construction. Communities at and nearby the site also need to understand the possible impacts on up and downstream water levels and potential flood areas after blocking the river. A rough estimation of project costs must be made and possible shares of each concerned party agreed to.

1.3 Conduct technical survey with local villagers/farmers.

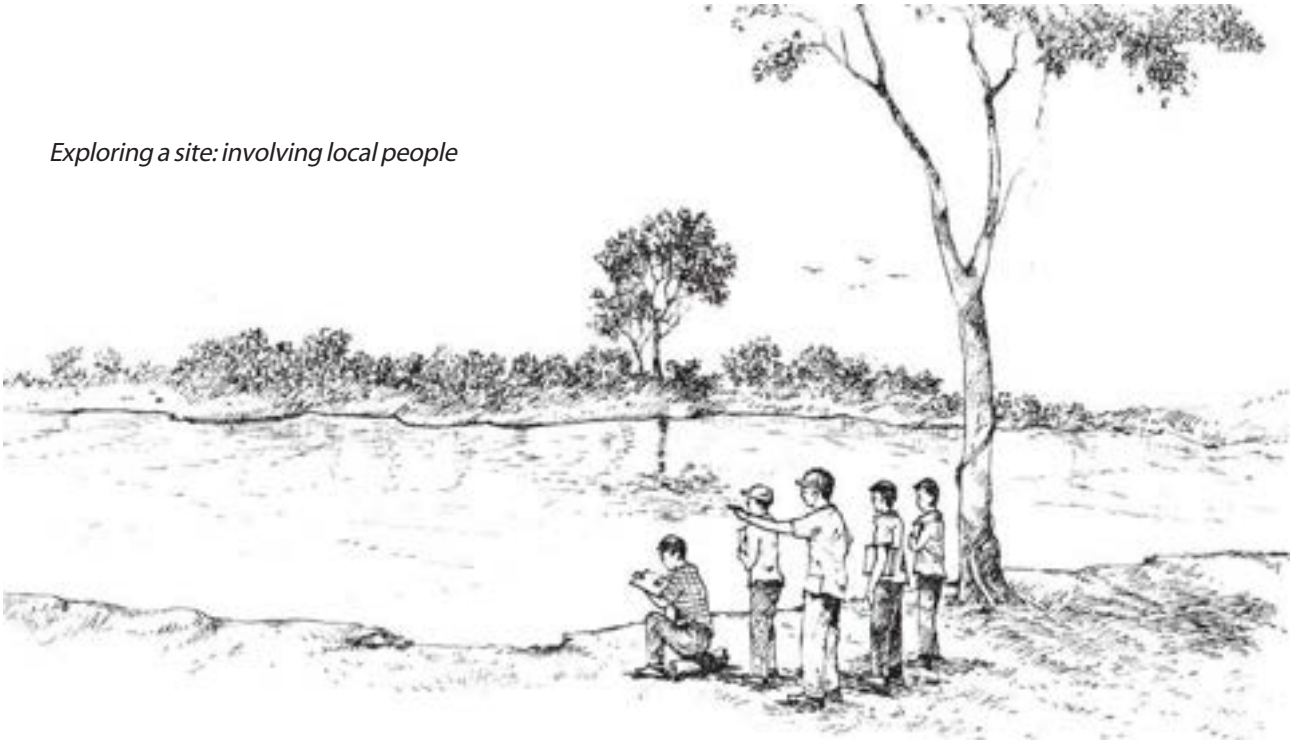
Activities in the survey should include:

- Preliminary topographic survey of the project site.
- Onsite inspection of a) maximum water level; b) layout of the canal lines (and assess land requirements for these); c) level of canal outlets; d) the nature of the river banks and river bed.

1.4 Preliminary design

With villager input, the weir and canal structures should be clearly sketched. At this stage the canal lines are clearly marked and agreed upon by all parties to avoid any future misunderstandings or conflict.

If a community does not seem to reach a real consensus on any of the above points, then the construction should NOT go ahead. Building an irrigation system with groups that have different expectations is likely to generate conflicts and enduring dissatisfaction within the community.



Exploring a site: involving local people

1.5 Form an interim working group

The aim of the working group is to establish a working plan for the project. The group will divide up responsibilities for different tasks including:

- Selection of competent persons for wood and cement construction work.
- Collection of contributed materials.
- Supervision of road preparation for project material delivery.
- Coordination between technicians, skilled workers and labourers.

An adequate information sharing system must be established to ensure that all members receive the same project information and receive it on time. People should have a forum in which to share their views and find solutions to problems quickly.

1.6 Finalise the design

Details of the final technical design must be discussed and approved by farmers, other project beneficiaries and people living up and downstream of the scheme. There must be open dialogue with these groups in order to seek final agreement on design before construction. It is important that the facilitator listens to all comments and responds appropriately.

When full agreement is reached, a convenient construction date which does not interfere with other annual work must be agreed upon. At this stage, right of way for canal lines must be sought and delivery dates for local and imported construction materials agreed on.

2. Construction phase

Quite often, attention is focused on the construction of the weir, but in fact, many problems and delays can come from the construction of the canals. Digging and securing the canals (along steep hill sides where some concrete channels might be needed) can be quite a burden, particularly if left to the few families who will actually use them. Thus it is often better to construct the canals first.

Similarly, if upland areas are to be converted into paddies, this can be done by first clearing upland fields, then levelling, bunding and planting them with upland rice in the season prior to construction. This assists land allocation in a practical and visible way.

Mobilisation of labour might be difficult in some schemes, especially where the number of households is not large. Additional labour can be mobilised through 'food for work' to get the job done. This also enables other households, even from other villages, to gain benefits from the activity.

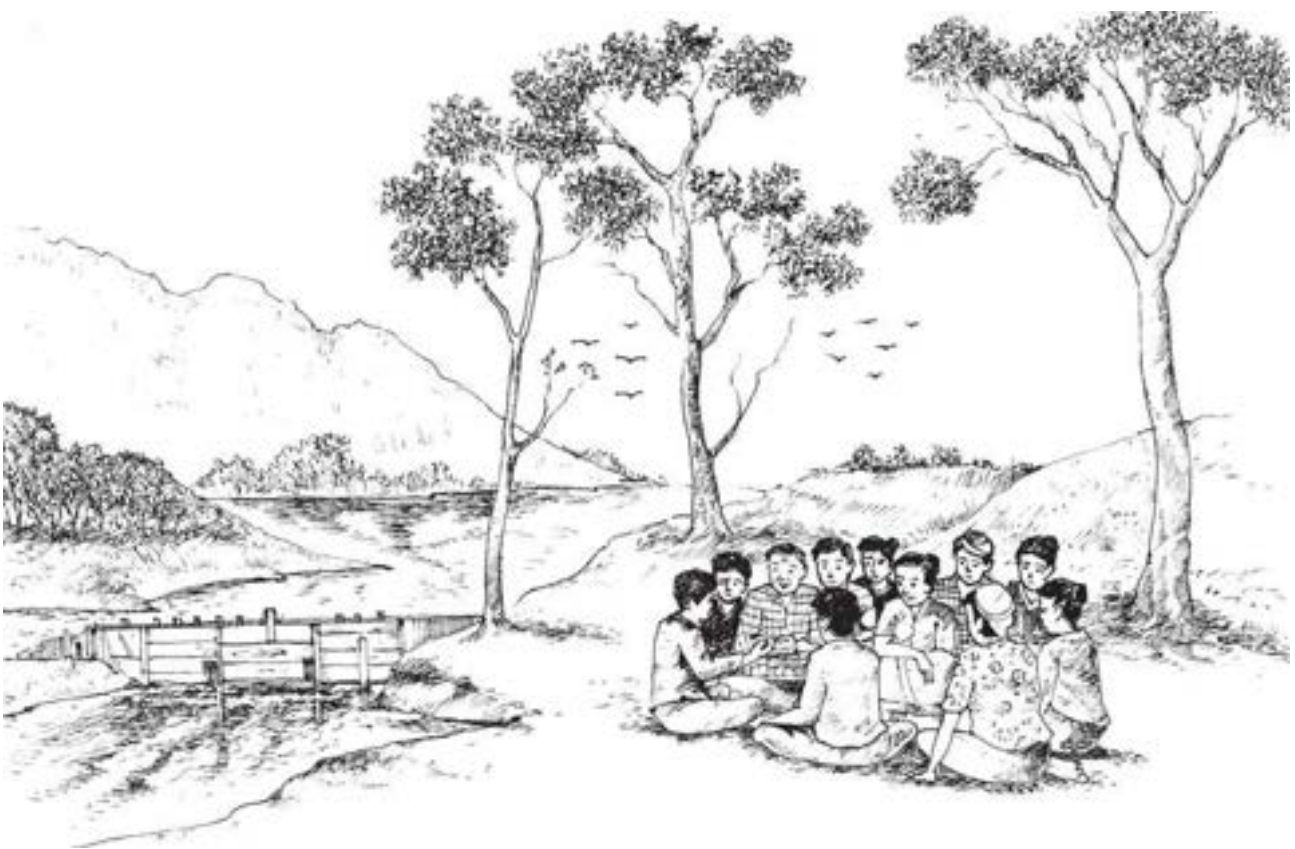
A daily work plan must be made available to all members and a construction agenda adhered to wherever possible. Based on the plan, villagers are then able to mobilise labour at the relevant times. District and/or provincial staff should supervise construction to ensure that all technical features are strictly respected.

3. Post-construction phase

3.1 Water User Group (WUG) Formation

One of the main aims of the WUG is to establish rules which enable participants to manage the irrigation scheme effectively and avoid any unintended conflicts over water distribution. Thus, the WUG should be built on community needs rather than on pre-determined policies. Water conflict often occurs in densely populated areas where many communities share the same river. If weirs are too close together and relationships and communication are weak between up and downstream users, disagreements over the resource are likely.

Men and women should be equally represented in the WUG wherever possible and the organisation should include members from a wide range of socio-economic backgrounds. Candidates are to be elected on a democratic and voluntary basis. If no one applies, the



organiser can ask members to raise candidates' names. The number of board members depends on the size of the command area, but is usually around three to five persons. The elected boards should assign responsibilities to each board member and draft the WUG's structure and regulations. Inputs should be sought from all members.

The next step of the WUG formation is to seek supportive policy and legal status from district or provincial authorities and than circulate this to all concerned parties around the surrounding villages. This is extremely important for the success and sustainability of the WUG.

3.2 Responsibilities of the WUG

The WUG, often with project assistance, is responsible for managing a number of technical and social issues including:

- Managing interactions among those involved in the project.
- Defining the boundaries of the scheme and organising it in accordance to zone or crops which will receive water from the same canal.
- Assessing the water needs of different crop varieties and delivering water in accordance.
- Maintaining the scheme to ensure the system functions properly and efficiently. This includes the guarding, improving or repairing of the system if needed.
- Ensuring that a water course is not over dammed and that weirs are not placed too close together (less than 1km), to reduce conflict between users.
- Maintaining good relationships with up and downstream water users in order to limit potential conflict, e.g. one party blocking a water course upstream without consultation with those downstream.

Social and environmental considerations

In the course of implementing community-based irrigation projects, a number of valuable lessons have been learned.

Social Considerations

- It is important to bring villagers from up and downstream to a meeting to discuss the project activities and inform them about potential positive and negative impacts during and after the construction, e.g. flooding of the upstream site and lack of water in the downstream site. The determination of, or the adjustment to, an appropriate weir height by all concerned parties can be a satisfactory way of seeking a common solution.

- Water conflict often occurs in densely-populated areas where many communities share the same stream or river. Conflict can be avoided, however, if measures are taken to guard against:
  - A community in the upstream area blocking the stream without consulting the downstream communities.
  - Too many dams being built close together in the same stream (less than 1 km).
- District and provincial authorities can help by being supportive and enforcing legal measures issued to protect against possible community conflict.

Environmental considerations

Rules and regulations should be established within the WUG to identify up and downstream fish species migration throughout the year. This is important for:

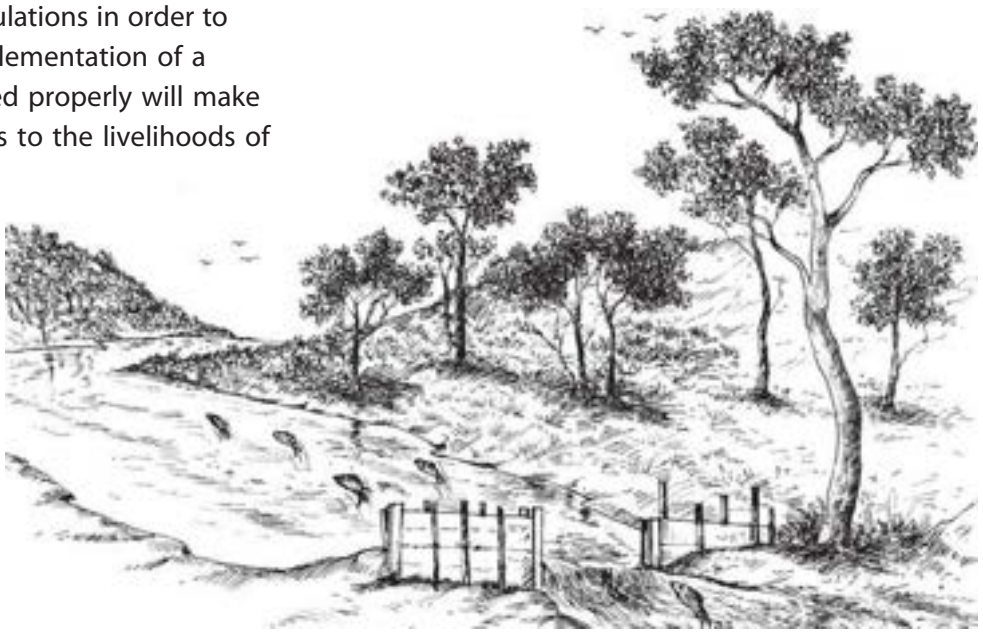
- Maintaining the protein source for people living along the river.
- Scheduling the operation of the water sluice gate to ensure fish migration up and downstream in order to maintain the diversity of fish species.
- Maintaining and protecting at least 500 m of forest on both sides of the river and at least 1,000 m on the upstream site in order to prevent siltation caused by opening up new paddy land and/or logging on the upstream site.
- Regular management of the sluice gate for deliberate de-silting from the weir after each heavy rain.

All the above measures should be clearly detailed in the WUG regulations in order to ensure the effective implementation of a project, which if managed properly will make significant improvements to the livelihoods of its upland users.

Conclusion

In communities where paddy cultivation has not been practiced before, then assistance may be needed for methods of cultivation during the first few years of a scheme. This goes beyond technical issues, and requires a social mobilisation approach. One way is to find an elder from a neighbouring village who could be paid as a resident advisor (i.e. farmer-to-farmer extension). Technical advice can always be added. Other aspects are the need for the new irrigation communities to know how to manage buffalo for ploughing (not just raising them), constructing harrows, etc.

The switch to paddy farming is likely to take a number of years. However, it does not require an intensive involvement over a long period, but just some sort of regular backstopping. It is unlikely that every household will benefit from any one scheme. Some thought might also be given to ensuring that other households (i.e. those who cannot directly benefit from irrigation) also benefit. In fact there are other activities that could benefit these "other households". "Food for work" can be one of them. Depending on the confidence of those households who will receive irrigation, it may also be possible for them to agree to pay a proportion of their benefit into a village fund.



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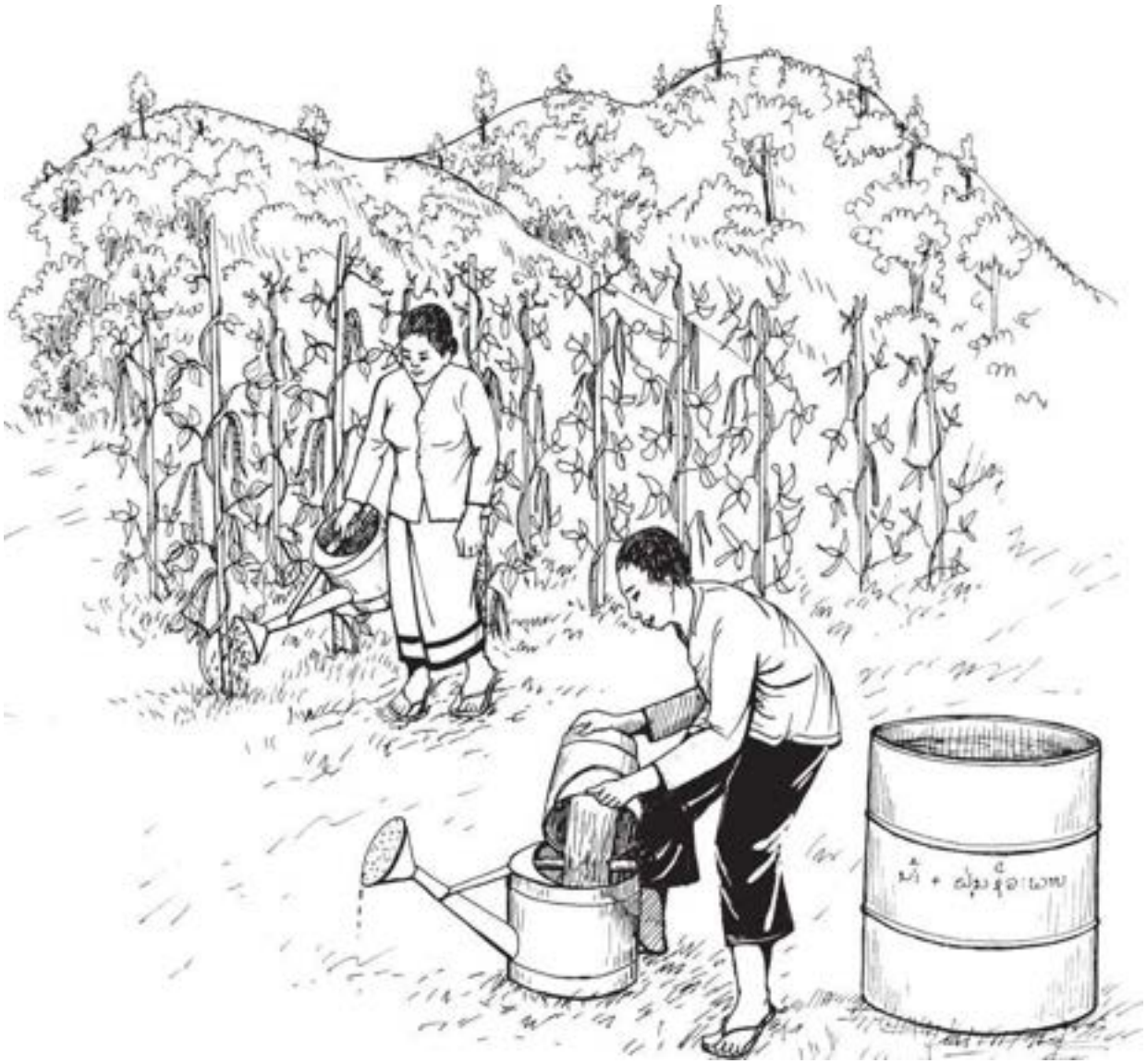
Using Bio-Extract for Bio-Fertilisers in Small-Scale Agriculture



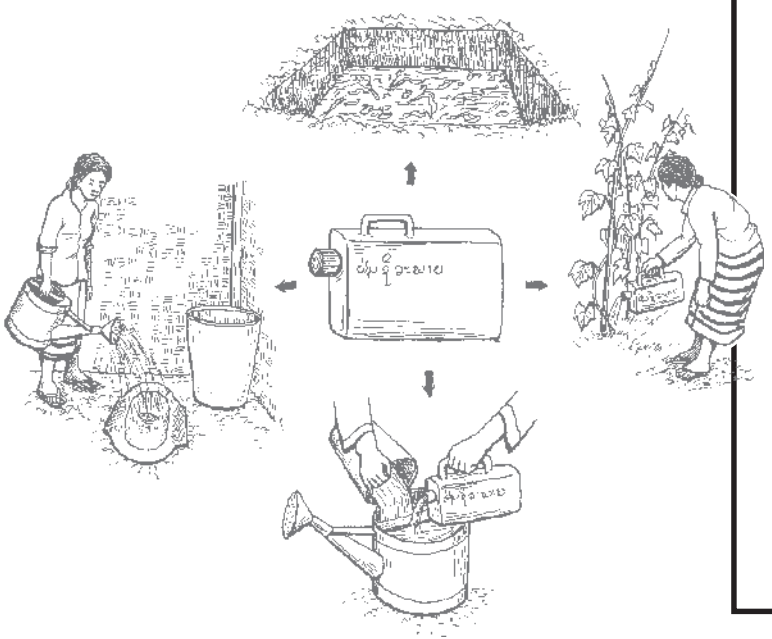
Bio-extract and bio-organic fertiliser are alternatives to chemical fertilisers for improving crop production while maintaining and improving soil fertility. Over the past few years, staff from Quaker Service Laos (QSL) and other NGOs have been training trainers and farmers to produce and use bio-extract and bio-organic fertiliser with very positive results.

Because farmers were hesitant to use manure, even though they understood the benefits, QSL and other NGOS promoted the use of bio-organic fertiliser as an alternative. Other benefits of bio-fertiliser include that it reduces the need for money to buy chemical fertiliser and recycles local waste materials.

What is bio-organic fertiliser and bio-extract?

Bio-organic fertiliser is a type of natural fertiliser that improves soil and plant nutrition. It is fast, inexpensive and easy to produce. It can be made by mixing vegetable waste and agricultural residue with animal manure, charred rice husks, and rice bran. The mix is then covered with black plastic sheeting and left to compost for the appropriate number of days, depending on the formula used, after which time it is ready for use. There are several different formulas for composting. For example, there is one formula where the compost is ready in 3 - 5 days and another where it is ready in 30 - 50 days.

The production method for bio-organic fertiliser promoted by QSL makes use of bio-extract. Bio-extract is an organic brown liquid made from the juice of vegetables and plants composted with sugar (molasses) for about seven to ten days. It is a liquid 'starter bug' rich in micro-organisms that benefit soil and plant nutrition. Bio-extract can be extended by feeding more organic material. Furthermore, when some of this starter bug is added, composting is faster and of a higher quality than when bio-extract is not used.



Benefits and uses of bio-extract

- It can be used to make bio-organic fertiliser to enrich the soil with organisms useful for plants.
- It can be applied directly as a fertiliser.
- Mix it with water to water vegetables or plants to make them grow well.
- Use in dry compost fertilisers to improve plant growth
- Reduces the spreading of pests
- Mix with water and apply around areas that have a bad smell such as toilets and animal pens to reduce the smell.
- Easy to produce by using waste of plants available in the locality.

Factor Comparison for three types of fertiliser use based on QSL's and farmer's experiences			
Factor	**Bio-Organic Fertiliser (BOF)**	**Chemical Fertiliser**	**Manure**
Acceptability to farmers			
Strength of crop	Improves quality of soil for long term use	Quality of soil degrades over time	Improves quality of soil for long term use
Crop Yield and size of vegeta-bles/fruit/seeds	Same as for Chemical fertiliser over first two years 4kg	Same as for bio-organic fertiliser over first two years 4kg, size	Half the yield (2kg), smaller size
Flavour and colour of produce	Flavoursome, more colour than with chemical fertiliser	No taste and less colour	Flavoursome and same colour as BOF
Storage time	Increased storage time	Does not keep as well	Storage time the same as for BOF
Toxins and risks to people	No toxic residue	Toxic residue	No toxic residue, risk of disease for people
Proneness to plant disease and weeds	Few weeds, strong healthy plants less prone to disease than others	Prone to disease	More weeds, attracts insects which can introduce disease, but better than chemical fertiliser
Use with cash crops such as long beans, tomatoes, cucumbers etc	Very good results. Only 5% cash crop plants die after one season's crop	30% cash crop plants die after one season's crop, they suck up fertiliser, soil gets compacted hard and disease quickly gets access via plant roots. Produce is the same size as BOF but has more defects	Mixed manure from different sources is more effective than from one source. Better than chemical fertiliser but not as good as BOF. Soil retains moisture.
Use with fruit trees	Fruit trees grow slower but can grow for a long time and moisture is kept in the soil. In the uplands using a combina-tion of Chemical fertiliser and BOF is not practical as there is no money or access to chemical fertiliser	Fruit trees grow and produce the same as for BOF, but the soil gets compacted; in the cities, chemical and bio-organic fertiliser can be used together to improve the soil	Trees grow slower but can grow for a long time; Soil retains moisture
Length of time it can be used	Suitable for sustained use	Benefits are short term, hen problems with soil structure	Suitable for sustained use
Cost	50% cheaper than chemical fertiliser costs	Prices set externally	No money necessary
Environmental impact	Benefits the soil, uses natural waste products that are usually burnt	Binds the soil, changes culture away from subsistence	Benefits the soil, uses some natural waste

Conclusion

Techniques to make bio-organic fertiliser have improved over the years, thanks to a number of skilled local people in different organisations who have continued to research and develop it to suit Lao conditions and cultural perceptions. Because of this a number of qualitative benefits have been observed, such as:

- Higher crop yields.
- Richer colour of produce.
- Better soil structure.
- Fewer tree deaths and disease.
- Increased interest from farmers. In fact, when everybody makes bio-organic fertiliser they have to go to other villages to get enough waste materials!

In spite of this, there is still a lack of quantifiable information about the benefits of bio-organic fertiliser. Most information is qualitative and further research is needed to collect statistics to quantify these observed results and coordinate work with others in the field more closely.

For more information on bio-fertilisers please contact:
The Sustainable Agriculture Forum (SAF)
Contact persons: Mr. Tongdam and Mr. Kumaloun. Tel. (856 21) 314630

The PADEC Participatory Development Training Centre (they have published a very good training manual in Lao language).
Contact person: Sombat Somphone. Tel. (856 21) 219130

The 'recipe' for bio-extract and how to make various forms of bio-organic fertiliser is available from RRDTC (rrdtc@etllao.com) or the product can be purchased from Savang Pahn Pa Shop, Saythany District, Kilometre 6, Dong Dok Road, Vientiane. The RRDTC has information and training courses and materials in both Lao and English.

Contact person: Phongsamouth Sisayavong, rrdtc@etllao.com or rrdtc@laopdr.com, tel: (856-21) 453-091

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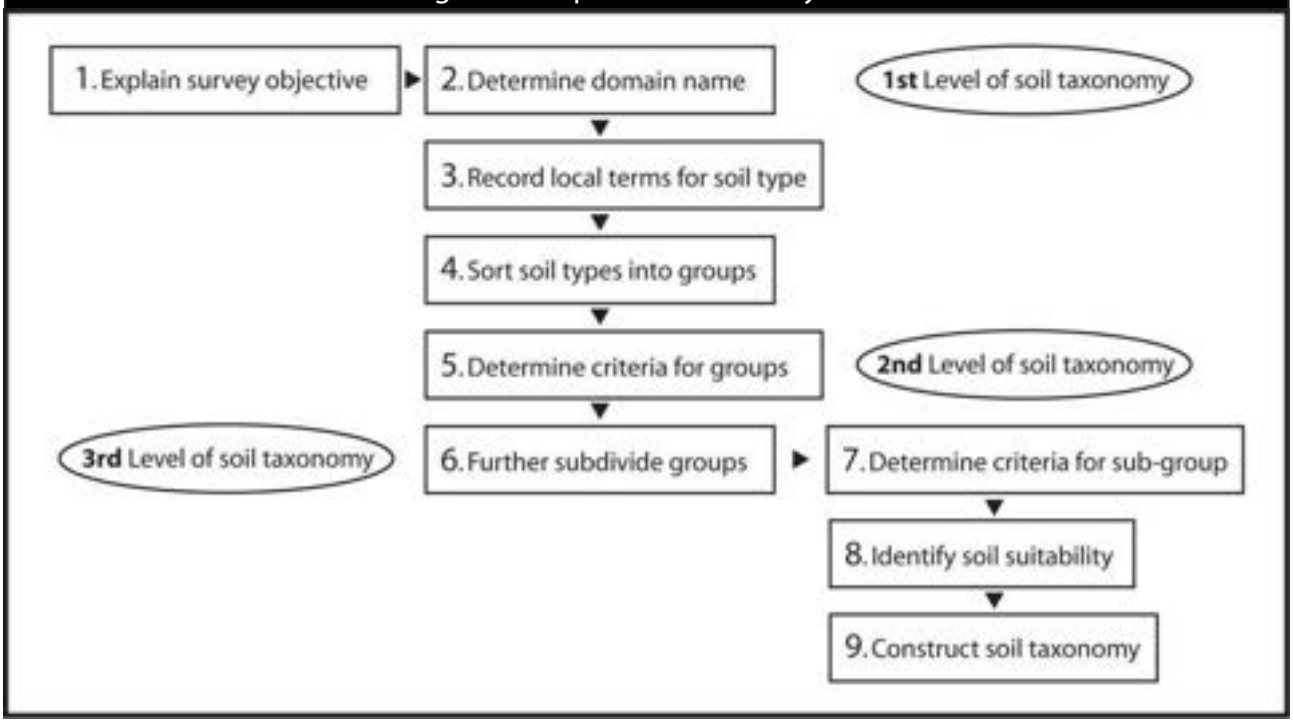
Ethnoscientific Study of Indigenous Soil Classification

Indigenous knowledge is the foundation of livelihood thinking. **"Ethnoscientific"** research methods are used to investigate how local people classify and explain the different elements of their environment, and one of the most important elements for a farming community is soil.

This article discusses the main 'card sort' method used to help understand the indigenous soil classification systems of Hmong, Khamu and Lao Loum villagers in Phonxay District, Luangprabang.

The purpose was to discover the indigenous classification system for soils used by a particular ethnic group and to construct a 'soil taxonomy' in the local language (a separate exercise is needed for each ethnic group). Understanding and use of indigenous soil terminology can help researchers and extensionists to communicate more effectively with villagers.

Figure 1: Steps taken to classify soils



Step 1. Explanation of survey objective to the village headman

Explanation and logistical arrangements were discussed with the village heads, and people that the communities considered to be knowledgeable about soils were identified.

Step 2. First level of the soil taxonomy

As a starting point or domain, the local term for the word 'soil' was determined. This provides a foundation as the first and most inclusive level in the local taxonomy of soils. Cards and marking pens were used for this activity.

Step 3. Local terms for different types of soil

All other local terms for different types of soil were elicited. For example, one of the informants was asked, "What different kinds of soil are there on your land?" The study team then probed, "Any others?" and continued asking individuals, then the group as a whole. Someone from the local group was invited to write down all of these terms on separate cards, one soil term on each card.

Step 4. Classification of soil types

Once all the local names for soils were elicited, the group was asked to sort the cards into piles. The informants discussed among themselves how they wanted to sort them. The study team was careful not to assume that the ethnic classification system was the same as any other, and did not suggest terms or descriptions to participants as this would 'contaminate' the data. When they had finished sorting the piles, the cards in each pile were numbered.

Step 5. Second level of the soil taxonomy

After the group had sorted the cards into different piles, they were asked why they had sorted them this way, what the cards in each pile had in common, and how they were different. This information revealed the soil properties and 'contrast sets' by which local people recognise the differences between

soils. It is the second level of the taxonomy. The local groups explained what features they used to distinguish and classify soils, and these properties were recorded.

Step 6. Third level of the soil taxonomy

Villagers were asked to sort each group into further sub-groups according to whatever criteria they wanted to use and the cards were numbered again. Step 5 was then repeated, and the group asked what criteria they had used to subdivide the cards this time. This new descriptive information was added to the cards, giving a third level of the soil taxonomy.

Step 7. Repetition

This procedure was again repeated for each pile and the group asked if it was possible to subdivide the piles further. New contrast sets and levels were noted and the new information added to the cards. This process was continued until the participants could not further subdivide the piles.

Step 8. Identification of soil suitability

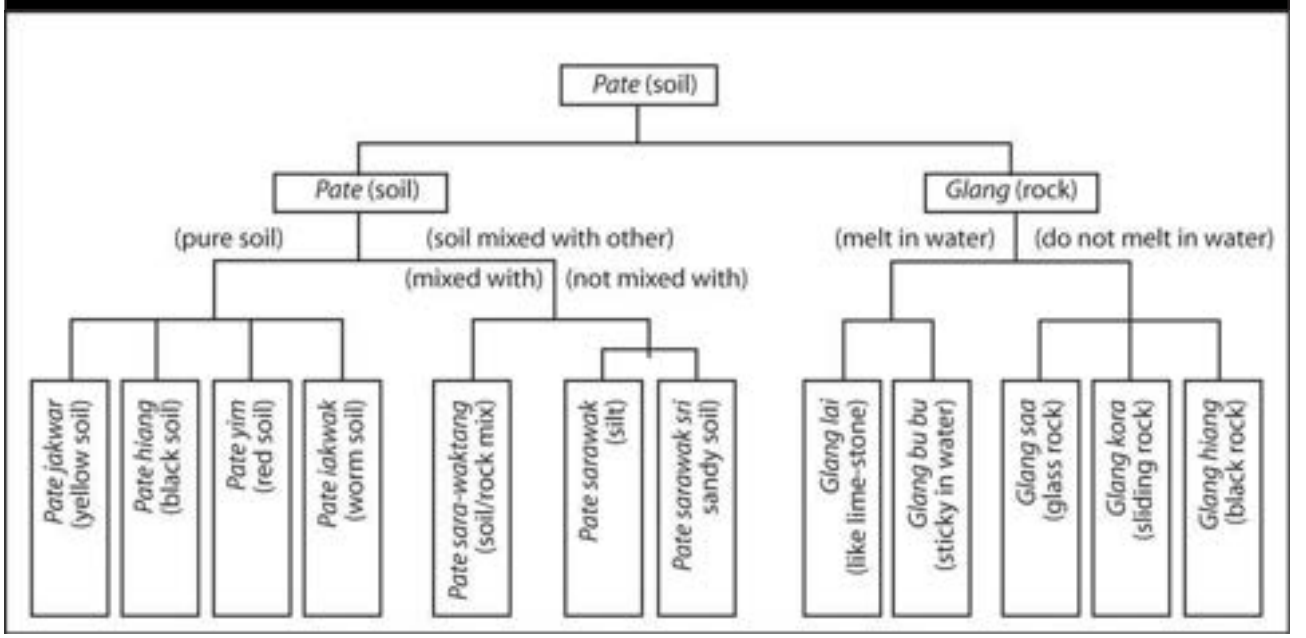
The group reviewed the results to be sure that the list of soil types and the description of their properties was complete. The study team then picked up each card in turn, and asked: "What can you grow in this soil?" or "What is this soil good for?" The answers were written on the card and the process was carried out again for the questions "What can you NOT grow on this soil?" and "What are the problems of this soil?"

Step 9. Construction of a soil taxonomy

The final step was to review all of the information and clarify any confusions or issues by asking questions like "How many kinds of X are there?" "Is X a kind of Y?" When the study team understood the local classification system, they drew a taxonomic diagram (see figure 2).

This procedure is repeated with each ethnic group and with different communities in other areas to find out how widely the local taxonomy is shared within the same ethnic group.

Figure 2: Indigenous soil classification of Khamu ethnic group in Nambor village



Applications of indigenous soil classification

Once this information has been collected it can be used as the basis for drawing indigenous soil maps of the local area and for explaining all land management recommendations in terms of the local soil names. It may also be useful to examine the relationship between the international scientific classification system and the ethno-scientific classification systems of the different ethnic groups and then develop a translation guide. The resulting improvement in communication about soil management options may dramatically accelerate the rate of technical innovation and provide a basis for collaboration between 'scientific' and 'ethno-scientific' traditions.

An example from the field on the use of indigenous soil terminology for effective communication

Indigenous soils terminology enables researchers and extensionists to communicate more effectively with local land users about existing and alternative approaches to land management. A striking example of this occurred at the end of the soil classification exercise with the Khamu focus group at the school house in Huaymaha. The session had been very lively with a lot of interest from the local participants. When it was over, they seemed reluctant to leave. As the team was getting ready to leave, one of the Khamu participants commented: "You know, the funny thing about those *glang kora* soils is that in a season of heavy rains the rice turns yellow and dies."

Glang kora is the highly erodable 'sliding rock' soil that occurs on steep slopes. What this villager was describing sounded like a classic symptom of nitrogen deficiency due to leaching under heavy erosion. They had already told us that the crops they considered suitable for this soil were rice, corn, chilli, cardamom and paper mulberry.

This gave the research advisor the opportunity to comment, "Well, you know, with that kind of *glang kora* soil on steep slopes, you really shouldn't plant annual crops. You should concentrate on the perennials, like cardamom and paper mulberry, which give you good soil cover and reduce the risk of erosion."

The villagers must have heard this message many times before because this is the basic extension message of the government about what to plant on steep, highly erodable land. But this time 'their eyes lit up as they heard the message. Why? Because it was expressed in one of their own terms - *glang kora*. This time the message got to them in a way it never had before.

Characteristics and uses of soils according to Khumu in Nambor village				
Soil Name	**Description**	**Abundance**	**Good For**	**Not Good For**
pate	Soil (domain name)			
pate yim	Not so fertile, good for trees	low	Teak, 'posa', 'khem'	Annual crops
pate hiang	Black soil, salty soil ('din khem', acid) found at valley bottoms	low	Suitable for every crop however with a possibility of low yields	
pate jaknar	Yellow soil, pure soil, hard slippery in heavy rain	medium	Pineapple, making bricks, rice if after bamboo-fallow (bamboo opens up the soil)	Corn, 'mak duay'
pate iakwak	Worm dung soil	high	All crops can grow	
glang saa	Glass rock, 90% rock, mountain soil	low	No use except furniture (beautiful)	
glang kora	Sliding rock , eroded soil on slope, often near stream, if a lot of rain, rice will become yellow and die or will develop bitter taste	high	Rice, corn, chili, 'makneng', 'posa'	Rice, if a lot of rain rice will become yellow and die or will develop bitter taste
glang lai	Limestone *'hin poon'*	medium	Break to make house, cement	
glang bu bu	Rock, top of stream, water from this soil sticks to everything, agglomerates in stream like limestone	low	Nothing	
glang hiang	Black rock, high % of rock (90%)	low	Nothing, road paving	
pate samwakrang	Rock soil mix, most abundant, soil near clearing, only good for 1 year	high	Rice, 'mak duay', 'nga', 'corn'	
pate sarawak sre	Sandy soil (2/3 sand), near stream or river (riverbed garden soil)	medium	Annual crops, chili, tomatoes, garlic, onion	Rice grows, but not well
pate sarawak bung	In stream silt	medium	Everything grows well including rice	

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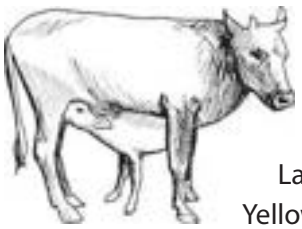
Smallholder Livestock Systems and Upland Development

Livestock is an important component of smallholder farms in the Lao PDR. Sales of livestock account for more than 50% of cash income in many upland areas. Over 95% of livestock is produced by smallholders, with only a small number of commercial pig and poultry enterprises near major urban markets. While livestock provide many on-farm benefits, they are also a source of savings to be sold when cash is needed. Only when households accumulate enough livestock to feel financially secure are they able to make long-term investments in their farming and livelihood systems (e.g. sending children to high school, planting fruit trees, buying a two-wheel tractor or micro rice mill).

In 2003, there were approximately 1.2 million cattle, 1.1 million buffalo, 1.6 million pigs, and 19.4 million poultry in Laos. There are fewer cattle and buffalo in the northern region than in the central and

southern regions, both on a per capita and land basis. Per capita pig density is higher in the upland and highland areas than in lowland areas. Livestock are raised in extensive, low-input systems that take advantage of naturally occurring feed. All livestock are native breeds and are well adapted to the extensive production systems used in Laos.



Cattle production systems

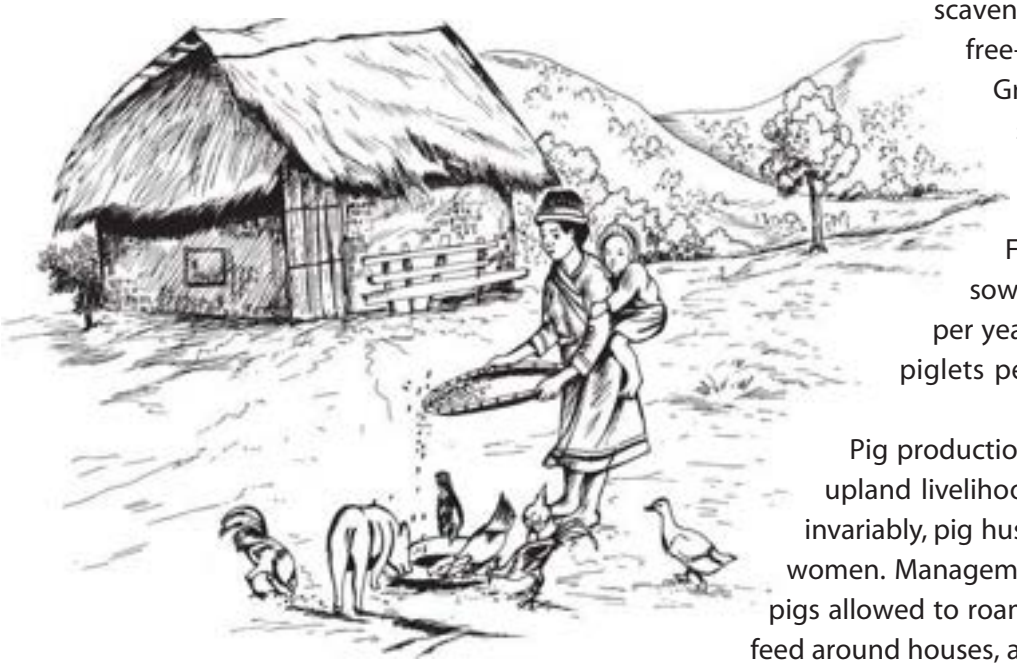
The main cattle breed in Laos is related to the Chinese Yellow cattle. It is well adapted to the environment and conditions on smallholder farms. It is small, agile and hardy, with good reproductive rates and few calving problems. Body weight is up to 350 kg for males (250 kg for females) and the dressing percentage is about 50%. Growth rates are low, with animals taking four to six years to reach mature weights. Females produce their first calf in their third year and thereafter a calf every year. They usually miss a breeding season once every two to four years. Average annual calving is in the vicinity of 70%. Breeding is not controlled and calving often occurs in the early part of the dry season with coupling during the late dry season or early wet season. Herd structure often shows a predominance of two year old females or older for reproduction because farmers sell more adult males than females.

Buffalo production systems

The swamp water buffalo commonly seen in Laos is indigenous to Southeast Asia. The buffalo is larger than cattle with males reaching 450 kg and females 350 kg. Females tend to have their first calf at four to five years, but calving intervals are lower than for cattle. Some reports put the annual calving rate at less than 50%.

Cattle and buffalo management in the uplands

In the sloping lands zone, cattle and buffalo are grazed in fallow upland fields and forests.



Management inputs are minimal and animals are left on their own much of the year. There are differences among ethnic groups and villages in the way cattle and buffalo are managed. The Hmong are well known for their skills and build extensive fences using local materials to keep animals from cropping areas. Many villages herd cattle and buffalo communally in dedicated grazing areas. In other villages, families manage animals individually. For part of the year, animals graze in remote areas where ample feed is available. At other times, animals are brought back to an enclosure every night. Farmers in some villages provide supplementary feed to cows with newborn calves and keep sick animals in special pens where they are given cut-and-carry feed. Most farmers provide salt to animals, often as an incentive to return to the enclosure by themselves.

Smallholder pig production systems

Most local pigs are high-fat, black, sway-backed Asian breeds, and reach a mature weight of 60-100 kg. They are hardy and able to scavenge part of their feed in free-range conditions. Growth rates tend to be slow and animals take 15 months to reach a weight of 40-50 kg. Farmers report that many sows have one or two litters per year with six to eight piglets per litter.

Pig production is an important upland livelihood activity. Almost invariably, pig husbandry is the task of women. Management is extensive, with pigs allowed to roam freely and scavenge feed around houses, although penning is practiced in some areas. Despite free roaming, pig production is very labour-intensive with supplementary cooked feed provided in most cases. Feeds include rice bran, broken rice, banana stem, taro, yams, maize, cassava and vegetation collected in fallow fields and forests. In remote uplands, feed collection can take as much as two to three hours per day in addition to preparing and cooking the feed.

Management systems are intensive in villages where pigs are fattened in pens for the local market. This occurs more often in lowland than in upland areas. One or two weaners (female or castrated male piglets) are fed for 3-4 months until they reach a saleable weight of about 35-40 kg.

Smallholder goat production systems

The Katjang goats found in Laos are common throughout Southeast Asia. Goats reach a mature weight of about 40 kg and are used for meat. They may have their first kids at 12-18 months, usually a single kid. Thereafter, females generally give birth twice a year, with a high incidence of twins. Goats are found more frequently in the upland areas, with the largest concentrations in Oudomxay, Luangprabang, Huaphanh and Savannakhet.

Goats graze freely all year in small groups in forest and fallow cropland. Farmers restrict the number of goats they raise to avoid excessive damage to crops, for which the owner is held responsible. There usually is good local market demand for goat meat, which is one of the reasons for the increased goat population (8% per annum) over the last 20 years.

Smallholder poultry production systems

Except for some commercial chicken farms near major cities, supplying meat and eggs to the urban population, farmers raise local chickens. These are preferred by consumers and command a higher price than imported breeds from Thailand. Chickens scavenge food around the house during the day, and are penned at night to protect them from predators. Most farmers provide rice bran or broken rice twice per day as supplementary feed. Growth rates are low and hens produce only 30-50 eggs per year.

Most households raise 20-30 chickens (3-5 hens, one cock and immature chickens of various ages). Yellow Chicken has been introduced from China and Vietnam in a small number of villages in northern Laos. A high incidence of disease and interbreeding with local chicken has limited the success of these introductions. Many households raise a number of other poultry such as ducks and turkeys.

Livestock and shifting cultivators

In Laos, shifting cultivators are also livestock farmers. Every upland village is involved in some form of animal husbandry: "Livestock

Livestock production and shifting cultivation are integrated through:

- Use of manure in plant production.
- Ritual slaughter for crop protection and production.
- Use of harvested fields and young fallows for grazing.
- Use of agricultural by-products for pig and poultry feed.
- The suppression of potentially harmful weeds, especially grasses.
- Production of animal feed, mainly maize and root crops for pig feed.
- Use of horses for transporting crops (occasionally bullocks and mules).
- Re-investment of incomes generated by selling livestock into inputs for intensifying crop production (e.g. small tractors, tools and seeds).

Adapted from Hansen 1998

production is well established as an integral part of existing swidden-based mixed farming systems, as an important factor for their sustainability and as a leading source of cash income for an increasing number of upland farmers" (Pravongviengkham 1998).

Problems to be addressed in the uplands

Diseases

Livestock production in the uplands is constrained by animal diseases such as Classical Swine Fever (CSF), Fowl Cholera, toxocariasis and haemorrhagic septicaemia. Some diseases are endemic and often present in most animals. Others are epidemic and occur sporadically. The severity and spread of all diseases are determined by many interrelated factors including nutritional limitations, management and husbandry practices, the movement of animals and the selling of diseased animals.

Vaccinations

Vaccination programmes based on cold-chain dependent vaccines have not been successful in remote areas and are unlikely to be a viable option for many years. However, relatively simple interventions can reduce mortality by 50% or more and improve productivity:

- Strategic (rather than blanket) vaccination against CSF of susceptible animals (e.g. sows and piglets).
- Village-based vaccination against diseases where heat-stable vaccines are available (e.g. Fowl Cholera and Newcastle Disease for poultry).

These depend on a better understanding by farmers of which diseases affect their livestock.

Women and livestock

Participatory livestock interventions need to encourage local government to employ male and female extension workers who can communicate with villagers through participatory extension approaches. The extensionists would strengthen the capacity of provincial and national extension staff to support livestock keepers with information. They would target disadvantaged village groups by working with them on activities.

Prices

If farmers do not receive a fair price for their animals in local and provincial markets, the uptake of proposed interventions will be limited. While demand for meat is strong, retail

Possible interventions with smallholder livestock keepers

- Improved pens and clean water supply to minimise Classical Swine Fever and Fowl Cholera.
- Early recognition of animal diseases by farmers to enable them to respond with quarantining and containment measures that limit the spread and impact of diseases.
- Strategic supplementary feeding of cattle and buffalo by planting improved forage grasses and tree and herbaceous legumes near pens, fields and villages.
- Planting feed such as maize, cassava, sweet potatoes and forage legumes such as stylo for pigs to reduce the labour burden.
- Improved bull and boar management to control breeding, improve conception rates and allow positive selection within local genotypes.
- Farmer recording of animal performance and animal health to help farmers improve animal management.

Source: ILRI 2002.

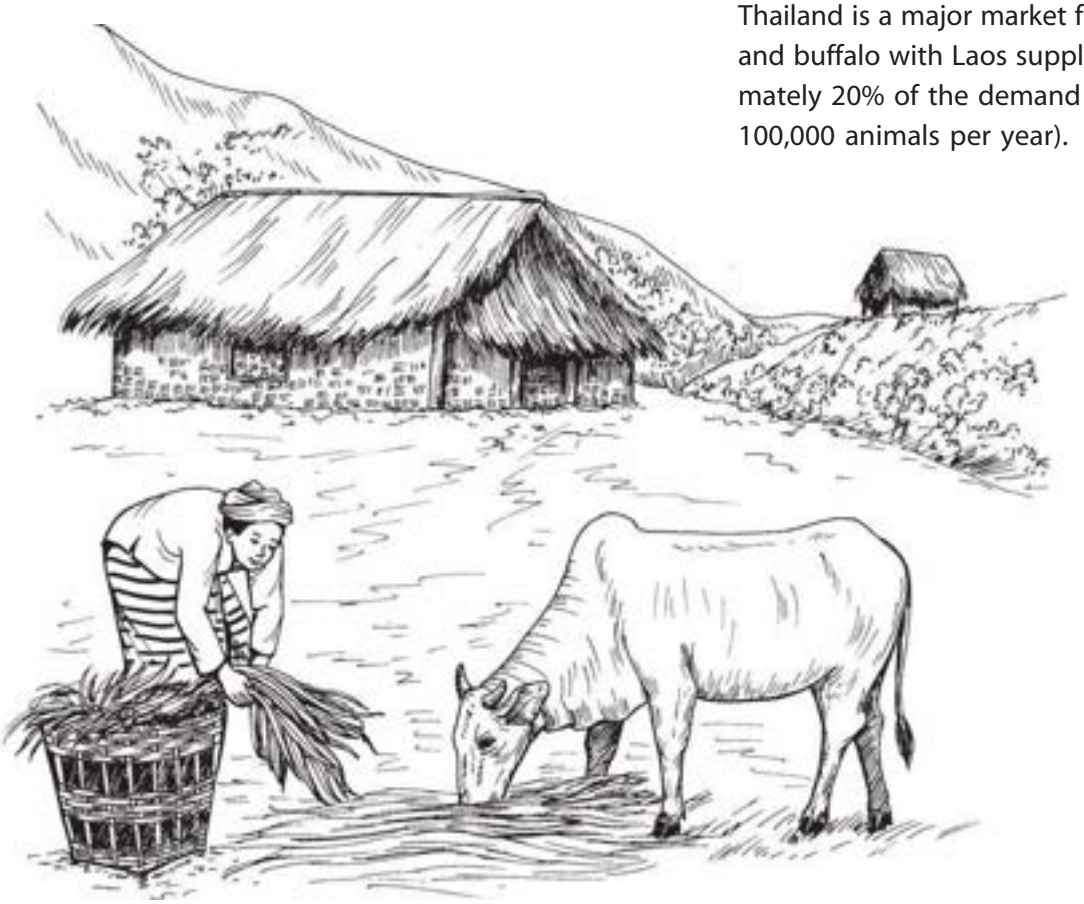
price controls, taxes and restrictions in animal movement for reasons other than containing disease, reduce the incentive for farmers to invest time and labour. Improving market opportunities goes hand in hand with building farmers' capacity to improve and increase production.

Credit

A lack of capital prevents disadvantaged villagers from increasing livestock production. Credit would ensure that families are not left out of a participatory livestock project. A participatory livestock project would need other components including extension worker training, technical interventions and improved market opportunities.

Potential for livestock development

- There is an opportunity to increase cattle and buffalo production in the uplands where naturally occurring feed resources are available.
- Opportunities to improve pig and poultry production exist, but expansion is limited by the small size of the domestic market. Lao farmers are unlikely to produce pigs and poultry competitively for large-scale export, although some trade opportunities may develop for districts near borders with China, Thailand and Vietnam.
- The demand for meat in Laos and other Southeast Asian countries has grown consistently over the last decade and is likely to continue to do so. About 75% of cattle and buffalo produced are consumed domestically and the remainder exported. Thailand is a major market for live cattle and buffalo with Laos supplying approximately 20% of the demand (approximately 100,000 animals per year).



- The development of upland livestock needs to be addressed through a number of initiatives:
  - Improving financial support (e.g. credit), market structure and facilities.
  - Strengthening support services in upland areas (especially improving animal health and forage production).
  - Improving farming practices that increase livestock productivity and protect the environment.

Some lessons learned from livestock development

1. Farmers' needs are better met by promoting participatory research and extension approaches.
2. Animal health care should be based on farmer demand and not top-down vaccination campaigns.
3. Vaccines requiring a cold chain to be effective are not a viable option for farmers in many villages, particularly those located in more remote areas.
4. The implementation and sustainability of any project requires:
   a. Well-targeted training and capacity building.
   b. Reliance on Village Veterinary Workers with clear status ('voluntary public servants' or 'private sector animal health workers').
   c. The use of farmer-to-farmer extension and farmers' groups to reach more farmers than the traditional way of visiting single farmers.
5. There is need for a multi-pronged approach to livestock development:
   a. Providing animals through a cattle credit scheme without effective support in animal and animal management often results in poor animal health, high mortality, poor reproduction and poor repayment rate.
6. For increased impact, livestock project interventions need a long timeframe.
7. Diversification of livestock production systems requires:
   a. A range of innovations or options that villagers can evaluate and adapt to their needs.
   b. The use of participatory approaches.
   c. Recruitment of local native speakers to overcome the language and other cultural barriers in remote areas.
   d. Working with women through female extension workers since women are responsible for small livestock.

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Managing Feed Resources in Upland Livestock Systems

Having a managed feed resource is the key factor enabling farmers to intensify their livestock systems in the uplands. It allows them to keep animals closer to the village, to provide better care, to collect manure for rice paddies and homegardens, and to fatten animals for market.

Substantial increases in demand for livestock products are already happening in Southeast Asia. Within Laos, the predictions are that the domestic supply of non-ruminant meat products (largely poultry and pigs) will be able to keep pace with demand, but that demand for ruminant meat products (cattle, buffalo and goats) will rapidly outstrip supply. This increasing demand, especially for ruminant meat products, is also reflected across the region.

Increasingly, smallholder farmers in the Lao uplands are becoming dependent on livestock to ensure their livelihood security. A combination of better feeding and animal management, combined with strategic use of veterinary medicines, can provide effective, achievable and sustainable solutions.

Figure 1: Projected ruminant meat production and demand

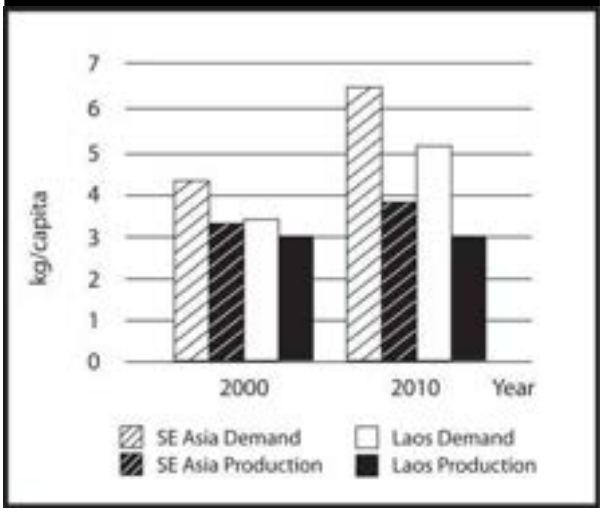
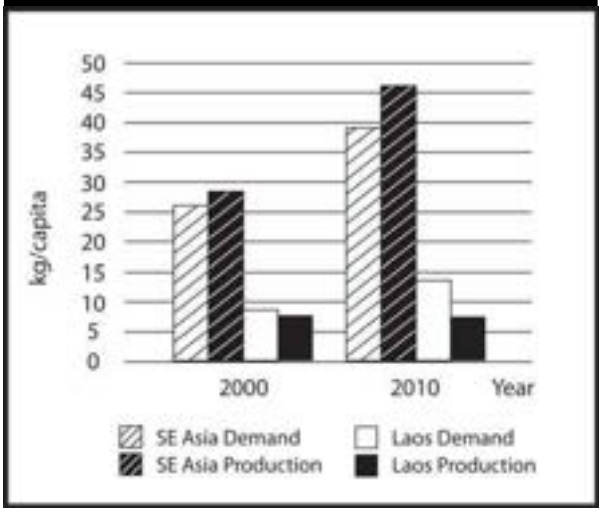


Figure 2: Non ruminant Meat



Source: Vercoe et al. 1997

Livestock intensification: a pathway out of poverty

Disease and feed problems are seriously limiting the contribution that livestock can make to rural livelihoods. Disease losses are less serious in cattle and buffalo, except for 30-40% mortality among buffalo calves from an internal parasite, Toxacara vitulorum. In addition, lack of feed resources near villages and the need to protect crops means that cattle and buffalo must spend much of the wet season grazing far from the village and are often lost. Farmers spend as much as four hours per day collecting feed for their pigs. These disease and feeding issues have made it almost impossible for farmers to move beyond the current extensive, low-input livestock systems with low productivity and opportunistic use or sale. These systems neither help farmers to move out of shifting cultivation nor help overcome poverty.

Controlling diseases, even where good quality veterinary medicines are available, is very difficult: all the livestock need to be gathered and treated together on one day. Farmers' experiences with low benefits and extra costs from vaccination mean that this approach is destined to fail.

Farm Facts

- 89% of farm households raise livestock (National Agricultural Census 2000).
- More than 95% of all livestock produced by smallholder farmers (Stür et al. 2002).
- Livestock commonly contribute more than 50% of household income in the north.
- 70% of villagers referred to livestock disease as a major cause of poverty (ADB 2001).
- Upland farmers surveyed reported that over 80% of chickens die every year from disease and epidemics frequently kill more than 50% of pigs (FLSP 2002).

Livestock production

Livestock production has often been identified as an ideal livelihood activity for Lao farmers who are looking for ways of moving out of shifting cultivation. The many reasons for this include:

1. Livestock can be sold at any time on a market with relatively constant demand and stable prices.
2. Cattle, buffalo and goats can be walked long distances to market.
3. Livestock provide manure to sustain yields of lowland rice and homegardens.
4. Livestock give a relatively high return per unit of labour input.
5. Larger animals eat feed resources that cannot be used for any other purpose.
6. In many cases, livestock are the only means of capital accumulation available to farmers.
7. Livestock are less susceptible to drought and floods and, unlike crops, can be sold to avoid extreme conditions.

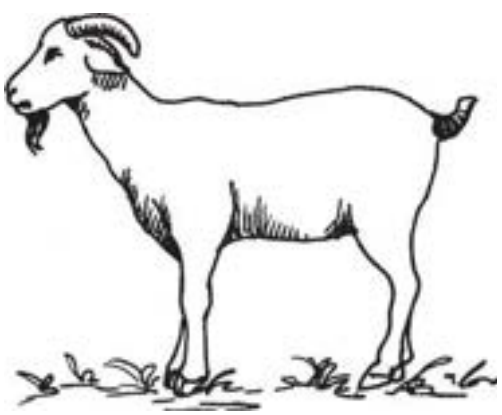
Promoting forage systems

Like all farmers in Houay Hia, Mr Sing used to allow his cattle to wander in search of feed. The roaming cattle damaged crops and he had to pay fines regularly. "Our cattle used to wander far from the village and being wild, they were easier to shoot than catch!" Many were lost in the forest.

In 1997, Mr Sing started testing forage varieties in small plots to see if any of them might allow him to feed his animals closer to home. He liked the fact that the forages stayed green in the dry season, so year by year he expanded the area. He began to tether his animals close to the house, feeding them cut forage. Calves that were fed forages grew more quickly: a ten-month old calf sold for more than his neighbour's twelve-month old calf. His wife started feeding the stylo legume to her pigs and was able to reduce the fattening time from five to three months.

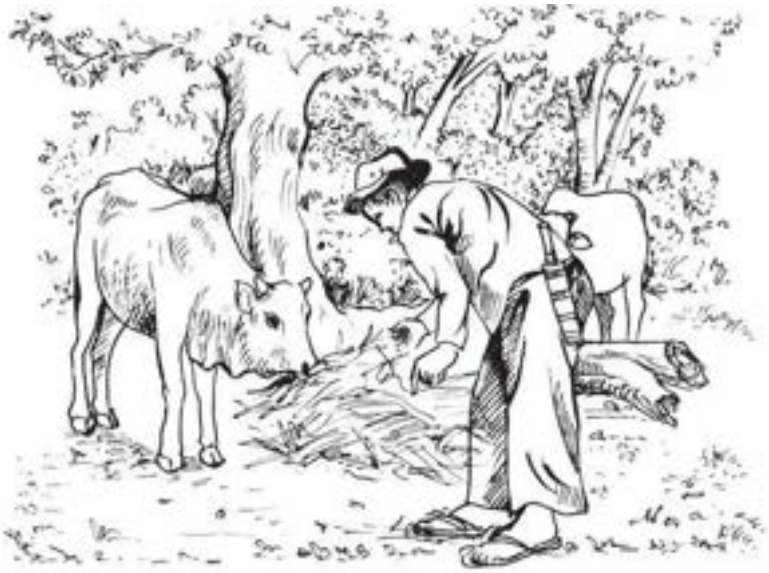
With one hectare of forages, Mr Sing now spends just 30 minutes collecting grass to feed his expanded herd of five cows, while his wife collects stylo to fatten pigs and goats. He has been able to halve the family's shifting cultivation area and intends to stop altogether once they have enough forages and the livestock system is well established. With the animals kept close to the village, they are now able to provide veterinary inputs and collect manure. More than 20 households in the village are now developing similar livestock systems.

Mr Sing is not alone. In Xang village in Xieng-khuang, 17 of the 23 households are developing market-oriented livestock systems following the lead of a few early innovators. Now the forage area in the village has expanded to 4.5 hectares and the shifting cultivation area has fallen from 40 to 18 hectares, largely as a result of improved livestock production and more productive paddy land. These kinds of impacts are significant, are not isolated to one farmer or



village, and are not the outputs of model farmers who receive unsustainable levels of outside support.

Within these villages about 40% of farmers who have been developing forage systems for at least two years seem to be experiencing significant livelihood impacts. In all cases, the development of forage resources is helping villages change to a market-oriented livestock system. The work is now is expanding to new farmers and villages.



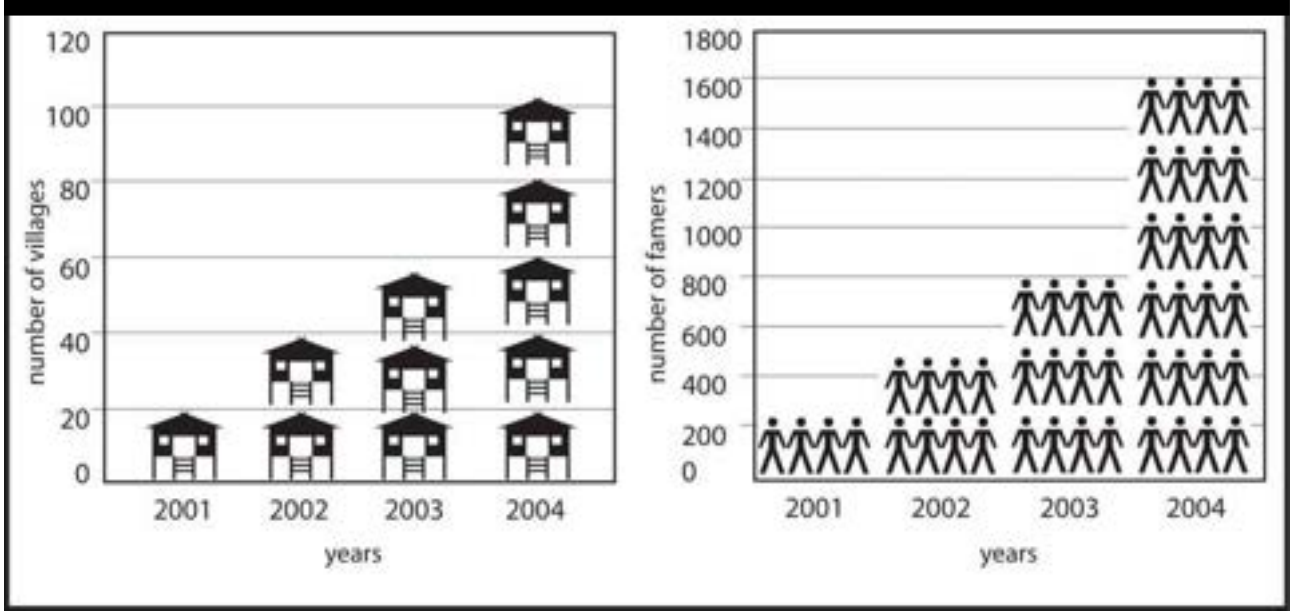
Finding the best varieties

In the past, it was hard to convince farmers to make these radical changes to their livestock systems mainly because:

1. Research did not often address the real needs and opportunities of farmers.
2. The forage varieties were not the most suitable for conditions on smallholder farms.

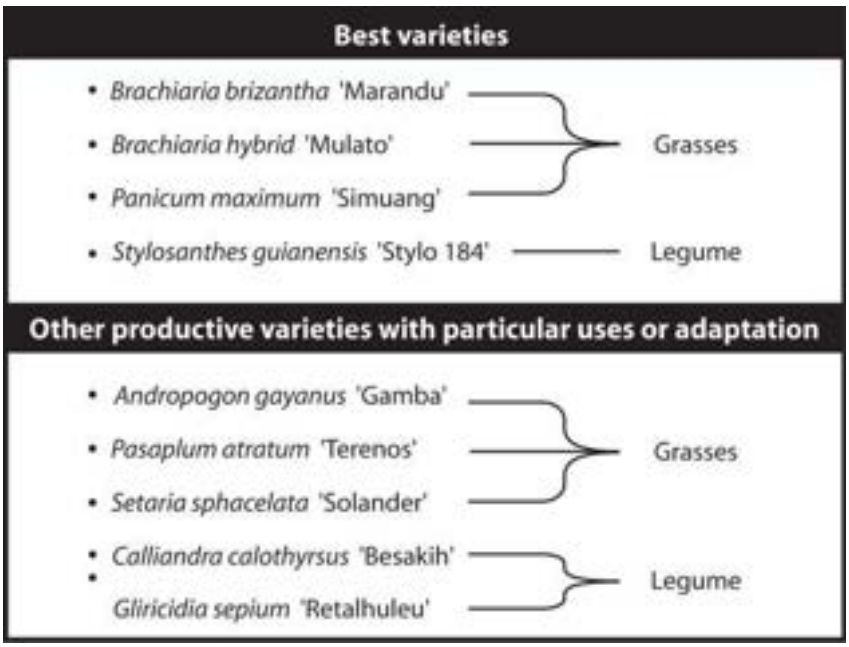
To overcome these problems, the Livestock Research Centre/NAFRI and CIAT started research in 1995 to identify forage varieties with the best potential, and to develop methods for forage systems. The result was a small group of broadly adapted and robust varieties suited to the Lao uplands .

Figure 3: Villages and farmers developing forage systems through the project



1 *The number of farmers for 2004 is an estimate based on the number of new villages working with the project*

Challenges affecting the intensification of smallholder livestock systems



- **Focusing on technical problems and opportunities that arise through farmer experience**

Generally, farmers are interested in testing forages to resolve obvious problems, such as lack of feed in the wet season or the large amount of time needed to collect feeds. However, the initial impacts that emerge clearly (e.g. faster sale of animals because of more rapid weight gain and reduced area of shifting cultivation releasing labour) are often unrelated to the problems initially identified by the farmers.

Another unexpected challenge is that forage area expansion is not accompanied by a change in forage management. After two to three years of regular cutting, forage plots inevitably start to exhibit nutrient deficiency (yellowing of leaves and declining yields). However, there are many simple ways of dealing with this problem and these are detailed in Phengsavanh et al (2004). As larger areas of forages are developed, new opportunities emerge, including developing other feed resources such as maize, cassava, and sweet potato for pigs.

- **Exploring markets, marketing and the private sector**

While market demand presents many opportunities, especially for the production and export of 'grass-fed' beef, significant market impediments still exist. These include patchy market access, poor flow of market information back to producers, lack of quality control and a

In the mid-1980s, CIAT scientists started breeding new hybrid *Brachiaria* species forages. The first of these, known as 'Mulato', was released in 2001 and combines the best qualities of its parents in one plant. It has both good dry season tolerance and produces high quality feed. Most significantly, the seed collected from this hybrid remains true to the parent. Thus it does not lock smallholder farmers into regularly buying seed from large companies.

- 'Mulato' appears to be an excellent variety for Lao conditions, although improvements can and are still being made.
- There is a potentially large worldwide market for the seed of these hybrid varieties and Laos seems to be one of the few localities in southeast Asia where seed production of 'Mulato' is technically possible.

lack of services to support the development of enterprises (Connell et al. 2004). There is an urgent need to address these market impediments.

Another problem is that private enterprise has contributed very little to developing the Lao livestock sector. Private firms that have attempted to establish cattle fattening farms have mostly failed because of lack of access to (or understanding of) markets, lack of clear land tenure or a lack of long-term commitment. Given the significant regional market potential, particularly for 'grass-fed' beef, and the existence of robust feed and management technologies, the opportunities for private sector investment now seem much brighter. The main obstacles are not technical but are related to policy, trade and quarantine issues. In particular, the development of a legal live cattle export market will depend strongly on resolution of restrictions for cross-border trade and containment of Foot and Mouth disease.

- **Developing better quality forage varieties**

The 'entry point' for getting farmers interested in growing forages has been grass varieties. They are robust and provide high yields of feed very quickly. Initially farmers are less interested in the better quality feeds, mainly legumes, which tend to produce lower yields and are slower to establish (Pengelly et al. 2004). Now that some farmers are making the shift towards market-oriented livestock systems, there is a need to develop better quality feed resources for supplementing productive animals, such as pregnant cows and growing piglets.

- **Developing forage resources for smaller animals**

The potential of higher-quality forages for non-ruminant animals, especially pigs, poultry and fish, is just beginning to be understood. These livestock systems are often important in poor villages and among poor people within villages, so there is good potential for positive impacts on poverty through improvements in forages for these livestock.

It is the farmers who innovate

A key lesson from this work is that extension staff do not need 'finished models' to promote to farmers. By providing farmers with a range of promising 'raw technologies', in this case forage varieties, and key technical information, and then using an extension approach that encourages farmers to innovate, significant and often unexpected impacts emerge.

Some failures also occur but these provide valuable lessons. In the case of forages, the impacts that are emerging are usually not related to the immediate problems that the farmers wanted to solve; they come from farmers intensifying their livestock production systems to take advantage of the opportunities they see forages provide.

For more information on this topic see:

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Forage Options for the Lao Uplands

Introduction of exotic forage species for Lao conditions

Offering upland farmers a choice of new forage species is important for intensifying livestock production in the uplands. The most recent and comprehensive forage research and development in the Lao PDR started in 1995 with forage variety evaluation. Evaluations were conducted at five sites in four provinces (see table). The objectives were to:

(i) Identify varieties that are broadly adapted to environmental conditions in the Lao PDR.
(ii) Help smallholders to integrate promising varieties into their farms.

152 forage varieties (35 grasses and 118 legumes) were introduced to evaluation sites. After two years of evaluation, about ten varieties were identified that are well adapted to the climate and soils of Laos.

Forage species and varieties broadly adapted to Lao climate and environment					
Promising varieties for possible introduction throughout Laos	**Evaluation sites (provinces and districts)**				
	Oudomxay	Luangprabang	Luangprabang	Vientiane Capital	Champasack
	Xay	Xiengngeun	Luangprabang	Naxaithong	Khong
Grasses:					
"Gamba" *(Andropogon gayanus)*	✓	✓	✓	✓	✓
"Marandu" *(Brachiaria brizantha)*	✓	✓	✓	✓	✓
"Signal" *(Brachiaria decumbens)*	✓	✓	✓	✓	✓
"Tully" *(Brachiaria humidicola)*	✓	✓	✓	✓	✓
"Ruzi" *(Brachiaria ruziziensis)*	✓				
"Jarra" *(Digitaria milanjiana)*	✓	✓	✓	✓	✓
"Simuang" *(Panicum maximum)*	✓	✓	✓	✓	✓
"Terenos" *(Paspalum atratum)*	✓	✓	✓		
"Sabi" *(Urochloa mosambicensis)*		✓	✓	✓	✓
Legumes:					
"Stylo or CIAT 184" *(Stylosanthes guianensis)*	✓	✓	✓	✓	✓

Selection of forage species for Lao uplands with farmers

The first series of evaluations of forage varieties was conducted mainly in large nurseries managed by researchers. After the ten most promising varieties listed above were identified, they were introduced to farmers in Xiengkhuang and Luangprabang for on-farm evaluation using a participatory research and development process.

Through this process upland farmers identified four varieties as being broadly adapted to the environmental and production conditions of the Lao uplands. Additional varieties of grasses and shrubby legumes were also identified as being adapted to particular environmental conditions or specialised uses.

Four forage varieties recommended for the uplands

'Marandu'. A tall grass that is suitable for cutting and grows well on moderately fertile, acid soils. It stays green into the dry season and produces more seed than 'Basilisk' (*Brachiaria decumbens*). It should not be fed to goats, sheep, or young cattle.

'Mulato' (*Brachiaria* hybrid). A cross between 'Marandu' and 'Ruzi' that produces fertile seed. It establishes rapidly from tillers, grows well in the dry season, and produces better quality feed than other *Brachiaria* varieties, but it needs at least moderate soil fertility and seed production is low.

'Simuang'. A tall grass suitable for cutting that produces high quality feed. It is generally suited to more fertile soils and must be fertilised regularly to maintain high productivity. It becomes stemmy if not cut frequently and is not suited to long dry seasons.

'Stylo or CIAT 184'. An erect, short-lived (two or three years) perennial legume that will grow on low fertility and acid soils and produces large quantities of good quality feed for cutting. It stays green into the dry season. Leaves can be fed fresh or dried and stored as leaf meal. 'Stylo' needs to be planted by seed and does not tolerate heavy grazing or frequent cutting.

More promising grass and legume varieties

Of the grasses with specialised niches, **'Gamba'** and '**Basilisk'** tolerate infertile and acid soils and stay green into the dry season. Both may be cut, but 'Basilisk' is also suitable for grazing. **'Terenos'** also grows well on fertile, acid soils but only in wetter areas, without an extended dry season. **'Solander'** (*Setaria sphacelata*) grows well in cooler areas but requires soils with good moisture and fertility. *Brachiaria* should not be fed to goats, sheep, or young cattle and *Setaria* should not be fed to horses.

'Retalhuleu' (*Gliricidia sepium*) and **'Besakih'** (*Calliandra calothyrsus*) are shrubby tree legumes that may provide high quality protein supplement to grass-based diets. 'Retalhuleu' can be planted from stem cuttings and is useful as living fence. It can grow on moderately acid soils at lower elevations and can be managed to produce leafy forage during the dry season. 'Besakih' can grow on acid soils in cooler areas, but must be planted by seed and initial growth is slow. Leaf yields are high with properly managed cutting and it provides good firewood. 'Retalhuleu' is initially not very palatable to cattle, but over time they learn to like it. 'Besakih' leaves are only palatable when freshly cut.

Important lessons learned

Experience has shown that to be successful in working with farmers to develop forage technologies, it is essential to offer the best varieties to farmers because:

- There can be huge variations between varieties within species.
- There is no magic variety that can grow in all conditions.
- Each variety has special characteristics that are suited to specific environmental conditions and uses.

Once promising varieties have been identified, locally-appropriate forage establishment and management practices need to be developed. These simple establishment and management practices are described in detail by Stür and Horne, 2001 (Extension manuals are available from the NAFRI/CIAT).

This work is being conducted by the NAFRI, the Department of Livestock and Fisheries and CIAT. It is funded by the Australian Agency for International Development.

Selected reference

Stür, W.W. & Horne, P.M. 2001. *Developing forages with smallholder farmers - how to grow, manage and use forages.* ACIAR Monograph No. 88. Canberra.

This paper is adapted from: "Livestock Intensification: Forage and Livestock Technologies for Complex Upland Systems" in *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland livelihoods.* NAFRI. 2005.

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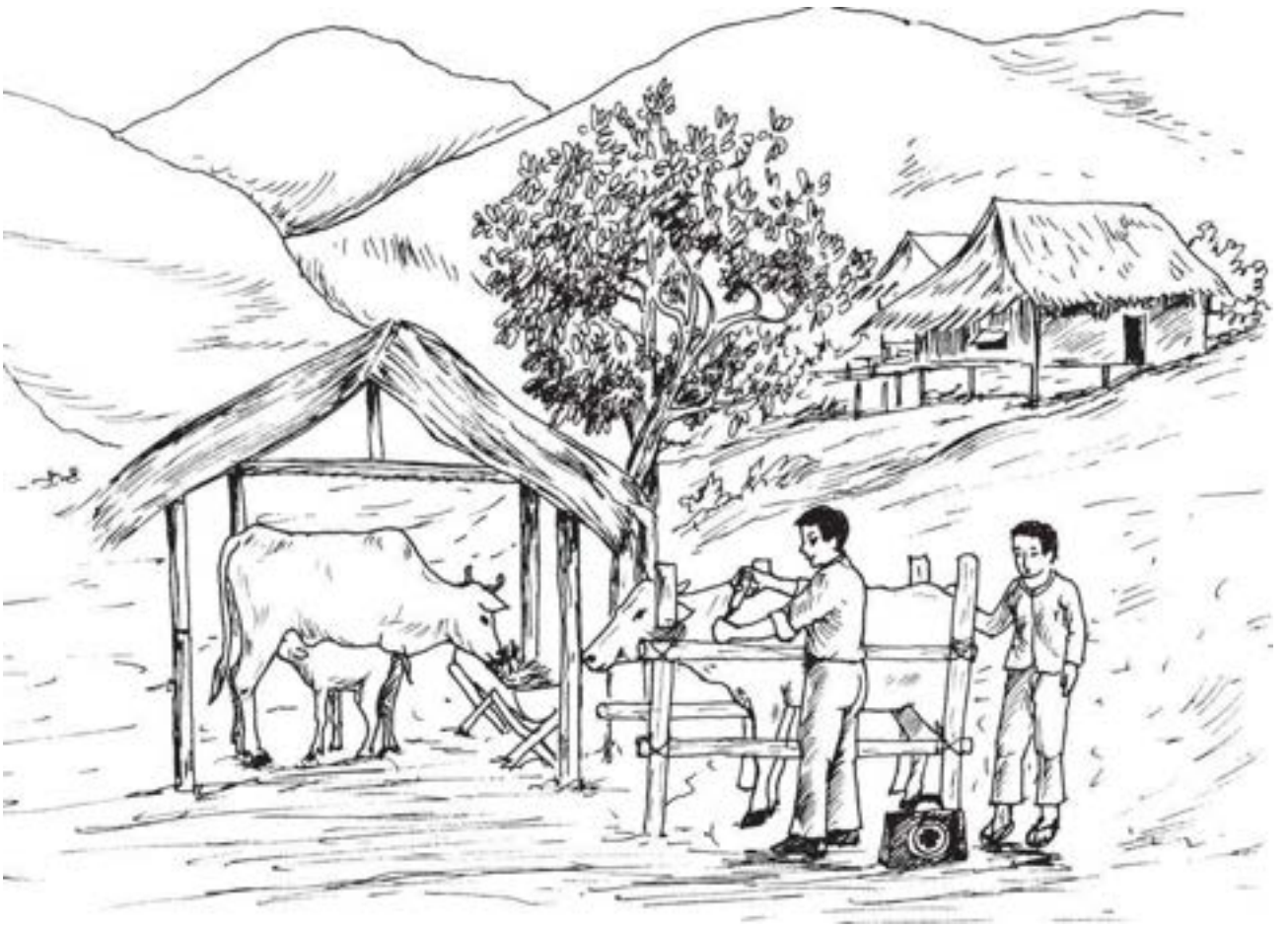
Village Veterinary Worker Network as a Private Sector Approach



Livestock are an important source of income for nearly all upland farmers so veterinary services are essential. Recurrent epidemics make investment in livestock uncertain, and farmers hesitate to invest in improved livestock keeping methods if they cannot access good veterinary services. The most common animal diseases in Luangnamtha Province are Hemorrhagic Septicaemia, Swine Fever, Newcastle Disease and Fowl Cholera. In 2001, Foot and Mouth disease appeared for the first time. To combat these diseases, many projects supported Village Veterinary Worker (VVW) training conducted by local district agriculture and forestry offices.

However, these local vets have so far had little impact on the occurrence of epidemics in targeted villages. Vaccines are often not available at the right time; many vaccine storage refrigerators do not work, making it impossible to maintain the cold chain from the district capital to the villages. In some areas the majority of VVWs trained by DAFO have not been working with animals at all.

In 2003, the GTZ RDMA (rural development in mountainous areas) project undertook a different approach to VVW training in Sing and Nalae districts, Luangnamtha province. In this project, training is still conducted by DAFO staff, but veterinary equipment and drugs are dispensed from private pharmacies. These VVWs are not volunteers, but charge fees for their services and sell medicines for profit.

Background

	Sing	Nalae
Population	25,275	20,432
Major Ethnic Groups	45% Akha, 32% Leu, 7% Hmong, 6% Tai Neua, 4% Yao, 4% Tai Dam/Lao	79% Khamu, 19% Leu
Highland Coverage	90%	95%
Number of Villages	95%	80%
Livestock in both districts totalled 18,000 cattle and buffalo, 20,000 pigs and 110,000 poultry.		

Project strategy and aims

The overall goal of the project was to provide each farmer in Sing and Nalae with access to veterinary services. DAFO staff from each district were trained to adapt the VVW curriculum to their district's special situation.

- In each village, one VVW was selected and trained.
- One private pharmacy was set up in each district capital.
- Pharmacists received training in book-keeping and how to supply themselves with vaccines, drugs and equipment.
- Two private village pharmacies were established in central villages of remote sub-districts in Sing, with three more scheduled to open in Nalae by April 2005.
- A follow up and evaluation system with DAFO staff was recently established.

Major elements of the project strategy:

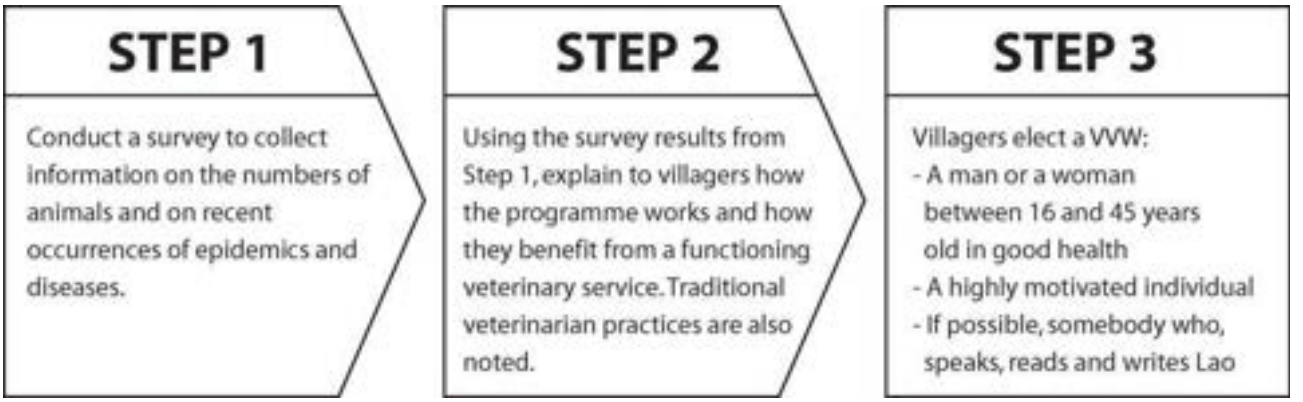
- Choosing the best VVW.
- Organising VVW training.
- VVW training courses adapted to the literacy level of non-Lao speakers.
- Availability of drugs, vaccines and equipment assured by a private network of pharmacies.
- Set-up of a cold chain for vaccines from the factory to the animal.
- Regular follow-up of VVWs.

Selecting a VVW

A VVW must be a motivated individual. Rather than let the chief simply appoint the VVW, this project helped the villagers select a VVW by holding a plenary meeting of men and women in each village.

During Step 3, it is explained that it is more important (because translators help with the course work), to choose someone motivated and willing to learn than someone who knows Lao. It is also explained that the VVW does not receive a per diem during the training. This eliminates those who are only interested in earning money during the training.

Course 2 covers treatment and prevention of the major cattle and buffalo diseases occurring in the province. Theory is explained over three days; the fourth day is for practical training and the fifth is a review in which role playing helps VVWs put their theoretical knowledge into practice.



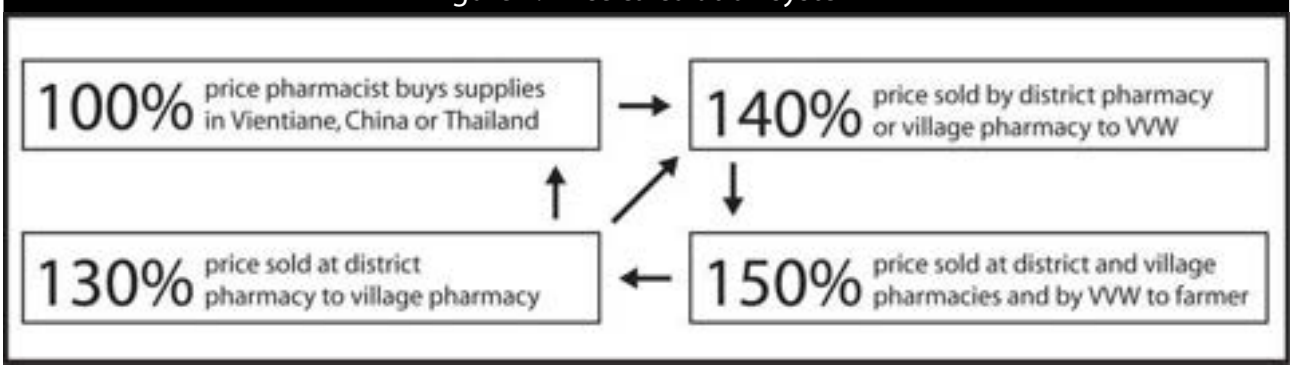
VVW training courses

Course 1 is an introduction and makes clear the difference between the treatment and the prevention of a disease, a point often neglected in short VVW training courses. Confusing the two can lead to vaccination of sick animals, which then causes villagers to question the whole idea of vaccination. Other topics in this course include how to store drugs and vaccines, how to clean and sterilise veterinarian equipment, plus simple courses in maths to allow them to do book-keeping and drug dose calculation.

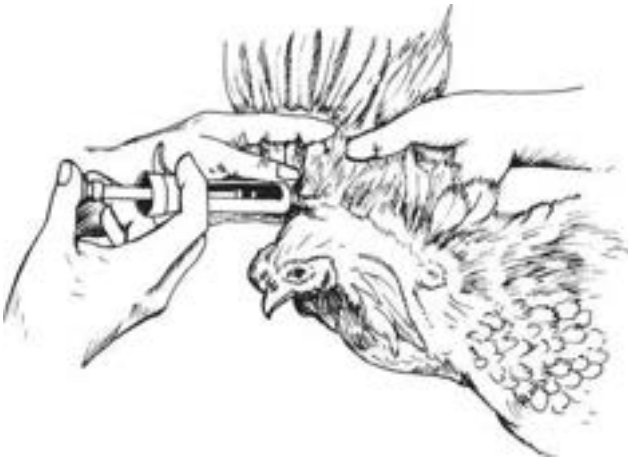
In the same way, **Course 3** deals with pig disease, **Course 4** with poultry disease and **Course 5** with the diseases of other animals (e.g. horses, goats, dogs and cats) as well as wounds, abscesses, diarrhoea and fractures.

After each course, the VVWs are given an initial stock of drugs and equipment. On demand, after having organised a vaccination campaign in the village, the VVW receives free vaccines for the first campaign against each disease. This stock of drugs and equipment has to be sold to the villagers according to the established price

Figure 1. Price calculation system



system (Figure 1). The money obtained allows the VVW to buy new drugs and vaccines as well as to earn a profit.

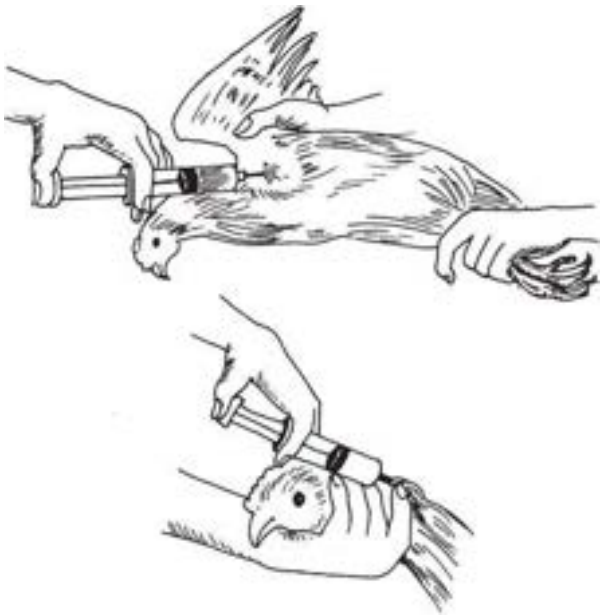


Drugs, vaccines and materials

Before this project, drugs and vaccines in both districts were only available at DAFO livestock departments. Vaccines were often not available at the right time for vaccination (i.e. shortly before the rainy season and before the cold season for Hemorrhagic Septicaemia and Fowl Cholera). The refrigerators where vaccines were stored were often not working - maybe because of 'diluted responsibility' in an office where there are several people but no individual directly responsible for keeping the refrigerator in proper working order. Some days, all DAFO staff were out in villages so there were no staff present who knew how to use the drugs and vaccines, or their prices when farmers came to buy. These problems were solved by establishing one private veterinary pharmacy in each district capital.

Drugs, vaccines and equipment produced in Laos are given preference. Some equipment is purchased in China and a number of veterinary drugs are bought from the Veterinary Supply Unit (VSU) in Vientiane or in Thailand. The project established a contact between private veterinary pharmacists and companies where they can obtain supplies. The pharmacists attended the VVW training as well as a special training course on bookkeeping, how to further advise the VVW, and how to report and cooperate with the DAFO follow-up team.

In Sing and Nalae, many villages are more than six travel hours from the district capital where a private veterinary pharmacy is located (six hours are the maximum time on a sunny day that vaccines can be transported in an icebox



containing two freeze-packs to keep temperatures below 4ºC). To ensure vaccine to all villages, the project established village pharmacies with a solar fridge to keep vaccine at appropriate distances (two in Sing and three scheduled for Nalae).

In addition to the 10% profit for selling medicine, a VVW charges a fee for veterinary services. The current charges range from between 500 Kip for treating a chicken to 2,000 Kip for a buffalo.

Cold chain for vaccines from the factory to the animal

Vaccines are bought from the Nongthene Vaccine Factory or the VSU. The district veterinary pharmacists collect the vaccines in Vientiane or arrange for them to be collected in Luangnamtha. VVWs living in villages less than six hours from the district capital come directly to these central veterinary pharmacies and take the vaccines in small iceboxes to their villages. VVWs give their warm ice packs to the veterinary pharmacist and receive cold ones in exchange. In the same way, village veterinary pharmacists take more vaccines from the district veterinary pharmacy to their village pharmacy to supply remote villages within a range of six-hour range of their village.

In the beginning, it is difficult for the pharmacists to judge the quantity of vaccines needed to ensure they are sold before the expiration date, while always having vaccines available. The project supports the pharmacists during a one-year period, during which unsold expired vaccines are exchanged.

Regular follow-up

Especially during the beginning of their activity, VVWs have to be followed-up regularly, at least every three months. These follow-up visits:

- Ensure the curriculum understanding of each VVW.
- Provide individual explanations for unasked questions during training.
- Help the VVW organise their first vaccine campaign.
- Assist in treating sick village animals.
- Collect data on VVW activity.

Lessons learned

While data is not available to produce a full evaluation, there have been some lessons learned from the first follow-up in Sing district.

- The VVWs attended most training sessions and appeared highly motivated. While some complained about not receiving per diems, and having to attend common meals and sleep at the training centre, most trainees soon praised the 'group feeling' and spent time in the evenings helping the weaker students.

- Not all VVWs are active but less than 10% have shown no activity at all since training. One reasons for inactivity is that VVWs felt they did not have enough support from village authorities. For these villages, special meetings were scheduled to explain the role and function of the VVW, the difference between treatment and prevention of disease, and how vaccines work. It was noted that most VVWs spend more time treating sick animals than vaccinating, so these special information meetings on disease prevention will be held in all villages.
- Pharmacists' incomes are currently low as most are still working with their initial stock. Most pharmacies also sell drugs to farmers who are not VVWs and sell other products for animal husbandry such as chicken and pig food.

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Participatory Extension Approaches in Support of Technology Development and Adaptation

Participatory extension approaches are being developed to introduce animal forages to upland farmers. The Lao Ministry of Agriculture and Forestry (MAF), the International Centre for Tropical Agriculture (CIAT), and the National Agriculture and Forestry Research Institute and extension services are working with farmers, encouraging them to take 'raw technologies' (well adapted and productive forage varieties), and find ways to fit them into their production system. This has led to increased livestock productivity and contributed to the reduction of shifting cultivation.

Through trials with local farmers, MAF and CIAT have been able to identify a small range of broadly adapted and robust forages well suited to the environments and farming systems of the Lao uplands. These varieties, applied in the right way and right place, deliver significant impacts, including:

- Allowing increases in herd size (e.g. from 2-5 cattle to 10 or more).
- Enable fattening of cattle and buffalo for regular sale (e.g. selling one animal every 2-3 months).
- Reduce the time needed to raise pigs to saleable age (e.g. from 12 months to 5-6 months).
- Increasing the rates of twins born and survival of goats.

These impacts have been gained from new systems for raising livestock, where forages are the main feed source, and the animals are managed close to the home for most of the year.

While such new systems have long been envisioned, MAF and CIAT did not begin by trying to define or introduce the improved systems to farmers, but rather focused on trying to solve the 'immediate problems' that farmers had with feed. It was then the farmers themselves who innovated new 'impact-yielding systems' based on forages.

Providing a framework for innovation: extension of raw technologies

1. Site selection
The project selected villages where farmers already spent time collecting native grasses to feed their livestock some of the year. Thus 'cut and carrying' of feed was already part of the system, and forages simply reduced the time and labour for this, without any systems change being required.

2. Identifying the immediate problems
Participatory Rural Appraisal (PRA) tools were used to help farmers identify causes of poor performance in their livestock production. While death from disease was a factor, constraints due to lack of feed were the most common and recurrent problem.

3. Testing options
Forages planted in small plots were presented as a solution to the immediate problem: the time needed to collect feed. Eight forage species were provided for farmers to assess and select those which performed best under local conditions.

4. Follow-up and expansion
District staff visited the farmers regularly to check on forage growing and use. Discussions were held within a focus group of farmers to share lessons learnt. Later, this group related their experience back to the whole village, encouraging expansion of forage use within the villages.

Growing forages solves the immediate problem of lack of time to collect feed. Most farmers were satisfied with the convenience of having feed nearby. This advantage was used to 'sell' the forage idea to farmers. A few farmers, however, began thinking beyond the immediate problems. They noticed a range of other benefits, such as improvements in the condition of their livestock; more rapid weight gain, clearer skin, reduced thirst and higher milk production for suckling. They then sought ways to gain these benefits more consistently through expanding the area of forage grown,

and keeping the livestock closer to their house so that they could eat forages more regularly. There is more than one system for fattening. Some farmers choose to fatten cattle and others buffalo; some buy thin animals and others rotate animals from their upland pastures. The type of forage grass farmers use also varies, depending on the soil and moisture conditions for each farmer. Across the 50 villages where these forages have been tried, a wide range of new impact-yielding systems are now emerging for cattle, buffalo, pigs and goats.

Initiating a problem solving attitude

Integrating half a dozen forage species into a livestock production system is by no means a simple matter. The farmers started growing and using forages with a small-plot testing phase. Many did not persist or expand. The 'raw' technologies do not automatically suggest a result: it is only once a few innovative farmers have adjusted their system and gained impacts, that the potential is revealed. Without this step, the raw technologies remain dormant.

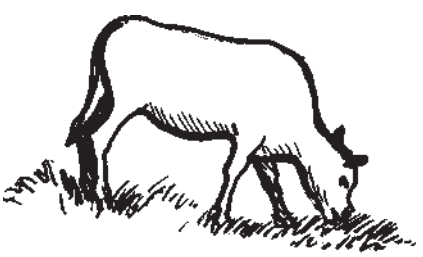
Some simple mechanisms used to initiate a problem-solving attitude include:

Problem diagnosis: PRA type tools were used to enable farmers to define and then focus on solving immediate problems. Thus the technical interventions, such as forages, were seen not as 'recommendations' to be followed, but rather as potential solutions to be assessed.

Technology options: Providing a range of forage varieties immediately placed the farmers in the position of evaluation. Limiting the initial introduction of forages to a small number of farmers, and small areas, also reinforced the sense of a trial to be learnt from. Together these two basic mechanisms engaged farmers in a problem solving process, which led a few farmers to go beyond their immediate problem and think about what further benefits could be gained.

'Creative follow-up' to consolidate and disseminate innovation

Technical follow up by DAFO staff during the first year is essential to the success of this process: in the first year, farmers had a number of technical problems with their forage plots. Follow-up by DAFO used these problems as learning opportunities with the farmers. The reasons for poorly-established plots were quickly understood, enabling the farmers to feel confident they could correct them. This technical follow-up meant that farmers could properly establish their plots and begin feeding their livestock. While the plots were small, generally providing insufficient forage to generate impacts among the cattle, the time and labour saved in collecting native grass was sufficient to interest most farmers and to drive expansion in the second year. DAFO staff also carried out 'creative' follow-up, observing how farmers were using the forages and any special benefits that were emerging. Such impacts were noted and passed on to other farmers through 'farmer-to-farmer' approaches.



Accelerating impacts

It took three years to move from identifying immediate problems, to identifying new impact-yielding systems through farmers' innovation. With these systems maturing, it should now be possible to short-cut the process and directly introduce these impact-yielding systems to farmers at new sites. Forages are a simple technology but livestock production systems and opportunities are diverse (Pravongviengkham 1988), so farmers may still need to innovate to gain impacts.

Farmer-to-farmer approaches

Focus group meetings within villages: sharing experience among the farmers who made the initial forage trials.

Cross-visits: selected farmers were taken to villages where new impacts had emerged so they could understand the benefits of expanding forage growth and using them as a regular feed source.

Village planning and interest groups: introduced after impact-yielding systems were established, to plan raising livestock according to these new systems.

Disseminating and exchanging these experiences with other farmers helped to stimulate further refinement and innovation within the broader population. Without this, isolated occasions of new impact-yielding systems might have been missed.

Key Dissemination Issues

As the potential opportunities from forages become more evident, there will be a strong urge to disseminate them as widely as possible. It will be important to understand:

(a) how quickly the use of forages can be scaled-up to new areas; and

(b) how much support will be needed within a site to allow its effective establishment.

The key issues appear to be the following:

Issue 1: Maintaining farmer innovation

Maintaining farmer innovation is likely to remain important in the uplands for two reasons:

(a) The highland environment is diverse. If presented with ready made impact-yielding systems, new farmers will still need to adjust and tailor systems to fit their particular conditions.

(b) In existing forage villages, farmers will soon begin to face a set of 'second generation' problems, including, managing soil fertility to maintain forage yields; dealing with animal health interventions as livestock become more concentrated, and dealing with community issues when extra stock place burdens on local resources, such as water supplies.

These second-generation problems are not unexpected and a range of options already exists for overcoming them, but farmers will need to be innovative in how they apply these solutions to fit their own situations.

Issue 2: Levels of support required

District staff have provided high inputs of time for follow-up to support the development of these impact-yielding systems. With these new systems now proven, it should be possible to reduce this level of follow-up. Some assessment is needed of the degree of follow-up that will be required, and for how long, to ensure that forages are still well established.

Issue 3: Management of extension

Extension has previously been conducted in the Lao PDR on a limited scale. Widespread introduction of forages will require effective strategies to manage extension, including staff capacity building, and planning and monitoring of complex activities.

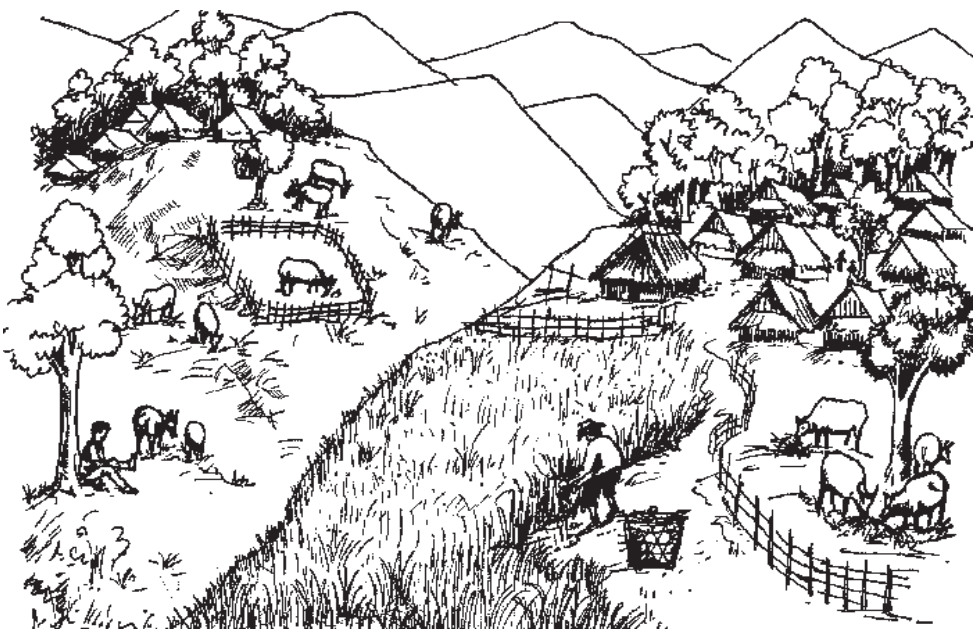
These issues are being researched by a new project, Accelerating Impacts from Participatory Research, funded by the Australian Centre for International Agricultural Research, or ACIAR (Millar et al. 2003).

Conclusions

Real gains are being demonstrated in forage and livestock systems in the Lao uplands. Farmers are beginning to gain genuine impacts, and as a result are finding new livelihoods not based on shifting cultivation. The raw forage technologies, while robust and broadly-adapted, required another stage of development, with farmers creating innovative, new impact-yielding systems.

The technologies were introduced in ways that engaged farmers in a problem-solving process, which is then maintained and consolidated through farmer-to-farmer approaches. Staff had to take on a new role during follow-up, to identify innovations as they occurred and then to quickly communicate these within their own extension group, so that they could be then be used across various sites.

The complex systems and diverse environments in the uplands are challenges that apply to most agricultural programmes. Research produces the initial raw technologies, but these need to go through a further process, to be integrated into new impact-systems, before they can be widely applied by farmers. Rather than attempting to do this within the research sector, this can be achieved more efficiently by working through extension, which will provide the opportunity for unstructured innovation by a broad population of farmers. This innovation then needs to be 'harvested' and further disseminated.



This paper is adapted from: "Strategies for Scaling Up: Technology Innovation and Agro-enterprise Development" in *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland livelihoods.* NAFRI. 2005.

For more information on this topic see:

Horne, P.M. and Stür, W.W. 1999. *Developing forage technologies with smallholder farmers - how to select the best varieties to offer farmers*. ACIAR Monograph 62.

Stür, W.W. and Horne, P.M. 2001. *Developing forage technologies with smallholder farmers - how to grow manage and use forages*. ACIAR Monograph 88.

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These are all published in English, Lao, Indonesian, Thai, Vietnamese, Chinese, Burmese and Khmer and are available from CIAT, PO Box 783, Vientiane, Lao PDR.

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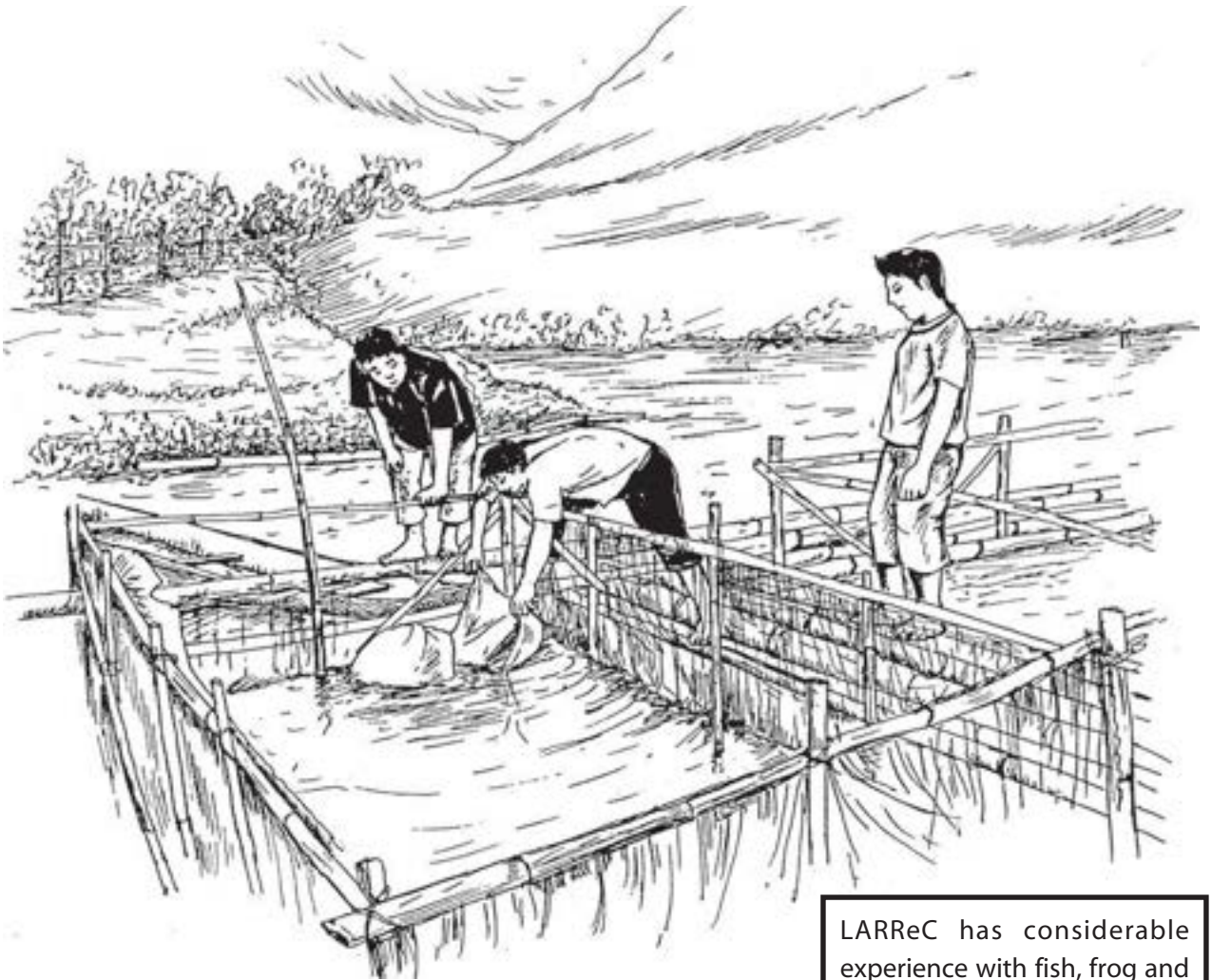
Livelihood Opportunities for Upland Aquaculture



LARReC has considerable experience with fish, frog and prawn culture and helps those interested in starting their own aquaculture businesses.

The uplands are rich in aquatic resources. Laos has many streams and aquatic resources are an integral component of most Lao people's livelihoods. Aquaculture can play an important role in upland areas by providing food, employment and income, playing a role in poverty reduction programmes and giving an alternative to shifting cultivation. An increasing population can benefit from the numerous aquaculture opportunities and it is expected that further inquiries and research will be undertaken to explore the potential for upland aquaculture.

From 2001 to 2003, LARReC operated several projects in Luangprabang and Oudomxay provinces, offering technical assistance and explaining the benefits of aquaculture to a number of local families. Fish culture had been tried before in this area, but through large-scale projects with participants who did not have enough technical knowledge. This article focuses on some of the LARRec research. While the results look promising, more research is needed to understand how aquaculture can support improved upland livelihoods.

Table 1: Fish species studied in on-farm aquaculture experiments			
Lao name	**English name**	**Scientific name**	**Origin, status**
Pa douk lao	Broadhead Catfish	*Clarias macrocephalus*	Native (Mekong basin)
Pa douk phan	North African Catfish	*Clarias gariepinus*	Exotic (Africa), locally introduced in Laos
Pa nin	Nile Tilapia	*Oreochromis niloticus*	Exotic (Africa), widely introduced in Laos
Pa nai	Common Carp	*Cyprinus carpio*	Exotic (Eurasia), widely introduced in Laos
Pa pak	Silver Barb	*Barbodes gonionotus*	Native (Mekong basin)

Pond culture of Tilapia, Common Carp, Silver Barb and Catfish

As part of a broader initiative to promote aquaculture, including frog and cage culture, LARReC looked at pond-based aquaculture in the uplands. The project worked through participatory trials with farmers in two villages, Ban Hatxoua and Ban Pakchiek, in Parkou District, Luangprabang Province. The research objectives were (1) to increase fish production (2) select suitable species and (3) develop some feeding techniques.

Small earthen ponds in Parkou district

Data was collected on:

- Fish species and stocking rates.
- Growth and survival rates of species evaluated.
- Farmers' preference analysis.

Catfish monoculture *(Clarias* sp.*)*

Catfish, or *pa douk*, are aggressive fish that must be raised alone, while the other species can be raised together in the same pond. Three farmers evaluated *pa douk* while two evaluated the remaining three species.

The Ban Hatxoua pond was 40.5 m^2, with a stocking rate of 24 fish/m^2. At four months, production was 24 kg per crop with a survival rate of 25%.

The Ban Pakchiek ponds were 71.5 m^2 and 83.2 m^2 with a stocking rate of 12 and 13 fish/m^2. At four months, production was 51.5 kg and 175.2 kg per crop. The survival rate was 50%.

Table 2: Fish species and stocking rates							
No. Pond	**Village**	**Area (m^2)**	**Fingerlings per pond**				**Total**
			Pa nin	**Pa nai**	**Pa pak**	**Pa douk**	
1	Hatxoua	40.5	-	-	-	1,000	1,000
2	Pakchiek	71.5	-	-	-	1,000	1,000
3	Pakchiek	83.2	-	-	-	1,000	1,000
4	Hatxoua	120.0	200	100	100	-	400
5	Pakchiek	45.5	200	100	100	-	400
Total		**360.7**	**400**	**200**	**200**	**3,000**	**3,800**

Poly-culture in Tilapia, Common Carp and Silver Barb formula culture

The Ban Hatxoua pond was 120 m^2 with a stocking rate of 3 fish/m^2. At four months, production of Tilapia, Common Carp and Silver Barb was 36 kg per crop. The survival rate was 70%.

The experiment compared the growth of Tilapia, Common Carp and Silver Barb using three local feeds:

- 100% rice bran.
- 50% rice bran, 50% broken rice.
- 50% rice bran, 25% broken rice, 25% corn.

The Ban Pakchiek pond was 45 m^2 with a stocking rate of 9 fish/m^2. At four months, production of Tilapia, Common Carp and Silver Barb was 17.5 kg per crop. The survival rate was also 70%.

Table 3: Growth and survival of the fish species evaluated							
No. pond	Village	Area (m^2)	Fish species	Stocking rate (no. fingerling)	Final weight (g/fingerling)	Total weight (kg)	Survival (%)
1	Hatxoua	40.5	*Pa douk*	1,000	100	24.0	24.0
2	Pakchiek	71.5	*Pa douk*	1,000	96	51.5	53.6
3	Pakchiek	83.2	*Pa douk*	1,000	310	175.2	56.5
4	Hatxoua	120.0	*Pa nin*	200	123	35.7	76.8
			Pa nai	100	129		
			Pa pak	100	98		
5	Pakchiek	45.5	*Pa nin*	200	45	17.6	75.3
			Pa nai	100	97		
			Pa pak	100	33		

Table 3 shows that *pa douk* grew faster than the other species, with an average body weight of 169 g/head, but had lower survival rates. There were significant differences in growth and survival among ponds. The reasons for these differences need to be explored further.

The average final weight (in g/fingerling) for each species was 84g for *pa nai*, 113g for *pa douk*, 100g for *pa nin* and 33g for *pa pak*.

Table 4: Farmer preference analysis				
Score	***Pa nai***	***Pa nin***	***Pa pak***	***Pa douk***
	10	8	10	9
Advantages	• Grows quickly • Large body size • Can eat many kinds of feed • Well adapted to local environment	• Grows quickly • Eats local feed • Reproduces quickly • Well adapted to local environment	• Grows quickly • Large body size • Eats a variety of feed • It is delicious	• Grows quickly • Large body size • Eats a variety of feed • It is delicious • Sells at a higher price
Disadvantages		• Small body size	• Not resistant to environmental change • Many bones	• Cannibalistic when young • Can escape the pond • High investment • Labour intensive

Although there were not large differences in preference between the fish, in general farmers liked *pa nai* and *pa pak* because they grew quickly, had large bodies and ate a variety of feed. While they liked *pa douk*, they felt that the investment and care needed was very high.

Lessons learned

- Further trials are needed to determine the effect and differences of lengthier feeding durations (e.g. six, nine and twelve months).
- The stocking ratio should be reconsidered to favour Common Carp because it showed better growth than Tilapia or Silver Barb.

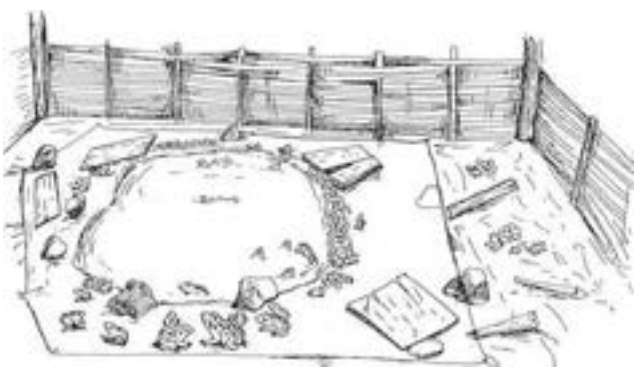
- Further trials are needed to determine the impact of different fingerling release sizes.

Cage culture

A trial was conducted in Parkou to determine if the river's biodiversity could be used when other feeds were unavailable. LARReC teams also looked at the possibilities for river or stream cage culture in seven provinces.

Lessons learned

- Commercial feed may have to be supplemented with local feed.
- Using bamboo structures keeps investment costs low and is readily available.



- Seasonality and temperature are important factors affecting nursing broodstock and eggs, resulting in only one harvest.

Frog culture

The first frog culture trials using earthen ponds were in Oudomxay and Luangphrabang. Culture of *Rana rugulosa,* or Chinese Bullfrog, is widespread in Yunnan province, southwest China, Myanmar, Thailand and Vietnam. This nocturnal frog is common in Laos, living in rice fields and ponds. It hides in caves during the day and comes out to feed in the evening. They are cannibalistic, but their diet also includes tadpoles, insects, earthworms, juvenile fish and small rodents.

Lessons learned

- Frogs grew best from July to September.
- Feed is an important factor and adding earthworms can reduce investment costs.
- Further study is required on growth using different feeding rates and mixtures of local earthworms and commercial feed, and how these affect investment costs.

Ongoing survey of Mekong prawns

LARReC regularly surveys aquatic animals in northern Laos, particularly the abundant indigenous prawns in the Parkou and Pak Seaum Rivers. These prawns are preferred by fishers because they are large and restaurants pay 60,000 to 90,000 Kip per kg. As this prawn becomes more popular, it risks being over harvested and could disappear if protection mechanisms are not put in place.

LARReC is conducting a study of the potential for culturing indigenous Mekong prawn integrated with Tilapia. The yield for Mekong prawn after five months is 90-120 head/kg and 60-80 head/kg for Parkou and Meuang Ngoiy prawn.

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Management Issues in Community Fisheries

The importance of fish and fishing in Laos

Fish is the major source of animal protein for the majority of people in Laos. Frequently when asked whether they eat fish every day, villagers will reply, "Not every day - every meal!" Though other animals are eaten, fish is the most affordable daily protein source.

Similarly, fishing plays an important role as part of the economic safety net for farming communities in Laos. When rice crops are lost through flooding, for example, fishing can provide a fresh, dried or smoked product to exchange for rice.

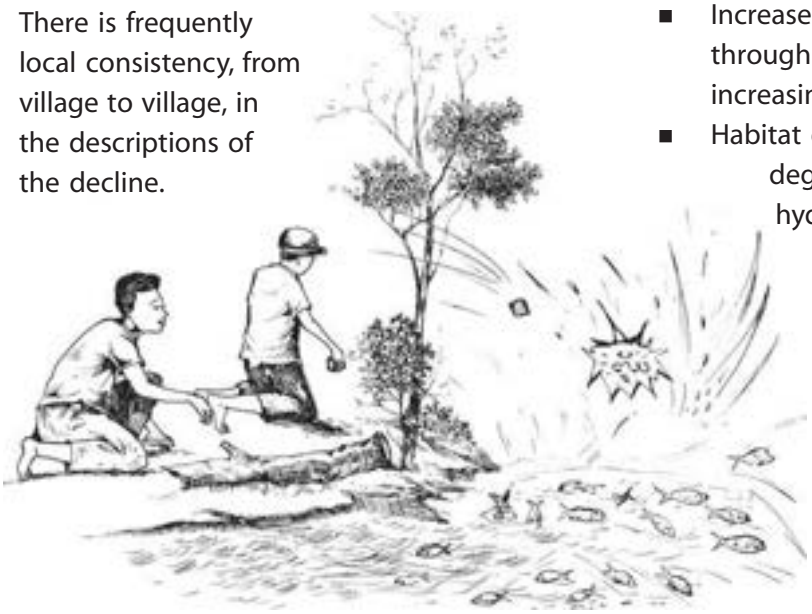
Fishing also provides a role for women and children in the securing of the family protein supply. Although men obtain the majority of protein in the form of fish and forest game, women often contribute significantly to this supply.

Key issues affecting fisheries in Laos

Decline in fish stocks

There are consistent reports from around Laos of long-term declines in fish stocks. While there is little hard scientific evidence, it is becoming widely recognised that community information sources originate from those most closely involved with the resource, and should be treated seriously and given the attention they deserve. In the case of Lao fish stocks, there is good reason to suggest that a real and probably significant decline has occurred.

- The reports are widespread, coming from many parts of the Lao portion of the Mekong basin.
- People are often able to provide details, such as the species which have declined, the extent of decline, and the time period over which the decline has occurred.
- Some types of fishing gear are being abandoned and the reasons given for this are associated with the lack of fish stocks.
- There is frequently local consistency, from village to village, in the descriptions of the decline.



It is also likely that an increase in the number of human fishers has contributed to the overall perception of fish declines, as there are now more people looking for the same fish.

Other factors involved in this decline seem to include:

- Introduction and overuse of monofilament gill nets.
- Use of explosives.
- Other unsustainable fishing practices.
- Ulcerative fish disease - which affected some areas so badly that people report not being able to go near some streams for the smell of dead fish.
- Infrastructure and market development leading to much higher harvesting levels.
- Increases in population, having an effect through both increasing demand and increasing numbers of fishers.
- Habitat destruction and environmental degradation, including changes in hydrological cycles and water quality.

Unsustainable fishing methods

A number of unsustainable fishing methods are, unfortunately, fairly widespread in Laos. These include:

- Overuse of gill nets.
- Blast fishing.
- Electro-fishing.
- Use of poisons.
- Pumping out of wetlands.
- Inappropriate use of fence traps.

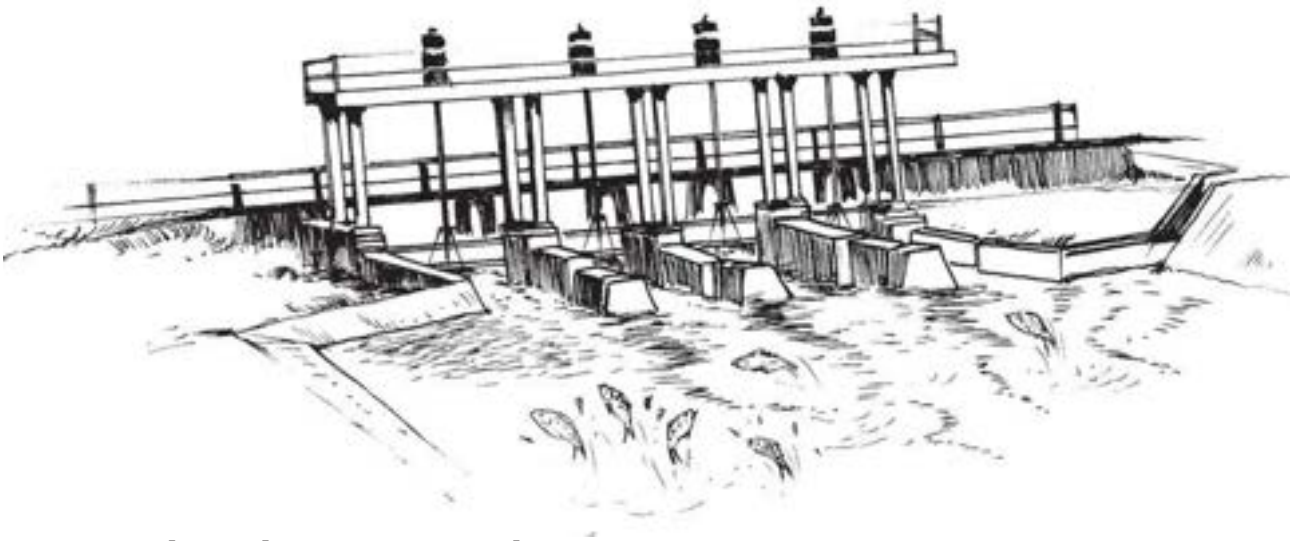
There are a number of reasons for the continued use of these unsustainable methods, such as:

- Lack of knowledge of viable alternative methods.
- Lack of affordable alternatives.
- Economic pressures such as failure of rice crops, leading to a need for a commodity to exchange for rice.
- A desire to gain maximum advantage from newly opened or expanded markets.

Several factors play a major role in hindering the adoption of more sustainable fishing practices. The first is a cultural reluctance to forbid others to do something - particularly when the 'others' are known to those affected by the action. Thus, where communities are aware that fish stocks are being depleted, for instance by overuse of gill nets, they are not usually willing to take action to prevent this unless consensus can be reached with the gill net users.

The second is that a lot of effort has been put into aquaculture development and breeding of exotic species for release into natural waters, rather than into sustainable management of wild-capture fisheries.

The third factor is the lack of mechanisms for consultation and communication among fishing communities over sufficiently large areas such as river basins. Unless people are aware that the resource is widely shared (and widely impacted) they are less willing to take cooperative steps to deal with the problems.



Improved market access and locally increased demand

Due to widespread improvements in the road system in Laos, together with the increasing number of private vehicles, remote fishing communities now have access to markets. In addition, new markets are developing, partly as a result of the very high levels of population growth (estimated at 2.9% per year) and partly through the growth of project settlements.

Communities which have the opportunity to supply these markets are generally turning to the most efficient techniques available - usually gill nets but also electrofishing and poisons. This is having a marked impact on fish stocks. For example, gill nets were recorded as leading to noticeable reductions in previously common species along the Nam Hinboun between Lak Sao and Thakhek. However, since this article was written the Theun-Hinboun dam has come on-line. The dam has completely changed the hydrological cycle, thus damaging fish habitats, migrations, and local livelihoods downstream. Therefore, while gill nets used to be perceived as a major problem, their ecological impact is small compared to that of the dam.

Habitat destruction and environmental degradation

There are a number of negative anthropogenic factors influencing wild-capture fisheries at present. These include:

- Ill-planned and inappropriate developments.
- Large irrigation projects.
- Large hydropower projects.

These projects contribute to changes in hydrological cycles and water quality, sometimes block fish migrations, and are generally associated with a variety of negative impacts on fish and other aquatic life.

Details of the many fish migrations in Lao rivers and streams are not well understood, but it is highly likely that the impacts of building large dams in the Mekong River Basin will be substantial. Apart from the nutritional and economic aspects, if fish migrations cease or are significantly reduced then a range of fishing techniques targeting these migrations will probably cease to be used. It is also important to consider the downstream impacts of dams and water diversion projects.

There is a need for more efforts to ensure that natural flow regimes are maintained downstream of dams through the provision of environmental flows. This requires making sure that water releases from dams replicate natural flow patterns. In addition, dams that block fish migrations need to be avoided whenever possible, and dams generally need to be designed to minimise negative environmental and social impacts.

Community management of fisheries

Little is known of traditional fishery management in Laos. However, in many places elements of traditional practices remain, and these are being modified to meet changing situations. These community management approaches take a number of forms and can be broadly grouped into:

- Areas permanently or seasonally closed to certain activities.
- Prohibitions or limitations on specific harvest techniques.
- Protection or particular fish species or groups.

These existing management controls can provide a basis for development of a more coherent, widespread and culturally relevant system of fisheries management for Laos. This, however, requires some outside assistance to provide the impetus and expertise to support the communities in devising and implementing such a regime.

It is therefore important that a range of people become aware of the current pressures on fisheries and their potential consequences in Laos, both in terms of livelihoods and biodiversity protection. These include the fisher communities themselves, government policy and decision makers, and advisors to government and communities, whether international consultants or non-governmental organisations.

Extracted from: Claridge, G., Sorangkhoun, T. & Baird I. 1997. *Community fisheries in Lao PDR: a survey of techniques and issues*. IUCN.

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The Importance of Fisheries for Upland Villages in Luangprabang

In Laos, fisheries and aquaculture play an important role in the livelihoods of upland people. The ways in which people catch fish are linked to local conditions: where there are streams and rivers there is a lot of opportunity for fishing; where there is little access to streams or rivers, people rely more on ponds to raise fish.

Though a mountainous region, Luangprabang Province is rich in aquatic resources. There are few floodplains, but rice fields are habitats for fish and aquatic animals that are extensively exploited. In addition, fish ponds are becoming more widespread and popular within the province.

The Luangprabang fisheries survey

A survey was conducted in Luangprabang to try and understand more about the importance of upland fisheries. Carried out in a sample of 27 villages (179 households and 500 individuals) between May and August 1999, the work was conducted by five LARReC staff and nine provincial and district staff, with technical support from the Assessment of Mekong Fisheries Component.

The survey villages were chosen randomly by a computer programme from all 1,207 villages in the province. It should be noted that most villages included in the survey were situated relatively close to the town of Luangprabang, downstream on tributaries to the Mekong. The northernmost villages in the province were not covered by the survey. Furthermore, all except four of the villages surveyed were within one kilometre of either a river or a stream (the four villages with greater distance than 1km were located between 1.3 and 2.2 km from a stream/river). This may affect the type of fisheries reflected by the survey and should be kept in mind when reading the survey results.

The objective of the survey was to provide mainly quantitative but also qualitative information on fisheries (including the collection of aquatic animals) in northern Laos, represented by Luangprabang Province. Basic fisheries-related information was collected at the village, household and individual levels. The information includes:

- The degree of participation by people in, and their dependence on, fisheries and collection of aquatic animals.
- The absolute and relative economic importance of fishing in rural people's livelihoods.
- Information on fishing gear, fishing activities, fishing grounds and fish consumption.

Below is a brief analysis of the main features of the data.

Source of living aquatic resources

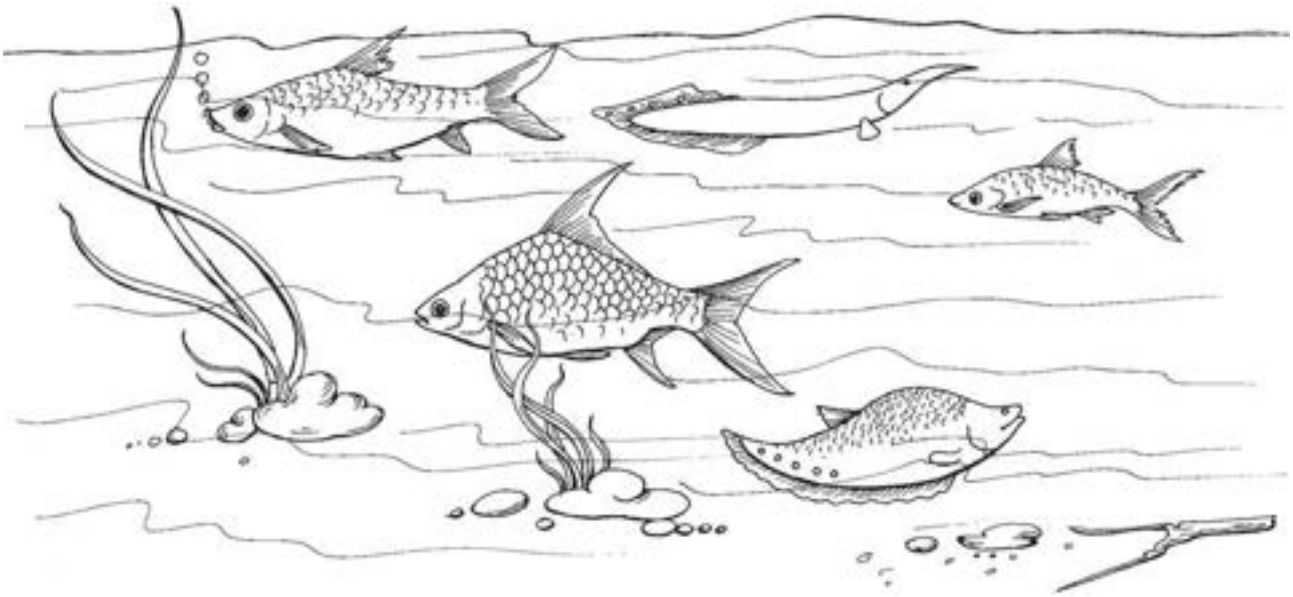
The most important fishing grounds (habitats) in the area surveyed are rivers and streams of varying sizes followed by rice fields. April and May are the most important fishing months followed by March, June and July. However, fishing activities are reported throughout the year.

Aquaculture is not as important as capture fisheries in this area. Catches by households from rivers account for 71% of the total yearly catches reported by households. Small streams account for 19%, rain fed wet rice for 7% and aquaculture ponds for 3%. Only four households (2%) ranked aquaculture as important for food, and only one household (0.5%) for income. In contrast, an average of 72% of households are involved in capture fisheries.

The average annual catch from rivers is 43kg per household (although with large variations), 15.4kg per household from streams, 16.8kg per household from rain fed wet rice fields. Only four households reported catches in aquaculture ponds.

Key facts from the survey

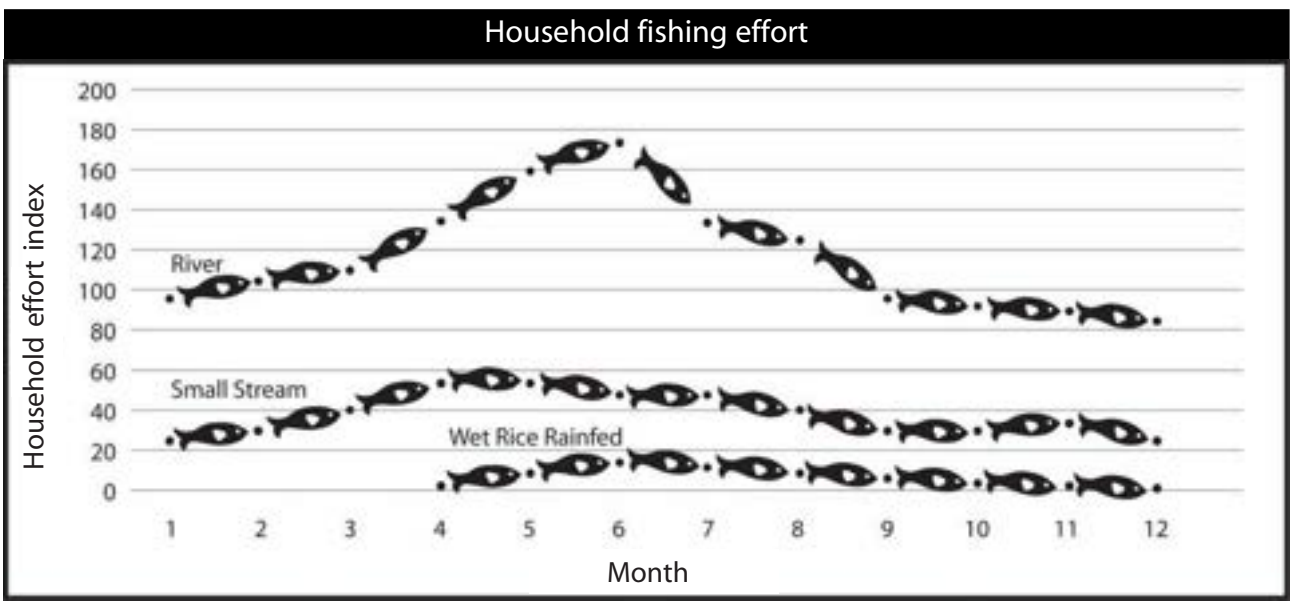
- Overall, 83% of households surveyed reported fishing and collecting aquatic animals.
- In 60% of surveyed villages, more than 95% of households reported being dependent on fishing and collecting aquatic animals for subsistence.
- In 75% of villages, over half the households were reported to be dependent on capture fisheries.
- In one village, all households were reported to be dependent on fishing for both food and income.
- Fishing and collection of aquatic animals was ranked overall as the third most important activity after rice farming and livestock rearing.



Community-based management systems for living aquatic resources are widespread. 52% of the villages report having some form of local management system for their resources. These include:

- Conservation zones.
- Restrictions on seasons, gear and fishing certain species.

Such measures often apply to migratory species and relate to specific spawning sites. Some of these fish stocks are very likely to migrate to and from different countries. However, current management activities appear to relate only to local fishing effort and access.



Effort index is: number of households stating "frequent" multiplied by 3, households stating "medium" multiplied by 2 and households stating "occasionally" as is.

Source: NAFRI, LARReC, MRC, AMFC. 2000. *Fisheries Survey Luangprabang Province Lao PDR.* Vientiane.

Almost all villagers asserted that major threats to their fishery resources arise from 'outside' influences, especially environmental degradation such as changes in water quantity and quality due to activities in other sectors. Unless communities can control influences from other sectors, these important fisheries can be considered as highly vulnerable, if not doomed.

Consumption of living aquatic resources

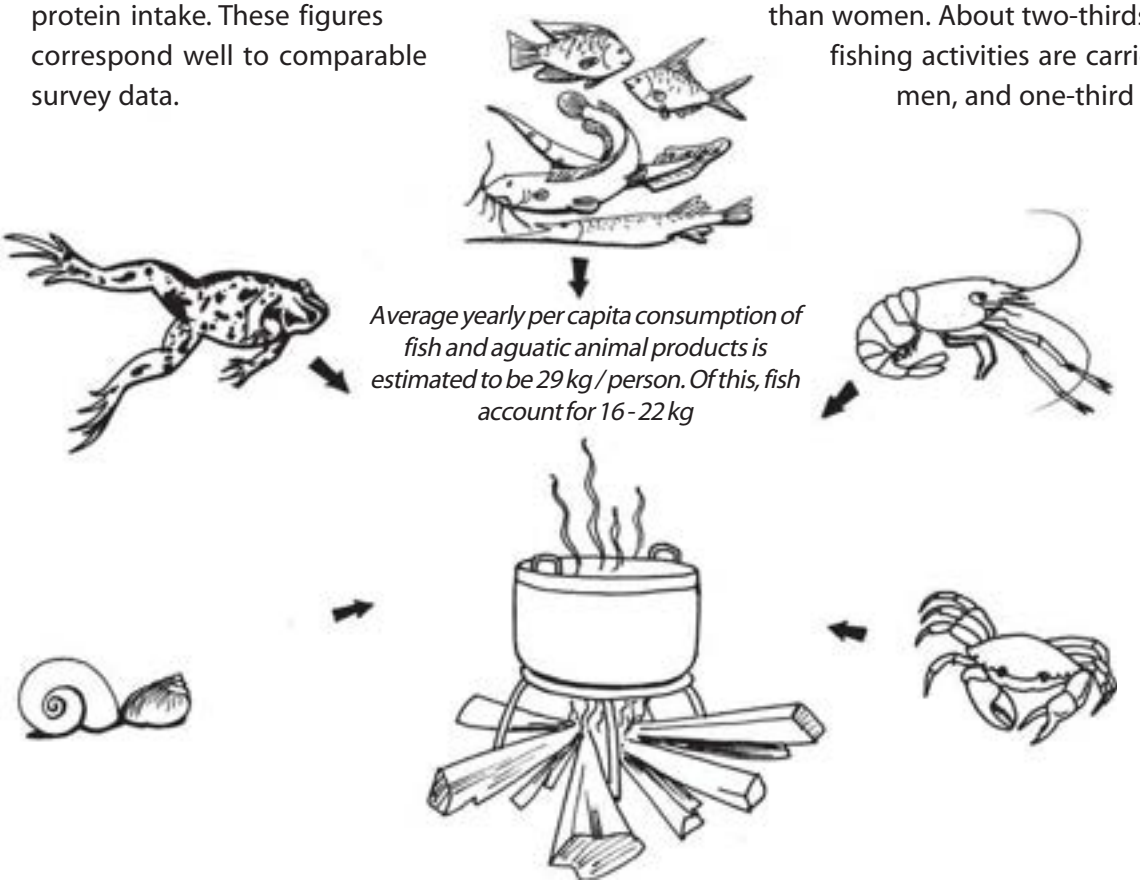
In rural Laos in general, the economy is largely non-monetary. Fishing, in common with most activities, does not appear to be important for cash income. Most of the fish and aquatic animals caught are consumed in the household. However, a sizeable amount is given away to other households or villages, sold, or used in barter trade. Fish and aquatic animals account for 55-59% of the total animal protein intake. These figures correspond well to comparable survey data.

Size of catch

Households catch on average between 30kg and 78kg per year. Half of the fishing population catch less than 10kg. The estimated total production of the province is between 10,000 and 15,000 tonnes per year, of which about half is processed fish and aquatic animals, primarily dried after catch. The survey confirms the findings of the 1998/99 Agricultural Census and the Lao Expenditure and Consumption Survey, that fishing and collection of aquatic animals is very important for subsistence and is integrated with all aspects of people's livelihood strategies. According to the Agricultural Census, 35,100 households, or 56% of the total households in the province, are engaged in capture fisheries.

Gender and fishing effort

Men fish and collect more aquatic products than women. About two-thirds of the fishing activities are carried out by men, and one-third by women.



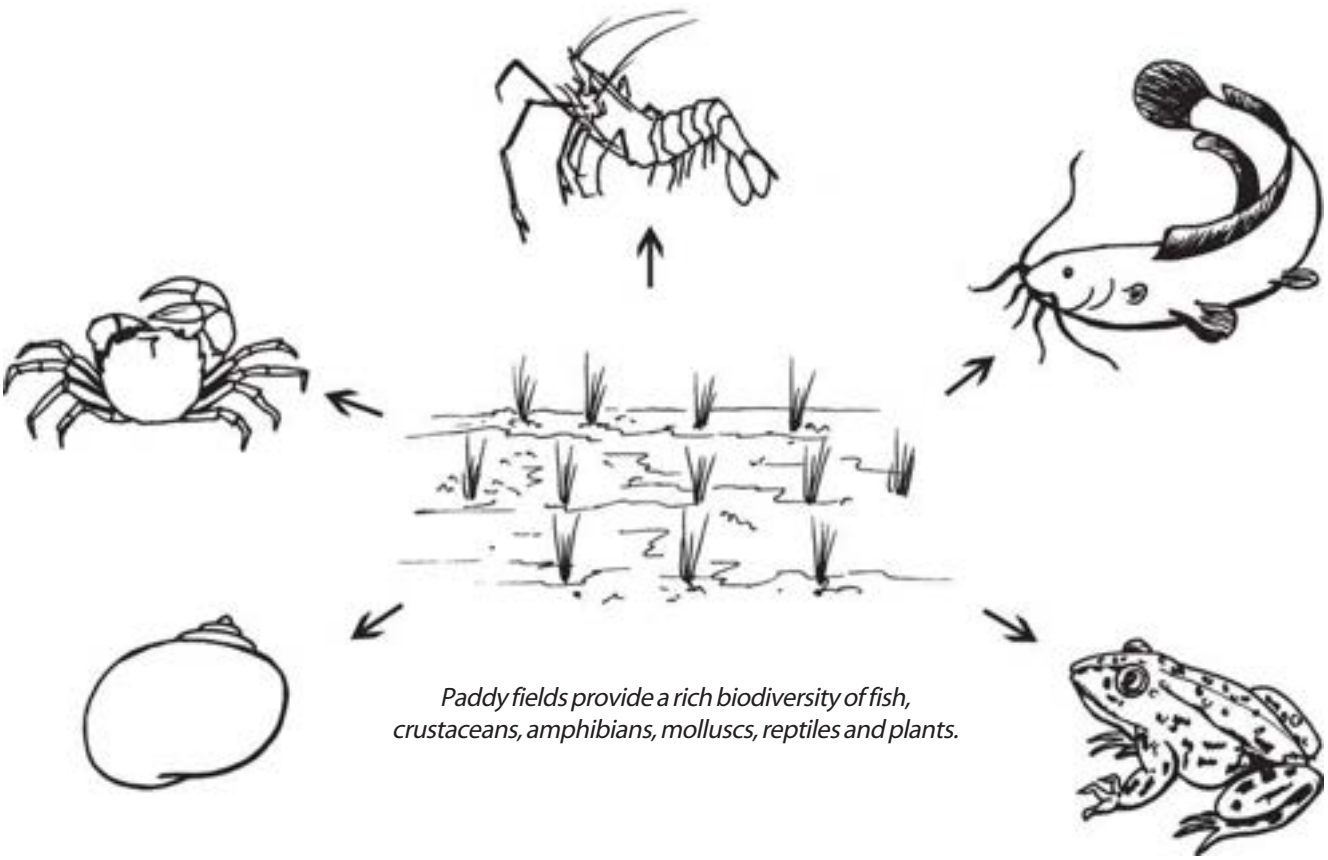
There are also differences between women, men and children in the gears used and where they are used. Women are the principal people engaged in the preservation of aquatic products.

Importance of paddy fields

There is a rich biodiversity of fish, crustaceans, amphibians, molluscs, reptiles and plants that are utilised in Lao rice fields. These aquatic animals play an important role in the livelihood of the local people, particularly in providing protein to the rural poor. The collection of aquatic animals is an activity widely practiced within the whole community and engaged in by rich and poor alike. The types of species targeted and the areas where they are caught may vary depending upon wealth level. To be able to maintain this rich biodiversity there is a need to manage the paddy field for both rice production and fish culture. It is also crucial to understand how the systems inter-connect.

Threats to living aquatic resources

The intensification of agriculture and use of chemicals will definitely have a negative impact on the living aquatic biodiversity and the livelihoods of rural people. Replacement of these resources through the culture of fish is not guaranteed, since access to suitable land for pond construction is limited and the open-access features of the rice field are the same in privately-owned fish ponds. The impact of a loss of aquatic biodiversity will therefore be greater on the poor, who are more reliant on such resources.



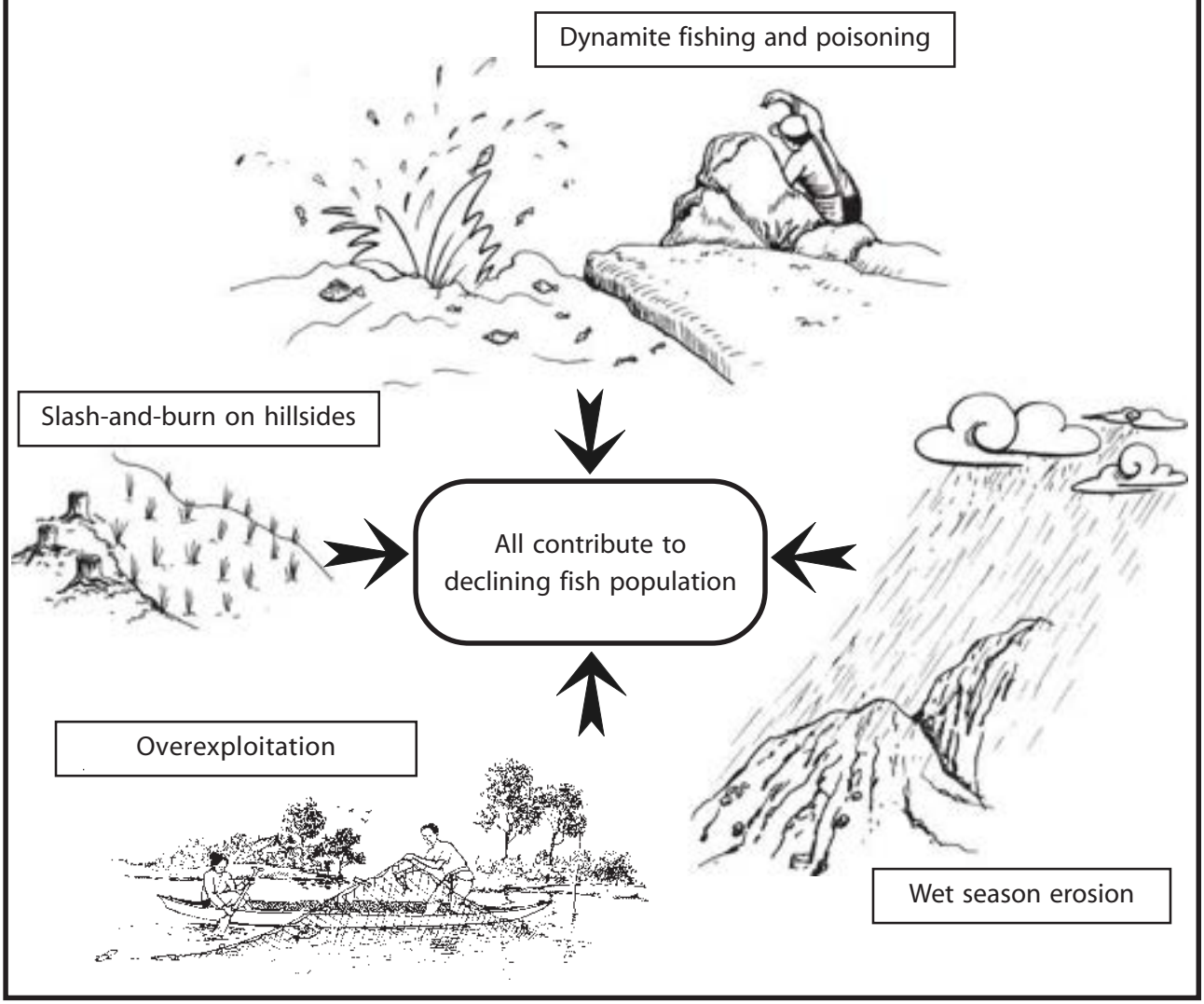
Paddy fields provide a rich biodiversity of fish, crustaceans, amphibians, molluscs, reptiles and plants.

Declining fish populations in Luangprabang

According to local anecdotal evidence, the most serious problem related to fisheries in Luangprabang is a declining fish population compared to five or ten years ago. The reasons given for this decline are:

- Slash-and-burn practices cause soil erosion, which reduces the volume of water in the rivers and streams.
- Erosion of the soil during the wet season destroys aquatic habitats and aquatic animals.
- Use of dynamite, chemicals and poisoning of fish.

The above issues reflect the viewpoints expressed by farmers interviewed. However, overexploitation is also widely recognised as being a major threat to fish populations.



Lessons learnt

- Aquatic resources are important to people's livelihoods in terms of consumption and as a household activity.
- Household fisheries need to be better understood, and sustainable use and management needs to be promoted.
- Where appropriate, community-based management of common property or open access fisheries such as rivers, streams and rice fields should be promoted.
- Though aquaculture can be successful at the household level, it is still practiced in very few of the surveyed households.
- More work should be done to develop appropriate methods for small-scale aquaculture. Constraints that need to be addressed include:
  a) Lack of basic information among farmers
  b) Lack of fish seed (both quality and quantity)
  c) Lack of low-cost, locally available fish feed.
- There is a lot of potential for better integrating aquaculture into the farming system.
- There is a need for continued coordination and collaboration among the partners to address specific needs.
- The biggest challenge to local agencies is to incorporate fisheries considerations into the management activities of other sectors.

Selected reference

Choulamany, X. 2000. *Fisheries Survey, Luangprabang Province, Lao PDR*. LARRec Research Report No. 0001. Living Aquatic Resources Research Centre. Vientiane.

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This paper is adapted from: "The Importance of Upland Fisheries in the Lao PDR: A Case Study" in *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland livelihoods*. NAFRI. 2005.

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Integrating Local Ecological Knowledge: Tools and Approaches in Upland Aquatic Resource Management

Aquatic ecosystems in both upland and lowland areas play a vital role in the daily lives of Lao people. Used sustainably and equitably, living aquatic resources can contribute significantly to rural livelihoods through:

- Provision of food security.
- Poverty alleviation.
- Shared access and benefits.
- Nutrition and health.
- Biodiversity conservation.
- Gender and generational equity.

Fish and other aquatic products are the primary source of animal protein in Lao peoples' diet and are believed to account for about 8% of national GDP. In Luangprabang Province, a recent survey showed that fish contributes 50-55% of the animal protein intake and that in the north of the province, per capita fish consumption is 22kg per year. Despite this however, the contribution of aquatic products to food security and income generation, especially in upland areas, has consistently been undervalued both by policy makers and development agencies.

TerraquaTEK has been working since 2001 to highlight the value of LEK systems for upland aquatic resources management. Activities and outputs have come through the use and development of participatory approaches. ***Although this paper focuses on LEK in Aquatic Resource Management, it has a wide application in many sectors.***

The need for information

The low value often placed on the role of living aquatic resources for upland livelihoods is exacerbated by the lack of available information. This lack of information has undermined the importance of aquatic resources and thus their management, and is reflected in the rising number of communities reporting a decline in aquatic resources. Gaining a better comprehension of the knowledge base - ecological, social, economic and traditional (local) - is therefore of the utmost importance for use in improved management of upland fisheries. Understanding Local Ecological Knowledge (LEK) comprises an important part of this strategy.

Living Aquatic Resources include fish, snails, crabs, aquatic plants, insects etc.
Local Ecological Knowledge is based on local peoples' ideas and beliefs and traditional knowledge of their environment.

Understanding and Using Local Ecological Knowledge (LEK)

LEK is the cornerstone of livelihood thinking and thus drives livelihood strategies employed by villagers. An understanding of LEK could provide development staff with a means to positively influence these strategies and thus improve livelihoods. LEK can support development and improved resource management through:

- Providing more realistic evaluations of local needs, environmental constraints and natural resource production systems.
- Providing a means to understand livelihood strategies and increase development impact.
- Improving communication through common understanding of local terminology.
- Ensuring initial acceptance and sustainability of development initiatives.
- Providing local resources (human and natural) for development projects.
- Adopting local solutions to aquatic resource problems/opportunities.

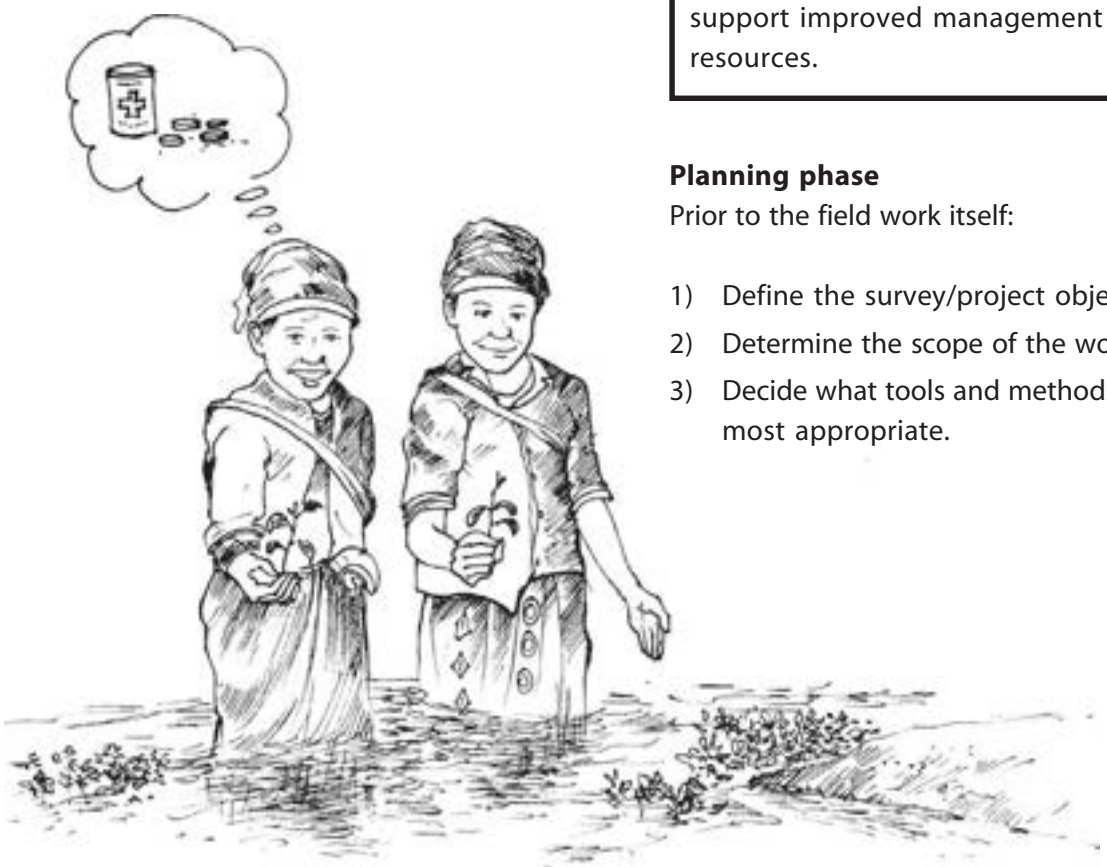
Though useful, the latest technical knowledge is not absolutely vital to improved aquatic resource management in Laos. In fact, a large body of knowledge, including Local Ecological Knowledge, already exists. Using LEK may prevent the need for development solutions (be it technical or otherwise), to come from outside the community. LEK-based solutions

are easily understood by communities who rely on the aquatic resources in question, and are often more appropriate, are adopted far quicker, and require less financial input than outside initiatives. For example, before releasing exotic species in the wild or using them (and their costly feed) in aquaculture ponds, check with the community to see what local knowledge exists on indigenous species and the aquatic plants they eat. This may be more appropriate to the community's needs and understanding, and to those of the environment.

So the question is, how do we find out what people know and what methods and approaches should we use?

Methods for data collection

The following methods and tools can be adapted to suit a variety of development needs, not just local knowledge of aquatic resources.



Villagers in Ban Hatkai, Xiengkhuang Province identified 75 species of wild fish that they regularly catch. Of these, over 50 were considered to be important for their livelihoods. Members of the community have an in-depth knowledge of many of these species, including their interactions, preferred foods, and breeding and nursery areas. For example, the introduction of exotic species, e.g. *Tilapia* Sp. to Ban Hatkai may not just be inappropriate, but may also not be the solution that local people are interested in. As opposed to this type of assistance, the community expressed interest in getting support from the government to help with setting up fisher groups, inter-village meetings, and developing and enforcing regulations for existing and new fish conservation areas. This type of approach, basically Co-management built upon LEK, provides an opportunity to increase mutual understanding of the issues and can strongly support improved management of aquatic resources.

Planning phase
Prior to the field work itself:

1) Define the survey/project objectives.
2) Determine the scope of the work.
3) Decide what tools and methods are the most appropriate.

4) Define roles and responsibilities of the interviewer, recorder and observer (who will be using which tools and when).
5) Set a realistic work schedule.
6) Review available secondary data.
7) Contact the host community to obtain permission and set a date for work.

Selected tools used to gather LEK in aquatic resource use and management

Tool & Activities	Description	Use
Focus group discussions	Method using small groups to elicit primarily qualitative information using topic guides	Perceptions on the resource base e.g. how people feel about (X)
Transect walks	Staff join villagers in fishing trips or river walks	Understand LEK and its application in aquatic resource use and management
Resource maps	Graphical representation of the resource e.g. water maps	Improve bio-physical understanding of habitat based on LEK
Semi-structured (group) questionnaire	Discussion focuses on an agreed list of open and closed questions. Allows follow up questioning	Useful for gathering specific quantitative and qualitative LEK data on aquatic resources, e.g. quantity (kg) and quality of catch
Timeline	Historical profile of long-term resource use patterns	Useful to determine how availability of aquatic products has changed over time
Seasonal calendars	Seasonal profile of collection periods	Can help determine LEK of fish migrations and seasonal availability
Decision Matrix	Ranking preferences of pairs of options according to agreed criteria	Useful in determining what livelihood strategies communities prefer
Direct observation/ informal situations	Staff interact with communities often over an extended period observing daily life through social interaction. This takes time and patience	Understand LEK aspects of resource use from an 'insiders' perspective, e.g. how and why communities manage a fishery the way that they do

Tools for data collection

In the data collection 'tool box' (see box on previous page), there are many different tools. Those that are most appropriate to the objectives of the study must be chosen. Tools that are commonly used for recording local knowledge can be highly participatory in nature. This does not however exclude less participatory tools such as group or one-to-one questionnaires. These tools can be used in a participatory fashion and often generate valuable data.

Implementation phase

Before the field work starts, introduce communities to the survey team and its objectives, approach and time-frame. Discuss with villagers what they are expected to contribute (time/ knowledge etc.) and what they can expect from the project. The following guides can help when conducting interviews or activities:

- Always keep your objectives in mind to avoid going off the point.
- Take clear, accurate notes. Try to get all the information down in your notes (and on questionnaires) not just what you think is relevant at the time. This information may prove valuable later.
- Make use of the 'six helpers' (what, where, when, who, why and how?) when asking questions or probing for more information:
- Ask all the questions needed at the time (sometimes it is not possible to go back).
- Encourage quiet people to speak. Listen to everyone, not just the most 'important' people. Make sure to involve and listen to women and children.
- Check if unsure of an answer, ask for clarification.
- Think where the interviewee got the information: is it first or second hand? How reliable is it?
- The interviewer is here to learn from the interviewees, so show interest and enthusiasm.
- Be attentive, look for information that relates to the focus and follow up. Lead the interview in this direction if appropriate, and assist the information flow.
- Do not always believe the first thing mentioned. If something seems strange, do not hesitate to clear doubts and curiosities; be polite when doing this.

Aquatic Resource Management: guiding questions

These questions were designed and used for collecting LEK on aquatic resource use and management in the uplands, but can be adapted and applied in other sectors.

Understanding aquatic resources and their management (the following questions can be used in conjunction with mapping activities)

1. What do you call the places where you gather aquatic products (including fish)?
2. Where do you gather them (including ponds, rivers, streams, rice fields etc)?
3. Is there anywhere you do not gather aquatic products? Why is this? (conservation, availability, spirits, danger etc.)
4. Describe the problems you have with gathering aquatic products.
5. What do you do about the problems?

Resource availability (historical, seasonal and daily timelines can be used here)

6. Have there been any historical changes in availability of (X)? If so, why is this?
7. Is there anything you do to try to ensure continued availability? What is this?
8. What time of year do you gather aquatic products? Why at these times?
9. When do you catch the most/least? Why at these times?

Labour patterns and techniques (drawing proportional circles can be useful here)

10. Approximately how many people are involved with collecting aquatic products in the village? Draw proportional circles for women/men/children.
11. What does each group collect? (this can be highlighted on a resource map)
12. What equipment do they use? Why? Where do they get it? Is this the same as in the past?

Education & communication (Venn diagrams can be used to identify communication channels)

13. What have you learnt in the last six months about aquatic product collection?
14. Where did you learn this and from who/what?
15. Where do you/other people go if they want to know something about collection?
16. Is there anyone who likes to try out new ways of collection?
17. How and where do children learn to collect aquatic products?

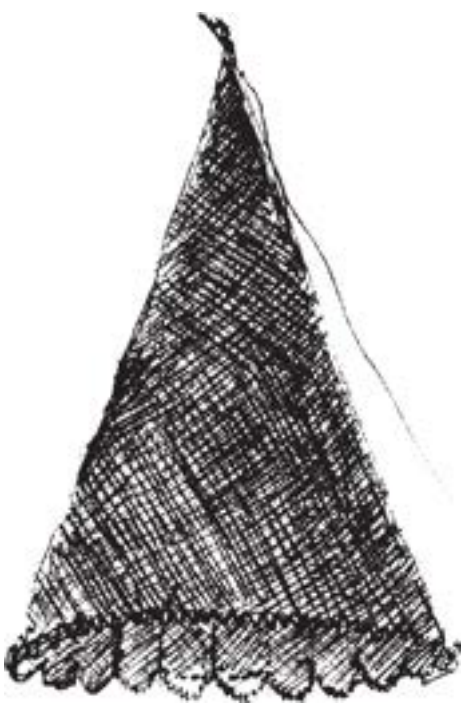
Lessons learned: collecting and integrating LEK

Data collection: Participatory approaches get best results if they are:

- **Systemic and holistic,** i.e. they focus on learning about inter-relationships between social and ecological systems.
- **Focused on social as well as formal interaction** between development workers and communities, encouraging an attitude of learning from communities.
- **Non prescriptive**: there is no blueprint that can be used in different situations. Instead adopt a reactive and flexible approach.

Data collection methods get best results if they are:

- **Well planned**: meaning that data collection should be relevant to the community, guided by objectives, efficiently carried out, and ensure an appropriate level of participation.

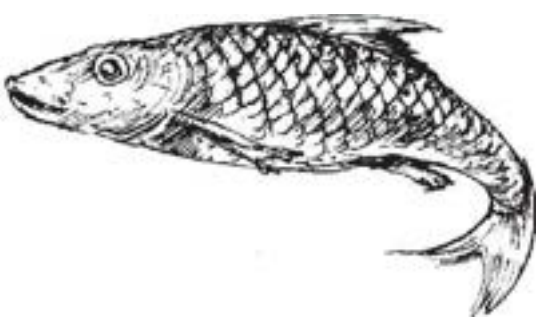


Data collection - Tools and techniques for understanding LEK get best results, if they:

- **Employ a viable mix of qualitative and quantitative tools,** with an emphasis on qualitative tools and supporting activities.

Integrating LEK can improve resource management! This is facilitated through:

- **Incorporating other knowledge systems:** The introduction/adoption of scientifically developed technologies can be more effective if matched to local knowledge systems.
- **Technical and advisory support:** Government staff can provide communities with assistance in adapting to rapid changes in circumstance. For instance, new infrastructure may encourage unsustainable practices due to increased demand and accessibility. Thus, sustainable use may require support or development.
- **Improving co-management through supporting regulatory and institutional mechanisms** to manage water resources, e.g. government assistance in setting up water user or fisher groups, inter-village communication, and enforcement of community rules and regulations.



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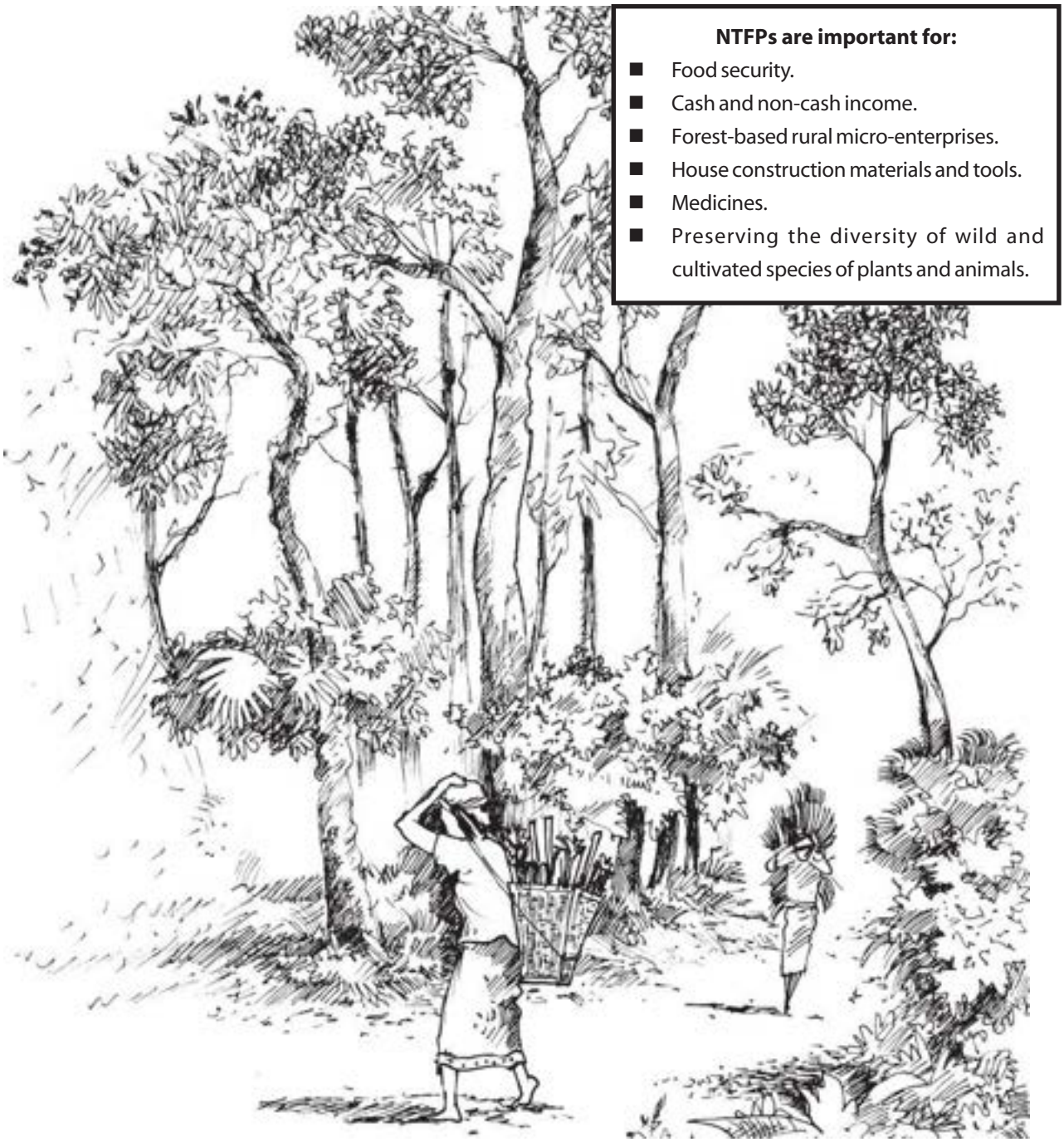
The Importance of Non-Timber Forest Products in the Lao Uplands



NTFPs are important for:

- Food security.
- Cash and non-cash income.
- Forest-based rural micro-enterprises.
- House construction materials and tools.
- Medicines.
- Preserving the diversity of wild and cultivated species of plants and animals.

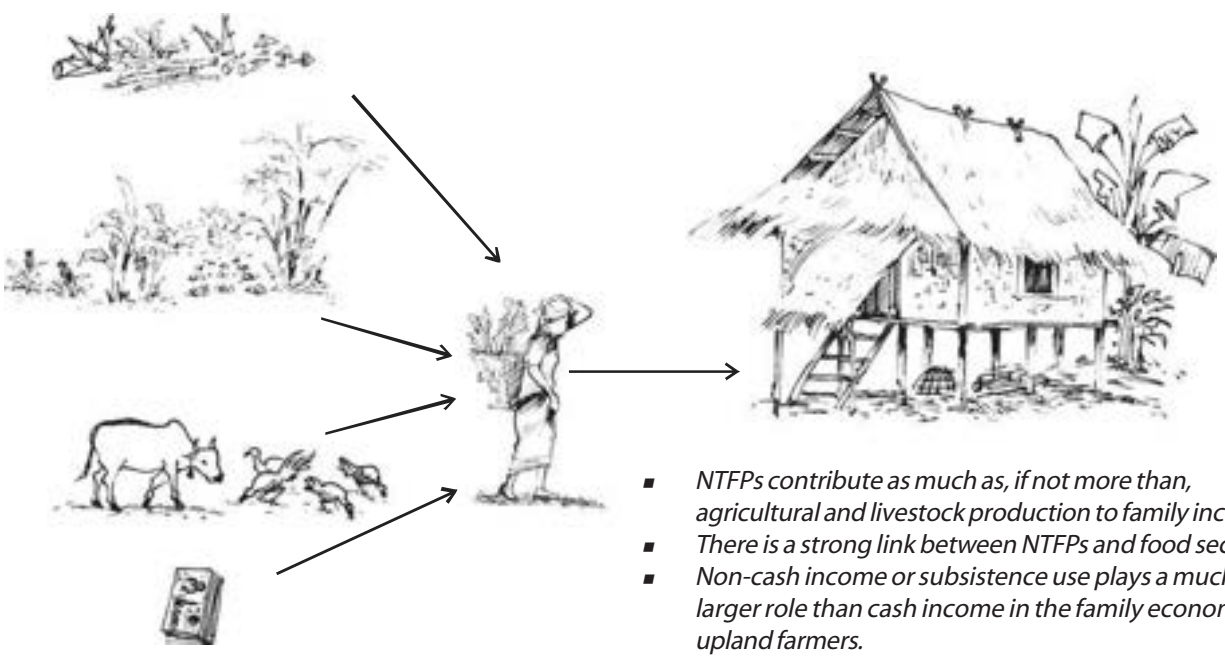
In the uplands of the Lao PDR, the gathering of Non-Timber Forest Products (NTFPs) is as important to human livelihoods as agricultural and livestock production. NTFPs provide food security and are the main source of cash income for the people of the uplands. NTFPs are promising for the development of forest-based rural micro-enterprises as a poverty alleviation strategy and also provide a good entry point to community-based land-use planning.

Exported NTFPs	Subsistence NTFPs
1 Broom grass (*Thysanolaema maxima*) *Khaem*	1 Forest vegetables
2 Sweet palm fruits (*Arenga westerhouttii*) *Tao*	2 Bamboo shoots
3 Paper mulberry (*Broussonetia papyrifera*) *Por sar*	3 Rattan
4 Benzoin (*Styrax tonkinensis*) *Nyarn*	4 Mushrooms
5 *Peuak meuak* (*Boehmeria malabarica*)	5 Wildlife
6 Eaglewood (*Aquilaria* sp.) *Mai ketsana*	6 Bamboo
7 Bitter bamboo (*Indosasa chinensis*) *Nor khom*	7 *Popiet* (*pueraria phaseoloides*)
8 Cardamom (*Amomum* sp.) *Naeng*	8 Forest fruits

Many NTFPs are derived from the mosaic of forests and fallows created by shifting cultivation. Literature on shifting cultivation tends to emphasise the agricultural component of the system, describing fallow vegetation and regenerating forests mainly as factors that contribute to crop production through soil fertility, weed suppression and erosion prevention. Over the last ten years however, a body of evidence has emerged on the importance of NTFPs in Lao upland livelihood systems and on the productivity of shifting cultivation systems in terms of forest products.

The role of NTFPs in the upland family economy

Roughly 70% of Lao people live in the uplands. Around half of these practice shifting cultivation in some form or another, often in combination with other farming systems (UNDP 2002). The mosaic landscape of these uplands results from a long history of shifting cultivation. It consists of a variety of forests and fallows, which produce a great amount of valuable NTFPs. These provide a basis for export, cash income and subsistence (non-cash income) for rural families.



- *NTFPs contribute as much as, if not more than, agricultural and livestock production to family incomes.*
- *There is a strong link between NTFPs and food security.*
- *Non-cash income or subsistence use plays a much larger role than cash income in the family economy of upland farmers.*

Annual family cash income from NTFPs varies from US$69 in Khammuane to $127 in Luang-prabang, providing on average around 45% of family cash income (Foppes and Ketphanh 2000; Yokoyama 2003). However, cash usually forms less than a quarter of total family income: Lao families directly consume most of the crops and products they collect from nature.

This non-cash income contributes as much as 75-84% of total family income and NTFPs provide up to half of this, with an equivalent value of $269-398 per family per year.

Time spent on gathering NTFPs and on agricultural production

A study in Phongsaly cites an average input of 210 labourer days per family per year for agricultural production (Baudran 1999). A recent study on harvesting of bitter bamboo shoots in Oudomxay quotes an average labour input per family of 195 labourer days per year (Morris and Ketphanh 2002). The same families also commercially harvest cardamom, *tout tiang* bark, red mushrooms and broom grass during other months of the year.
For subsistence use, families need to collect palm leaves, bamboo, rattan, etc. for house construction and tools. In addition, every family has to collect firewood, vegetables, small water animals (fish, frogs, shells and crabs) and other food products for cooking every day. The total amount of time spent on NTFP gathering per family per year is probably greater than the time spent on agricultural and livestock production.

NTFPs, local knowledge systems, and genetic diversity

People who practice shifting cultivation in the uplands can easily describe the hundreds of NTFPs that they gather from forests, fallows and wetlands. These 'repertoires of knowledge' are one of the more visible parts of local knowledge systems, developed and maintained by local people over centuries. Other aspects include agricultural production and resource management systems, and beliefs and rituals. There is growing recognition among social scientists that these local knowledge systems are essential for sustainable development and are a key factor in the vast genetic diversity of plants and animals found in the uplands of Southeast Asia (Santasombat 2003).

Through their practices of shifting cultivation and NTFP gathering, upland peoples have actively maintained a wide variety of wild products in the landscape. Local knowledge systems and local practices should not be regarded negatively. Government, researchers and development agencies need to rethink the role of shifting cultivation and local knowledge systems as part of the sustainable use of uplands and NTFPs, and the preservation of genetic resources.

How shifting cultivation produces a wide range of NTFPs

Shifting cultivation produces a landscape consisting of a mosaic of vegetation types, representing fallows and forests in various stages of regeneration. Each of these vegetation types produces its own specific set of harvestable products, or NTFPs.

Not all NTFPs are collected from mature forests; many are also found in young fallows, grasslands and wetlands. The variety of NTFPs is greater in a mosaic of vegetation type, as produced by shifting cultivation, than in a landscape covered by only one type of vegetation (crop fields, mature forest). The dynamics of fallow vegetations, how they depend on fallow length, soil type, slope aspect, previous vegetation etc, are still little documented and poorly understood.

Current trends in NTFP gathering in uplands of Lao PDR

NTFP gathering in the Lao PDR has changed more rapidly over the last decade (since the early 1990s) than in any other period of Lao history. The following four factors are the main drivers causing these changes:

1. Evolving markets for NTFPs

There is increasing trade in NTFPs with neighbouring countries such as China, Vietnam and Thailand (Yokoyama 2003). Exports of NTFPs from Laos are worth several million dollars per year. Products include medicines for the Chinese market, aromatic barks and woods, foods and fibres.

Trends in the commercial use of NTFPs are:

- Prices stay low, as markets are volatile and non-transparent and products are sold raw without any processing or quality control.
- Lack of a legislative framework to support sustainable trade in NTFPs.

Typical upland vegetation types and the products gathered from them

Vegetation type	Age of vegetation	Products collected
Upland rice field	01 years	7,000 or so rice varieties, 40-60 other crops
Young herbaceous fallow	1-4 years	Vegetables, grass for animal grazing, grass for thatch
Permanent grasslands	5 years and older	Grass for animal raising
Young secondary forest	5-15 years	Cardamom, *tout tiang* bark, *mak kha* fruits
Bamboo forests	5 years and older	Edible bamboo shoots, bamboo canes
Old secondary forest	Over 15 years	Timber, rattans

(Source: adapted from Pollini and Lamxay 1999)

Forest foods and food security

Food security is the overwhelming concern of most rural families in the Lao PDR. Especially in hilly areas, where people are dependent on upland rice cultivation, most families are unable to produce enough rice to feed their family all year round. The main coping strategies of poor families are:

- Complementing their diet with forest foods.
- Selling NTFPs to buy rice.
- Borrowing rice and paying back in labour.

A study on consumption of forest foods in three villages in Saravane showed that:

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

Forest foods provide unique advantages as a coping strategy for poor people:

- Availability and dependability.
- Diversity
- Nutritional values.
- Economic and cultural values.
- Forest foods can replace rice in times of great hunger.
- Forest foods can be exchanged for money to buy rice and avoid debt.

(Source: Clendon 2000)

- Increased gathering for trade leads to a rapid exhaustion of natural stocks for some NTFPs, e.g. eaglewood, or the aromatic barks of *Lauraceae* spp. such as bong bark.
- Increased demand for NTFPs starts to result in commercial plantation of economically attractive species like cardamom and bong bark.

2. Population growth

With an estimated population growth of 3.5% per year, the population of Laos can be expected to double within twenty years (Foppes et al. 1993). Without emigration or changes to more intensive land use systems, this population pressure will lead to a shortening of fallow periods, to the extent that shifting cultivation will no longer be possible and natural supplies of NTFPs will disappear. Local communities often report declining availability of NTFPs over a time frame of about ten years.

The challenge remains to find out how conservation of upland resources can be combined with such a rapid population increase. Sustainable management of NTFPs in the wild will be an essential strategy in this, as will additional production of NTFPs from gardens and plantations. Research that builds on existing local knowledge is needed to develop these plantations.

Examples of declining NTFP resources due to increased population pressure

Forest dwelling communities can make good estimates of declines in off-takes of NTFPs. The village of Ban Nong Hin, Champasack, has developed management systems varying from rotational harvesting of rattans to prohibited fishing seasons or total hunting bans for certain species of wildlife.

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

Changes in off-takes per unit of effort for three key NTFPs over the last ten years (1989-1999), assessed by villagers of Ban Nong Hin, 17/2/99. (Source: Foppes & Ketphanh 2000).

3. Deforestation and NTFPs

Shifting cultivation is often cited as the main cause of deforestation. However, several studies have pointed out that commercial logging and conversion of forests for plantations (rubber, coffee) are the main causes of destruction of Lao primary forests (Ducourtieux 2000). Deforestation for commercial use often destroys the NTFP resources that local communities rely on.

4. Impact of land allocation systems on upland NTFP availability

The main impact on NTFP harvesting seems to be that policies on land allocation and reduction of shifting cultivation decreases the area of fallow land producing NTFPs. Land allocation policies may need to be revised to allow village communities to practice the long fallow rotational systems that provide them with the maximum range of NTFPs in a sustainable way.

Conclusion

If left unchecked, the key trends discussed above could lead to a rapid increase in poverty and a loss of natural resources and biodiversity. NTFPs are important for the survival of upland communities, both in terms of cash income as well as subsistence use. Shifting cultivation and NTFPs are closely related and both are part of local knowledge systems that should be preserved for sustainable use and conservation of wild and agricultural genetic resources. Developing long-cycle NTFP production systems that are suited to the ecology of the Lao uplands could stabilise shifting cultivation, protect watersheds and conserve the biodiversity of both wild and cultivated species of plants and animals.

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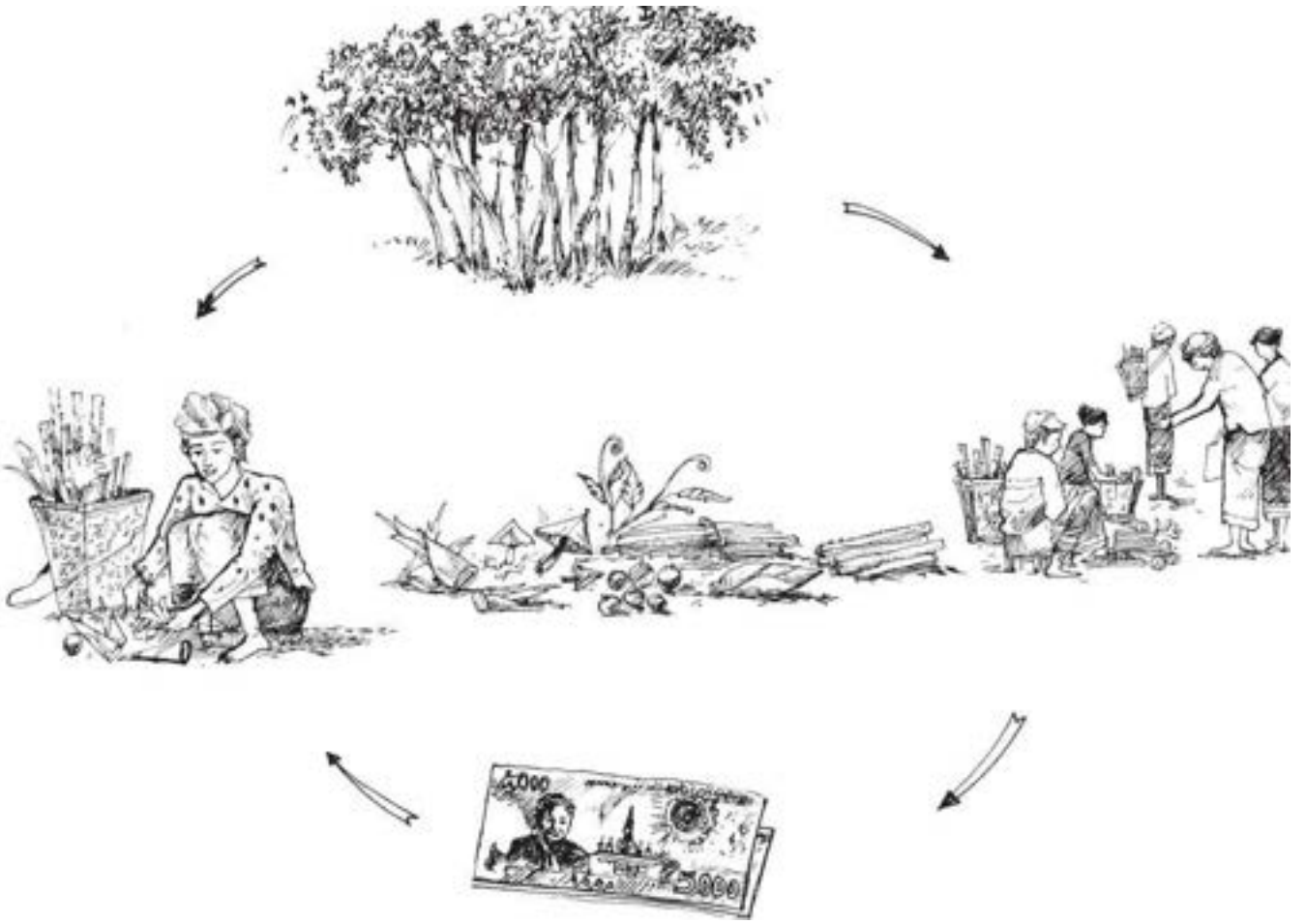
NTFP-Based Approaches for Sustainable Upland Development



NTFPs provide an important vehicle for sustainable upland development. They are a good entry point for maintaining food security, for introducing community-based forest management, private sector development, and domestication of NTFPs, and also form a good basis for income generation and poverty alleviation.

A number of new systems for NTFP production are evolving, including agro-forests based on domestication of NTFPs, community-based NTFP harvesting rules, and multi-village NTFP conservation rules. The key factors driving this process are the importance of NTFPs in the rural economy, the wealth of 'indigenous technical knowledge' on NTFPs and forests, increasing access to markets, innovative and enterprising attitudes of local forest users, and the support of facilitating projects and programmes.

Maintaining the food security and coping mechanism role of NTFPs

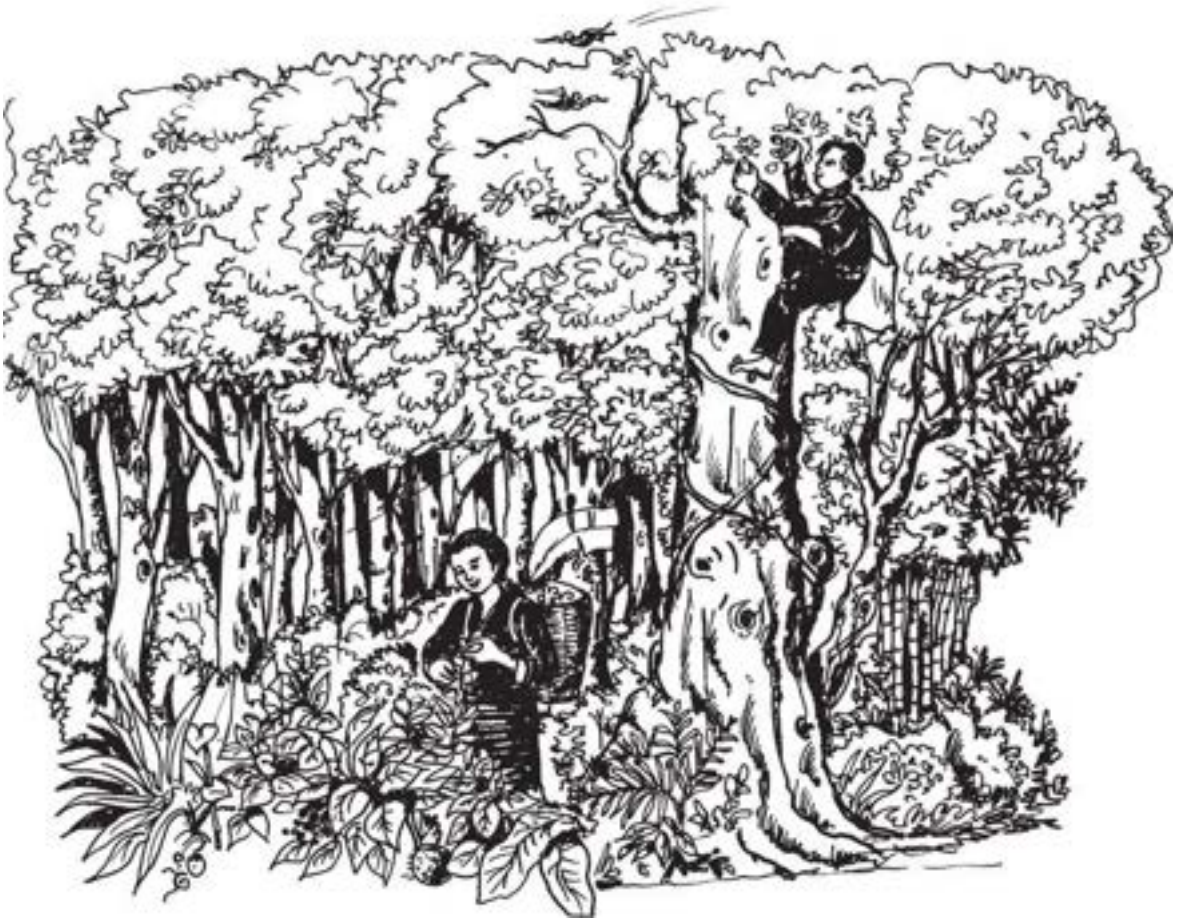
NTFPs are essential for upland Lao families to secure their basic food needs. Forest products are either directly consumed by the family or sold to buy rice in times of shortage. Strategies for maintaining the role of NTFPs for poor rural families include:

- Place NTFP activities at the core of livelihood based strategies.
- Integrate forest management into rural development activities to promote food security from the gathering of forest products.
- Apply rapid appraisal tools to identify the role of NTFPs in livelihoods and food security.
- Give local communities clear access rights to forest resources.
- Promote NTFP agendas as a 'must-have' for every rural development programme at provincial/ district/ community level.
- Include NTFP use indicators and criteria in livelihood assessment studies.
- Conduct studies to monitor changes in quality and quantity of forest foods in the diets and consumption patterns of the rural population.
- Develop strategies to enhance food security based on wild foods from forest and wetlands, in combination with rice-based strategies.
- Provide networking and training support to village level local innovators who want to develop new production and management methods for wild foods in forests and plantations.
- Train district and provincial extension officers from the services of Agriculture, Health, Education, and the Lao Women's Union to raise awareness on the role of NTFPs in food security, biodiversity, and culture.
- Develop training and extension materials to raise awareness on the way wild foods supply a broad range of nutrients. Incorporate this into the curriculum of university students.

Village-based management of wild NTFPs in natural forests

The management of wild NTFPs in natural forests is a good entry point for sustainable, community-based forest management and biodiversity conservation. NTFP-based community land-use planning and biodiversity conservation initiatives could include:

- Finding out the purposes that people are using the forest for, and the issues regarding this use, then facilitating a process for solving these issues by agreeing on sustainable use rules per product, rather than for the entire forest.



- Using land allocation, not only to focus on demarcation of areas but also to facilitate agreements on the use of specific products inside forest areas.
- Developing frameworks for dealing with the use of one forest block by multiple villages at sub-district level.
- Building on local concerns about exhaustion of NTFPs, and engaging local communities in using their local knowledge to preserve biodiversity.

NTFPs as a basis for private sector development

To improve NTFP-based private sector enterprise, consider:

- Strengthening local communities to organise NTFP production and marketing by creating producer associations and entrepreneur groups.
- Improving business support services for rural micro-enterprises.
- Strengthening producers and traders' associations at provincial and national level.
- Developing market and price information systems.
- Improving marketing/quota systems and linking them to ecological sustainability criteria/indicators.
- Adding value by introducing quality control and product processing techniques.
- Studying the potential of standards-based systems, e.g. product certification.
- Linking NTFPs to eco-tourism.

Domestication of NTFPs in gardens

Wild NTFP resources are on the decline and alone they may not provide enough supply for the future demands of a growing local population and export markets. The establishment of plantations and gardens is essential to meeting this growing demand and decreasing the stress on wild supplies. Ways of promoting domestication include:

- Setting up systems to record and support the exchange of local knowledge regarding domestication and ecology of wild plants and animals.
- Identifying and protecting the genetic resources of all NTFP species.
- Developing nurseries and multiplication systems for key species.
- Conducting agroforestry trials to identify best practices for the production of key species in gardens.
- Carrying out farming systems research to integrate domesticated NTFPs in long-rotation hill farming systems.
- Secure intellectual property rights for Lao NTFPs in the context of conservation of biological/genetic diversity.

Conclusion

NTFPs are essential to maintaining food security for poor rural families in the uplands. Forest resource management needs to be integrated into rural development activities and food security strategies. Village-based management of wild NTFPs is a good entry point for community forest management systems but more legal and training support is needed. Wild NTFP systems will not be able to meet

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Main Commercial NTFPs in the Lao PDR

Non Timber Forest Products (NTFPs) are a major source of income for rural villagers throughout the Lao PDR. Some of the main commercial Lao NTFPs are listed below.

Lao name	English name	Botanical name and family	Regional distribution	Uses
1. *Dok khem*	Broom grass	*Thysanolaena latifolia* (F. *Gramineae*)	North	Inflorescences exported to Thailand for making brooms. From fallow land (grasslands).
2. *Posa*	Paper mulberry	*Broussonetia papyrifera* (F. *Moraceae*)	North	Bark collected from wild, but mainly from cultivated trees, to make fibre products. Exported to Thailand.
3. *Mak tao*	Sugar palm seed, sweet meat	*Arenga westerhoutii* (F. *Palmaceae*)	North	Fruit exported to Thailand for making sweets. From medium elevation forests.
4. *Peuak muak, Sapane, Toutiane*	*Muak* bark	*Boehmeria malabarica* (F. *Urticaceae*)	North	Bark contains gum used in China to produce glue.
5. *Mak neng*	Cardamom	*Amomum* sp. (F. *Zingiberaceae*)	North,Central, South	Fruits (capsules) collected from wild and cultivated plants for export to China. Medicine and spice.
6. *Nyan*	Benzoin	*Styrax tonkinensis* P. (F. *Styracaceae*)	North	Exported to France for making perfumes and other products. Domesticated.
7. *Kisi*	Damar resin	*Shorea* sp. (F. *Dipterocarpaceae*)	Central,South	Resin exported to Thailand and Vietnam.
8. *May ketsana*	Eaglewood	*Aquilaria crassna* (F. *Thymelaeceae*)	North, Central, South	Scented wood with distilled oil exported to China, Arab countries and Japan. Domesticated.
9. *Nor may*	Bamboo shoots	*Gigantochloa* sp. *Bambusa* sp. *Oxytenanthera* sp. *Dendrocalamus* sp. (F. *Gramineae*)	North,Central, South	Wet-season (year round due to range of species) edible shoots generally sold by villagers to nearby markets. Partially domesticated.
10. *Nor khom, May khom*	Bitter bamboo shoots	*Indosasa sinica* (F. *Gramineae*)	North	Dry-season edible shoots for local markets or export to China.
11. *Nyod vay*	Rattan shoots	*Calamus* sp. *Daemonorops* sp. *Raphis* sp. (F. *Palmaceae*)	North,Central, South	Wet-season (year round due to range of species) edible shoots generally sold to localmarkets or exported to Thailand. Partially domesticated.

Lao name	English name	Botanical name and family	Regional distribution	Uses
12. *Mak kha*	Galangal	*Alpinia galangal* (F. *Zingiberaceae*)	North	Exported to Thailand as a spice. Spice used in SE Asia.
13. *Peuakbong*	Bong bark	*Persea kurzii* (F. *Lauraceae*)	North,Central, South	Bark exported to Thailand and Vietnam for joss sticks and incense. Partially domesticated.
14. *Hed*	Wild mushrooms	Various species	North,Central, South	Sold for food on domestic markets.
15. *Mak koh*	Chestnut	*Castanopsis* sp. (F. *Fagaceae*)	North,Central, South	Sold for food on domestic markets.
16. *Mak kho*	Taraw palm	*Livistonia* sp. (F. *Palmaceae*)	North,Central, South	Oily fruits are edible. Leaves used for house roofing.
17. *Mak chong*	Malva nut	*Scaphium macropodum* (or *Sterculia lychnophora*) (F. *Euphorbiaceae*)	South	Sold for food on domestic markets.
18. *Mak seng beaua*	Strychnine	*Strychnos nux-vomica* (F. *Loganiaceae*)	South	Seeds contain strychnine, used for medicine.
19. *Vai*	Rattan fruits	*Daemonorops* sp. (F. *Palmaceae*)	North,Central, South	Used for food or medicine in China.
20. *Nam man yang*	Yang oil	*Dipterocarpus* sp. (mainly *D. alatus*) (F. *Dipterocarpaceae*)	Central,South	Oil extracted from wood, but this practice prohibited.
21. *Pakvan*	Sweet vegetable	*Melientha suavis* (F. *Opiliaceae*)	South	Young leaf shoots used as vegetable.
22. *Mak kabao*	Chaulmoogra	*Hydnocarpus kurzii* (F. *Flacourtiaceae*)	Central, South	Fruit used as medicine to treat leprosy.
23. *Chandai*	Dragon's blood tree	*Dracaena loureiri* (F. *Pandanaceae*)	North	Medicinal plant exported to China. Grows on limestone outcrops.
24. *Dok pheung, Dok euang*	Orchids	*Dendrobium* sp. (F. *Orchidaceae*)	North	High–value medicinal plants exported to China.
25. *Fek hom*	Oil of Vetiver	*Vetiveria zizanoides* (F. *Gramineae*)	South	Commercial essential oils extracted from roots.

Sources: NAFRI, IUCN, SNV and IFAD

For more information on NTFPs readers should contact the NTFP Unit of the Forestry Research Centre at NAFRI. Email: frc@nafri.org.la; Tel: 021 770892.

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Models for Participatory Forestry Approaches

Forests play an integral role in the lives of most upland people. Some 80% of the population are heavily reliant on the forest for timber, food, fuel, fibres, shelter, medicines, condiments and spiritual protection. In rural areas, forests are a precious economic resource and Non-Timber Forest Products (NTFPs) often provide more than half of a family's total income.

The Government of the Lao PDR has always recognised the importance of local involvement in forest and natural resource management. The Forest Law of 1996 allows for the recognition and allocation of forest land to villages to manage and protect their local forest resources. Village boundaries, including forest demarcations, are officially drawn in cooperation with neighbouring villages through the land and forest allocation process. Village forest is classified into several types, and rules on the use of each type are agreed upon by the villagers. Villagers are allowed to collect and sell NTFPs and to harvest

timber for domestic use in line with these rules (MAF 2004).

Starting in the mid- to late-1990s, a number of participatory forest models were tested in state forests. These projects used people-oriented forest management approaches, with varying degrees of participation and benefit-sharing arrangements. Comparing these different models provides an opportunity to better understand which approaches might work best in the various ecological and social conditions in Laos.

Participatory Forestry in State Forests

While a comprehensive strategy for involving local people in forest management activities beyond the village forest has yet to be formally proposed, it is a major component of the Forest Sector Strategy for 2020 (MAF 2004). Some of the main characteristics of participatory forestry include:

- Aims at sustainable use of forest resources.
- Involves local people in forest management and is based on their needs.
- Uses land allocation as an integral component.
- Ensures a large part of the income from forest management remains in the villages to promote rural development and reduce rural-urban disparity.

(Sophathilath 1998)

The main participatory forestry projects in Laos

1. Joint Forest Management Project in the Lao-Swedish Forestry Programme (**JFM**).
2. Forest Management and Conservation Programme (**FOMACOP**).
3. National Watershed Conservation Project (**NAWACOP)**.
4. Forest Conservation Project (**FORCAP**).

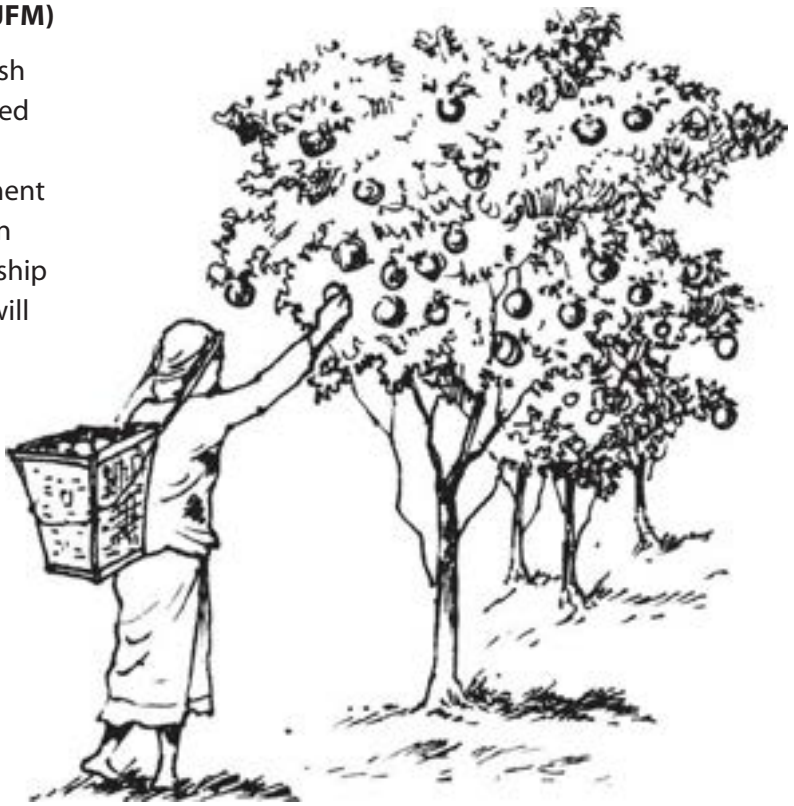
These four projects fall naturally into two groups:

Overview of projects

Related projects	Primary orientation	Environment	Management approach
Group 1 JFM and FOMACOP	Focused on participatory approaches to the management ofnatural forest	Heavily forested areas, primarily in the southern lowlands	*Sectoral* *Why?* Greater opportunities for livelihood enhancement already exist using current forest resources
Group 2 NAWACOP and FORCAP	Focused on participatory approaches to the rehabilitation and management of degraded watersheds mainly through: a) Plantation forestry & agroforestry b) A range of livelihood options as an alternative to shifting cultivation	Moderately to severely degraded areas, primarily in watersheds and upland areas.	*Non-sectoral:* A comprehensive welfare approach is applied *Why?* More urgent need to provide alternative livelihoods to prevent further degradation of the resource base

1. Joint Forest Management Project (JFM)

The JFM sub-programme of the Lao-Swedish Forestry Programme was a small Sida-funded experimental project designed as the first venture into participatory forest management in Laos. The basic concept is that forests can best be managed sustainably by a partnership between foresters and villagers. Villagers will protect forests that contribute to meeting their basic needs and to their overall social and economic development. The project used an action research approach and focused on modelling different benefit-sharing arrangements.



The JFM project tested two models:

Model 1:

- The village has full responsibility for managing the forest.
- The village gets assistance from district and provincial forestry staff.
- The government receives a royalty from the sale of timber.
- All other revenue from the forest goes into a village development fund.

Model 2:

- The FD retains management control of the forest and villagers are hired for management operations. After selling the logs the FD pays the villagers' share into a village development fund.

Compared to the FOMACOP project the JFM project was a much smaller project and had less ambitious goals.

2. Forest Management and Conservation Programme (FOMACOP)

FOMACOP was a large GoL/World Bank/ FINNIDA/GEF funded project based on state-of-the-art methods in participatory forestry and global experience. As such, it set the standard for participatory forestry in Lao PDR. Although its training approach can be described as top down, the hallmark of the project is its dedication to bottom-up participatory planning. Alongside the technical aspects associated with forest management, FOMACOP paid special attention to organisational building and strengthening at the village and district level, as well as to entrepreneurial development among villagers. FOMACOP placed a greater value on local people's participation than JFM. The short-term objectives of the project (1995-2000) were:

- To help develop national strategy guidelines and a legal framework to support village forestry and sustainable forest management.
- To develop and test pilot schemes that improve the implementation of sustainable forest management and biodiversity conservation systems and to strengthen villagers' and forestry staff's capacity to implement these systems.
- To seek acceptance for the developed systems as a basis for expanding their implementation.

The long-term objectives (2000-2010) were to expand these systems beyond the pilot sites and to continually develop, test and improve other systems elsewhere. The project planned to produce participatory forestry handbooks, guidelines and training manuals, and to play a role in helping the authorities create supportive legislation and instructions for participatory forestry through the National Participatory Forestry Strategy and Programme. The project finished in 2000. However, a follow up project (Sustainable Forestry and Rural Development Project) has been initiated.

3. National Watershed Conservation Project (NAWACOP)

Again, with NAWACOP, the concept of partnership between state and villagers underpinned the project. Integrated Watershed Management replaced the old focus on soil conservation issues with a more comprehensive approach focusing on community resources management, poverty alleviation and food security. The objectives of the second phase were to:

- Create a basis for sustainable management with active participation of the target group.
- Promote gender-specific income options.
- Improve ability of district and provincial institutions to implement participatory, sustainable resource management.
- Inform the target groups about government services and methods of family planning.
- Enhance the capacity of national institutions to develop a strategy for watershed management and implementation of land allocation.

As objectives were fulfilled it was expected that there would be a greater level of community involvement in sustainable forestry management. There would be more options for sustainable income generation and beneficiaries would improve their knowledge and use of family planning services. There was also to be increased capacity at provincial and

district levels to support sustainable resource management and land allocation.

4. Forest Conservation Project (FORCAP)

With FORCAP, local people participated in the whole process of project cycle management, from planning, through implementation, and finally in monitoring and evaluation.

The project promoted forest conservation and afforestation activities and improved living conditions through village development action plans. The capacity of local staff was developed, especially at district level, through on-the-job training and the implementation of project activities in close collaboration with villagers. Technical cooperation took the form of developing silvicultural techniques for the recovery of degraded forest in the watershed area. Experimental forests and nurseries were to be established to develop technology needed for conservation and afforestation.

The objectives of the project were:

- To contribute to the implementation of the Forest Watershed Management Plan of the Lao PDR by establishing technical and management methods for forest conservation and afforestation in the Nam Ngum Watershed Area.
- To prepare a concrete action plan for forest management and stabilisation of shifting cultivation. This will be implemented by local people and local governments at model villages in the Watershed Area.

A 'general model'?

Although substantial progress was made by these projects in developing models for their particular situations, none of them can be said to be fully satisfactory as a general model for participatory forestry in Laos. Each of the methods tested has been tailored for a particular area of application and each has its own strengths and weaknesses.

However, while there can never really be a 'general model' for participatory forestry in Laos, it can be said that there is a need for common methodologies for diagnostic assess-ment of various forestry situations. There could be a shared consensus on the possible range of technical and institutional responses. There are certainly some common observations and lessons to be learned from the four projects.

Levels of participation

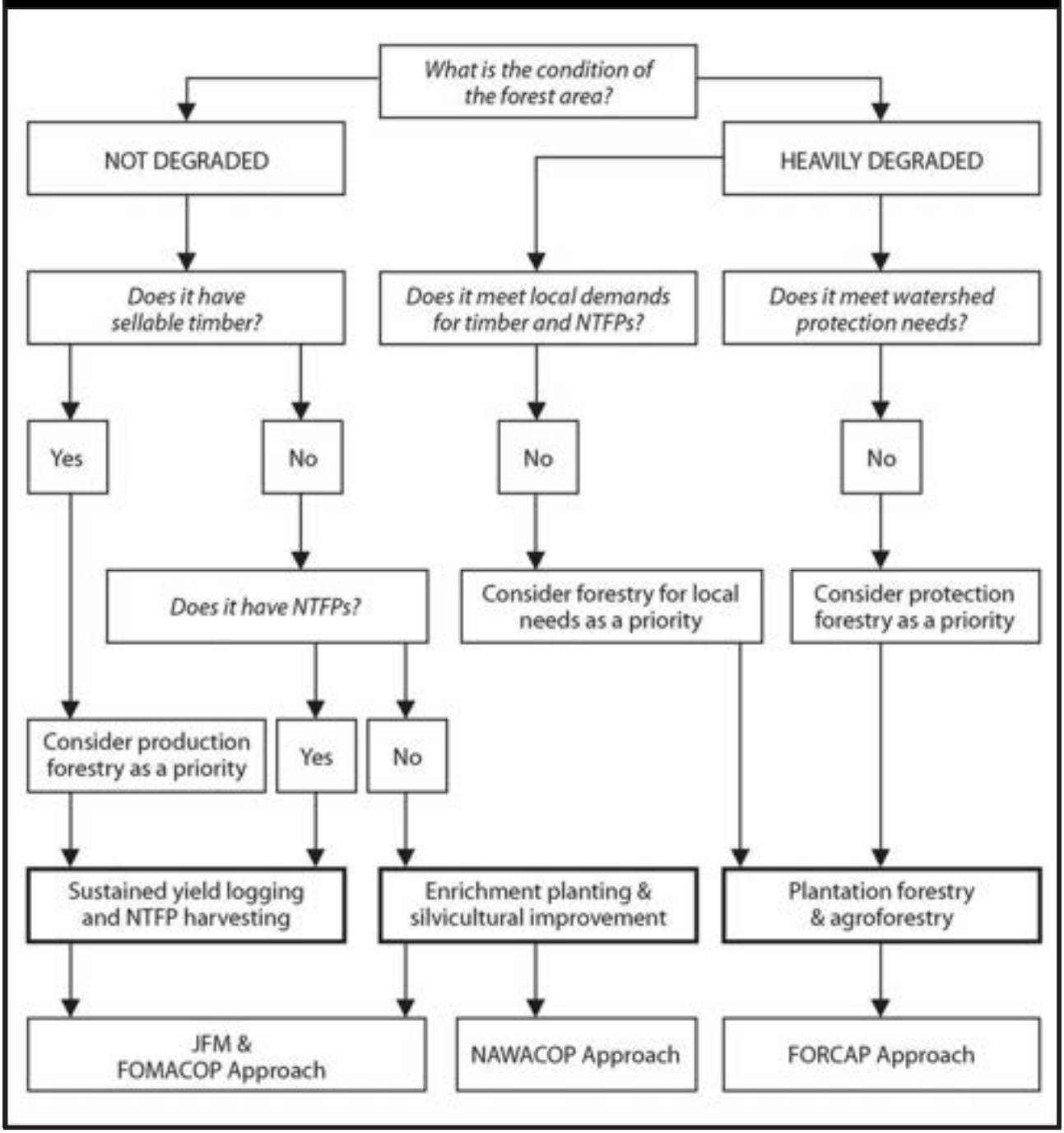
The partnership between villagers and the state is important in all of the models. Participatory forestry should not be seen as the devolution of control and management of forests to villagers, but rather a joint responsibility between both parties. Another common thread to all the models concerns the roles and responsibilities of different stakeholders. It is generally accepted that the villagers are the managers of the village forest area, while professional foresters play an advisory role and perform a number of technical tasks.

The need for technical and supervisory support depends on the type of resources being managed. In the JFM and FOMACOP projects, where timber and state production forests can not be managed by villagers alone, technical support is obviously needed. Managing forests for watershed values also requires state intervention. However, there seems to be much more willingness to allow villagers sole responsibility when it comes to NTFPs and other smaller resources linked to villagers' livelihood systems.

Using a diagnostic key to assess forestry situations

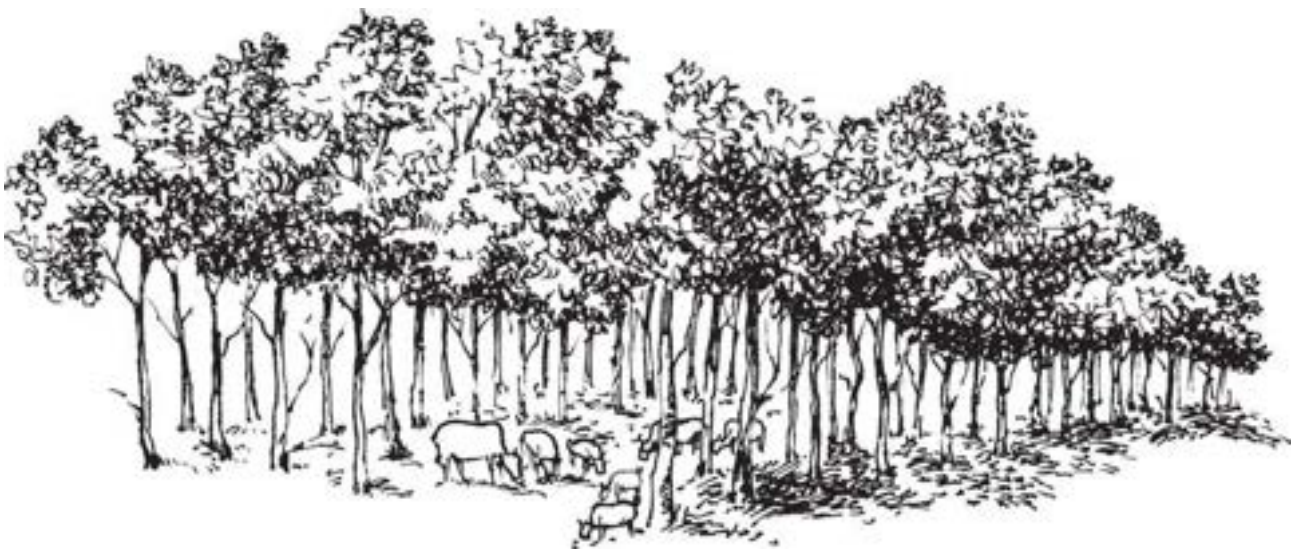
The following diagnostic key can be used to help PAFO/DAFO staff assess which elements of different Village Forestry approaches would be appropriate to a particular village situation. The forest types can be seen to fall into two major groups: degraded and not degraded, and the approaches seen at the bottom of the diagram are the main forestry-related projects so far tested in Laos. Implementation of a given project may be based on one of these models.

Diagnostic decision tree on approaches to participatory forestry



These four projects provide a window on the general situation, which is that each village has a unique configuration of environmental and socio-economic resources and problems that need to be addressed in a situation-specific manner. This suggests that, rather than searching for some kind of Village Forestry 'supermodel' that magically satisfies everyone's needs, it might prove more productive to adopt a kind of 'uniform process approach' based on the diagnostic key.

When a suitable approach has been identified, detailed plans are available on the chosen methodology. As a brief guide, the table opposite presents an overview of the four project approaches.



Extracted from: *Comparison of Village Forestry Planning Models used in Laos*, LSFP/Department Forestry, Ministry of Agriculture and Forestry. 1999.

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Table 2. Comparison matrix of the four projects		
Group 1		
	Participatory methods used	Types of interventions in villages
LSFP - JFM	• Village organising • Delineation of village boundaries • Land-use mapping • Forest timber inventory • NTFP assessment • Land-use planning	• Training • Village organisation • Land-use planning • Natural forest management • Village Development Fund
FOMACOP	• Village organising • Delineation of village boundaries • Land-use mapping • Forest timber inventory • Land-use planning	• Training (pyramid approach) • Village organisation • Land-use planning • Natural forest management
Group 2		
	Participatory methods used	Types of interventions in villages
NAWACOP	• Participatory land-use mapping • Allocation of use rights for different land classes • Training of extension staff • Initiation of various sustainable agricultural & forestry practices	• Training • Village organisation • Land use planning • Natural forest management (considered for limited areas) • Afforestation • Agroforestry • Agricultural systems improvement • Alternative livelihoods & income generating activities
FORCAP	*Main activities in preparation phase:* • Baseline & household surveys • Project Cycle Management workshops in 15 villages • Pilot workshop on land use • Planning in 1 village • Pilot technical training in specific techniques for stabilising S.C. Pilot testing & modification of draft village development action plans in 3 villages	*Same as NAWACOP, plus training on a broad spectrum of income-generating activities as alternatives to shifting cultivation, e.g.:* • Fruit tree grafting • Livestock raising • Medicinal herbs • Agroforestry • Charcoal production • Bamboo vinegar production • Bamboo paper hand-made products (Open-ended. No sectoral limitations in principle)

Village Forestry: Assessment Methods that Enhance Participation

The methodological efforts of forest management programmes have so far concentrated on obtaining the biophysical information necessary to manage forests, but comparatively little attention has been given to socio-economic information. While every project tends to have a socio-economic information gathering exercise, it is not clear what is done with this information after it is collected, and there is little to suggest that the information gathered has much direct bearing on management practices.

Social information has a direct bearing on how the forest is managed and it needs to be much better understood than it is at present. Such information concerns:

- Indigenous systems of forest resource classification and management.
- Traditional social groups and their decision-making authorities and capabilities.
- Customary tenure rules governing traditional use rights in land and forest resources.
- Gender differences in knowledge and use of forest resources.
- Economic strategies and household livelihood systems.

- Classification of different livelihood systems found in a village (agricultural, forest-related and other).
- Diagnostic assessment of the needs and opportunities of different livelihood systems and social groups.
- The villagers' own assessments of what their most important problems are, what strategies they use in overcoming these problems, their own perception of possible solutions, and the opportunities they themselves would like to pursue.

The need to use qualitative methods

If village participation in planning and managing is truly the goal, then most of the information gathering and decision-making processes must be done in ways in which villagers can actually participate. Many quantitative methods used in forestry are simply not very relevant to villagers' thinking processes and not very feasible without outside help.

However, such methods might still be needed for some purposes, such as sustained yield logging calculations, because 'sustained yield' is not obviously tangible. The only way to see it is to calculate it.

When finding the balance between quantitative methods and local participation it is important to keep in mind the idea of 'appropriate precision'. When scientists and others involved in development work look at their use of quantitative methods they find that quantification is usually only a step towards the real information used to make a decision. Most often they need to convert numbers into some kind of 'yes' or 'no' reading which allows them to make a judgment on whether, for example, a resource is above or below acceptable stocking levels for harvesting.

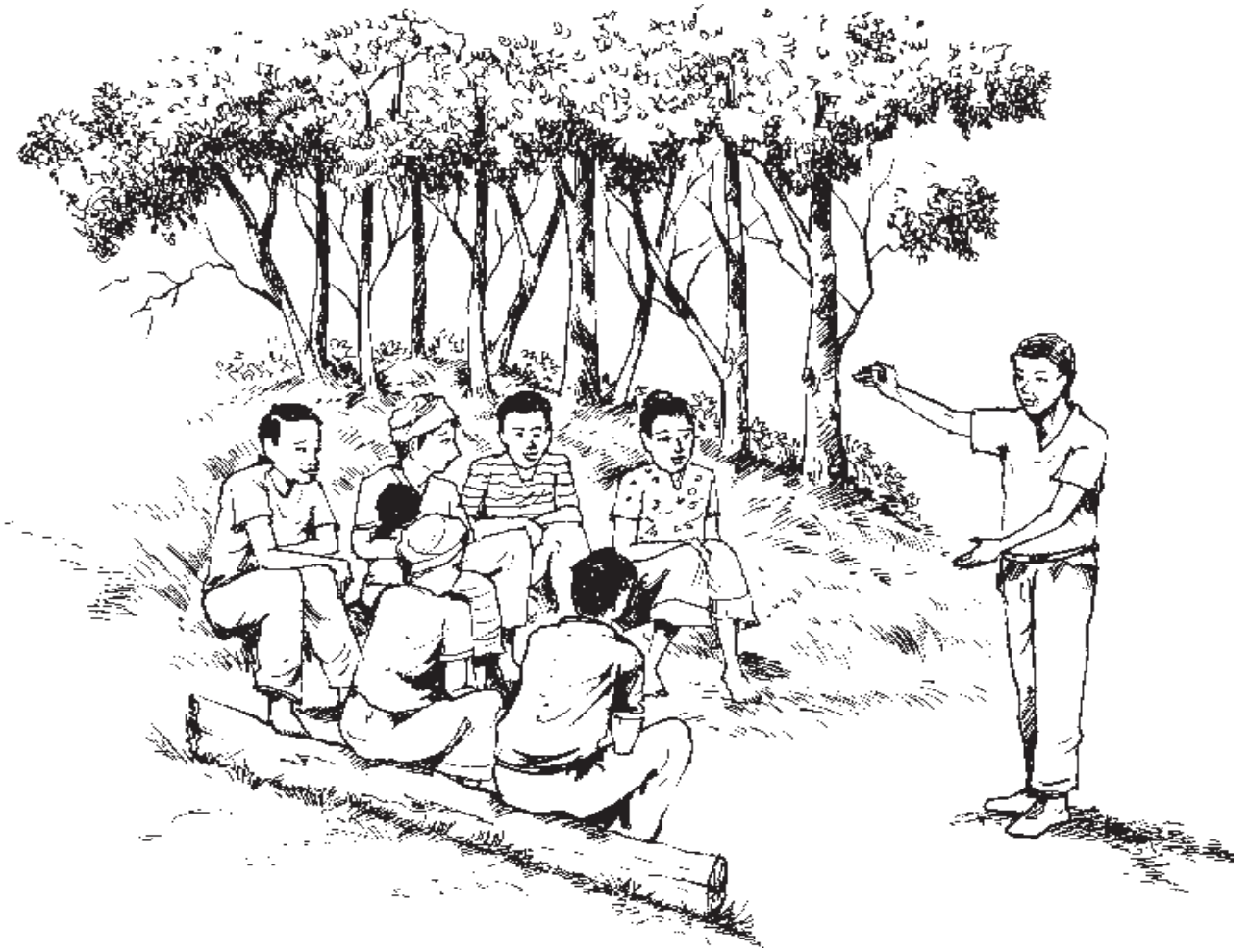
> It is important not to employ a 'blind preference' for quantitative methods, but also not to overburden villagers with tasks that are foreign to their way of thinking. Decision-making processes that make sense to villagers, and in which a majority of villagers can fully participate, are far more relevant and effective.

If it is possible to arrive at the 'yes/no' information required for the decision without going through the preliminary numerical steps, then there is no loss in ability to make decisions and to manage effectively.

This is particularly the case for NTFPs. The prevailing idea among projects and foresters in Laos seems to be that NTFP management requires methodologies similar to those used for sustainable timber management - i.e. complicated sustained yield calculations.

However, such methods are often not possible or not necessary for NTFPs. They may even be counter-productive to the aim of sustainable management, or harmful to the interests of villages who depend on NTFPs far more than they do on timber products.

Foresters should not feel under pressure to use methods similar to those used for timber inventories. Indigenous management of NTFPs is a long-established tradition among communities who live in the forest and depend heavily on these products for food, other subsistence needs and supplementary cash income. However, the methods they use are not highly quantitative.



The most important assessment to make is whether or not NTFP stocks are generally declining in quantity or quality, and this determination can be made by using simple monitoring methods. On the basis of participatory diagnostic methods, village forestry management groups can make their own assessments and decide to restrict or suspend harvesting until the stocks come back, or to undertake domestication of certain species.

To insist on substituting quantitative methods in place of the traditional decision-making processes is to risk losing the villagers' genuine participation in the planning process and replacing it with low quality 'token' participation in processes that are foreign to their way of thinking.

Extracted from: *Comparison of Village Forestry Planning Models used in Laos*, LSFP/Department Forestry, Ministry of Agriculture and Forestry. 1999.

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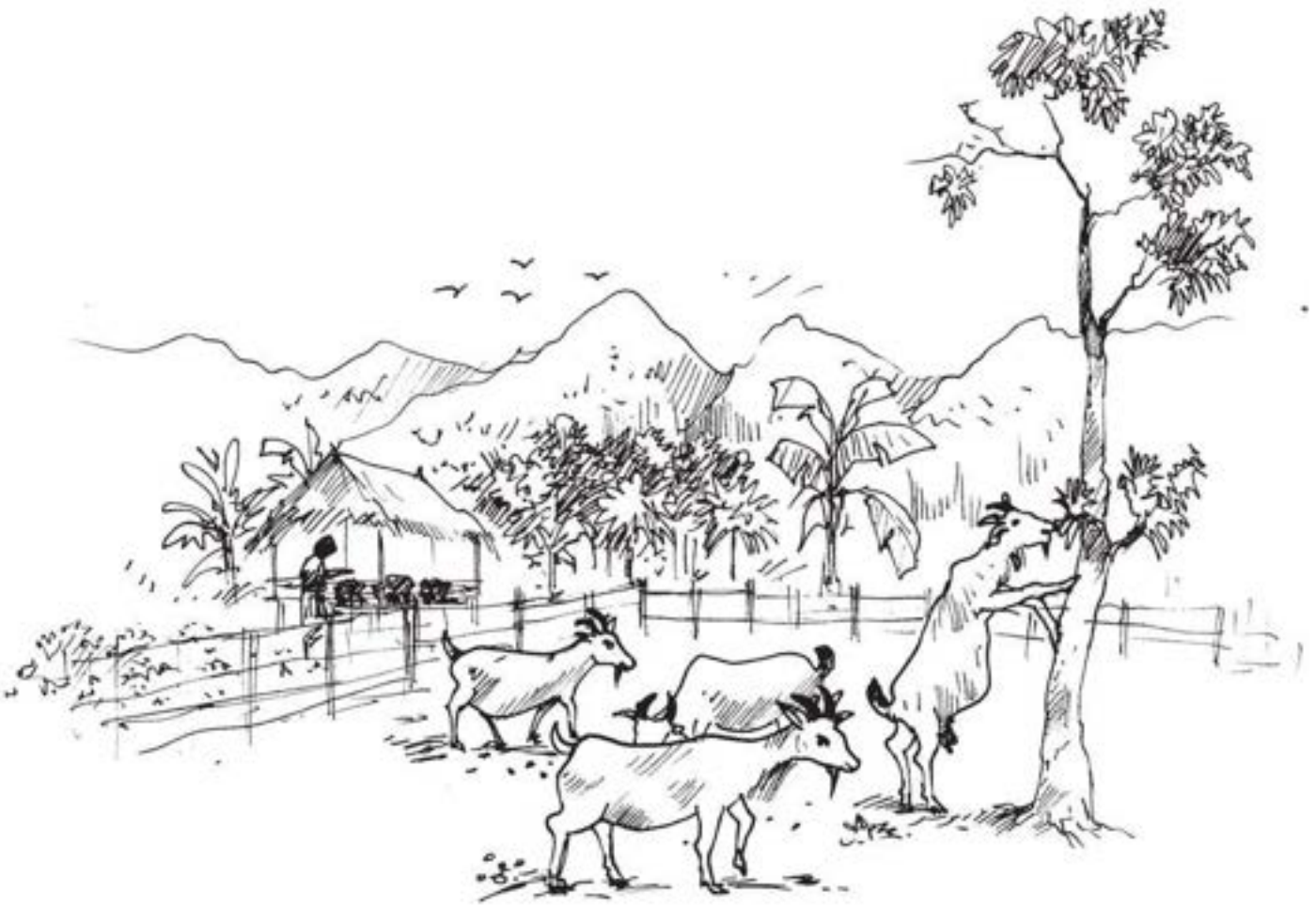
Indigenous Agroforestry Practices of Northern Laos



Shifting cultivation is the most common agricultural practice among farmers in the northern uplands of the Lao PDR. Alongside this agricultural practice many types of indigenous agroforestry systems have been practiced for many decades as people use the forests and forested land to grow different crops.

Such practices range from a few silvicultural treatments in the natural forest to get a desired product to highly advanced systems where trees, animals and plants grow together so that they can benefit from each other. This article focuses on describing key indigenous agroforestry systems practiced in northern Laos.

This paper is based on a study carried out in 2003 within two districts, Namor in Oudomxay, and Phonxay in Luangprabang Province. Information about indigenous agroforestry practices was collected through interviews with farmers and follow-up observations in the field. 20 villages, located close to roads, were visited and at least 150 farmers were consulted in some form.

Indigenous agroforestry practices

1. Livestock practices

Managing livestock in combination with trees and pastures is common in Phonxay District. The most widespread livestock practice is the free grazing of livestock. Chickens and pigs feed close to houses, in home gardens and other nearby areas. Cows and buffalo also graze freely around the village but in a more extensive way, feeding in fallows and forests. Farmers often use the animals as investments - instead of putting money in the bank.

According to interviewed farmers, problems with this system are that:

- The animals eat un-fenced crops.
- It is difficult to watch over the cattle.
- It is difficult to identify the animals' owners.
- The animals grow quite slowly and are very thin.

The advantage is that this method uses very little labour.

Some villages also keep cattle fenced or herded. Generally, a number of farmers group together and build fences in fallow land to protect crops from being eaten. The livestock are only fenced during cropping seasons, about six months per year. A fenced area is usually 200 ha in size and holds about 40 animals. Ideally it should contain preferred grasses, such as *Imperata*, and a stream for fresh water. After some years of being used the fallow area becomes a very good rice production site. If rice is not replanted, the forest grows back.

One livestock practice found was a goat farm where 100 goats are held permanently in a fenced area of 50 ha. The goats are rotated within the area so that the land can recover.

Indigenous practices, developed and tested by farmers, are flexible and able to adapt to the changing needs of the household without the involvement of research and extension services.

Agroforestry practices integrate trees or woody perennials with crops and/or animal production fields. These techniques include hedgerows, intercropping, homegardens, alley cropping, silvopastoral systems, and improved fallows.

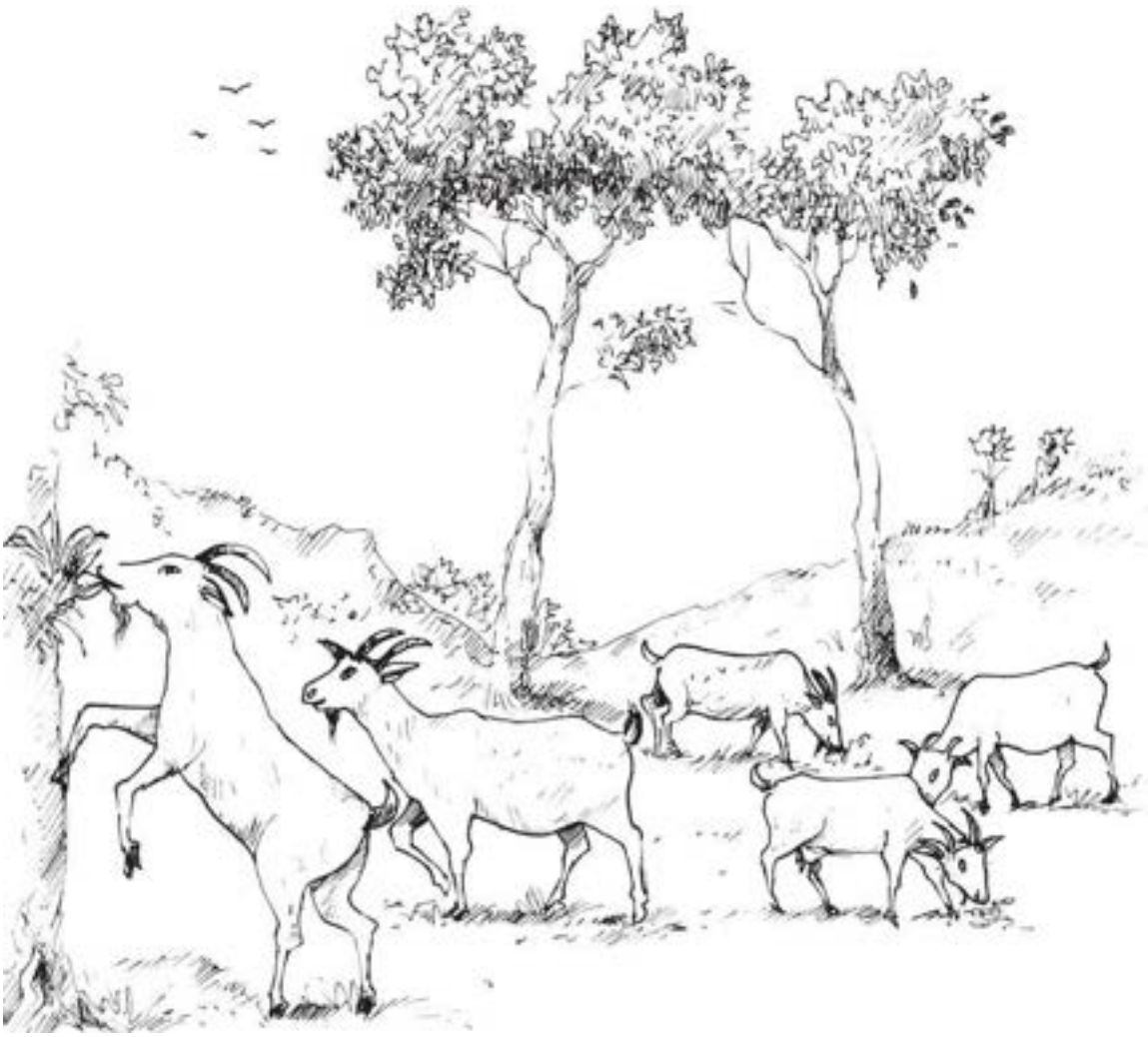
Pigeon pea is planted to ensure that the animals have enough fodder. Forest trees grow back in the unused areas, and after some years the goats can graze in the forest. Six families work together on this goat farm and they all stopped growing rice a few years ago. They now rely on the income from the goats, which they sell at local markets.

2. Home gardens

Home gardens in Phonxay range from 0.25 to 1 ha in size and contain fruit trees such as papaya, banana, citrus and jackfruit and vegetables such as eggplant, chilli, cabbage, and beans. In one home garden in Huay Doy, a Hmong/Khamu village high up in the mountains, more than 50 different plants are grown, mixed together or rotated within the garden. Most home gardens have a living fence of various trees or woody perennial species. Many kinds of medicinal plants are also common, especially in the older gardens.

Home gardens are located in all types of environment, ranging from mountain tops down to river valleys. Gardens are mainly situated on relatively flat land close to the village houses.

Some home gardens intercrop vegetables such as cabbage, chilli and taro with crops like rice or corn. These gardens are often slightly bigger than the traditional home garden and tend not to include the large variety of plants found in the smaller, traditional gardens. Fruit trees are common and are often either planted as borders along the contour or scattered throughout the plot.



Cooperative livestock raising by the Hmong

One interesting livestock management system, practiced by the Hmong, is raising animals in fenced areas directly in the primary forest, high up in the mountains. Here, groups of around 40 farmers fence in an area of 1,000ha, providing permanent grazing for roughly 200 animals. All families have a special ear-mark to identify their cattle. Advantages with this system are that it protects other crops from being grazed, animals get fatter, and vaccination is not necessary. It is also much easier to keep them protected from wild dogs, tigers and other threats, although herding and guarding of cattle is still necessary. The farmers stated that this system was very sustainable and that they have used it in the same area without any decline in production for a long time already.

3. Intercropping and rotational practices

Rotational systems and intercropped permanent systems are closely related to the relatively large home gardens and are usually around one hectare in size. Here the main focus is on grain crops like rice, Job's tears or corn.

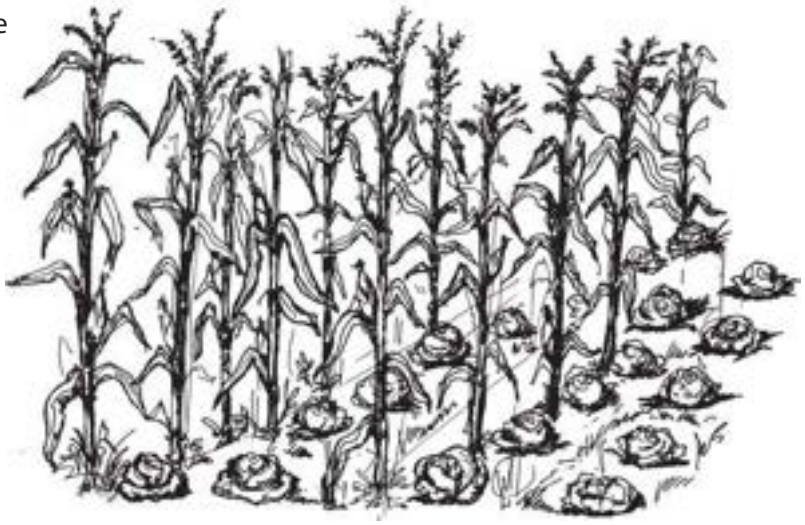
In rotational systems, crops are rotated from one plot to another or are planted in succession within the same plot. Crops such as peanuts are often grown between cropping periods or as an intercrop (e.g. with corn) to provide fertiliser. Other vegetables (e.g. banana, sesame, taro and chilli) are also found within the gardens. In these systems, fruit trees like jackfruit and papaya are grown either on the border or scattered throughout the field. Such rotational practices are mostly found in valleys quite close to rivers or in moist places with good soils.

Intercropped fields contain some kind of grain crop grown with trees or other plants. One example is Job's tears intercropped with paper mulberry. After the paper mulberry is harvested, Job's tears are planted and harvested one year later. The paper mulberry is harvested every two years. This system produces crops with apparently sustainable yields every year with no fallow periods. Paper mulberry cultivation is found in rather steep areas far away from river valleys. Other intercropped areas are, however, mainly situated close to rivers and streams.

4. Entomoforestry

Entomoforestry is the practice of combining trees (forestry) and insects (entomology), as in the raising of stick-lac. Stick-lac produces a resin which is used as glue and also for colouring cloth. It can be grown in two ways, either in natural forest or in small plantation

areas. In the natural forest the insects are introduced on to branches of *Mai Faen* (*Protium serratum*) trees. Insects are introduced onto new trees and branches twice a year. The tree belongs to the person who infests it, and can be re-infested every third year. The other method of raising stick-lac is to grow pigeon pea in an open field, e.g. fallow land, and then introduce insects onto the branches. Farmers in Phonxay state that nowadays demand for stick-lac is low and enough can be obtained through the forest.



5. Improved fallow

In Namor, fallows are sometimes managed for a preferred species. One of the most common examples is the growth of different varieties of cardamom during the fallow period. Green cardamom grows best in fallow areas, taking three years to mature from when the rice is harvested. Harvesting can continue for two years before the land has to be cleared again. Some farmers let fallows grow into forests in order to create a good growing environment for the shade-tolerant red cardamom, which can be harvested after a ten year fallow.

6. NTFP plantations

Bitter bamboo is an interesting NTFP that has been successfully transformed to a plantation crop. In the village of Ban Kuang villagers began to plant bitter bamboo directly into secondary forest some 30 years ago. These plantations still exist and, over the years, several new ones have been established. During the first years of establishment, plantations are often intercropped with pineapple. Today plantations of up to one hectare in size can be found.

Conclusions

- **Livestock agroforestry practices:** livestock raising is common in both fenced and non-fenced forms. Farmers have a wealth of indigenous knowledge about raising animals. Farmer to farmer knowledge exchanges about different livestock management systems would benefit local production systems.
- **Home gardens:** simple home gardens containing vegetables, trees and some other plants are common and are under continuous improvement, with the farmers themselves testing and evaluating new species. It seems unnecessary to make further improvements here since the farmers know best how to create and manage home gardens.
- **Intercropping and rotational systems:** these practices are relatively new and undeveloped. More knowledge is needed about sustainability and production aspects. Intensive research on identifying crops that can grow together, especially without fallow periods, is essential if practices like this are to be an option for farmers.
- **NTFP plantations:** this system has high potential and will be necessary if NTFP production is to increase. Knowledge is currently limited, and practice not widespread, but there are some interesting examples of successful NTFP plantations. More research on potential NTFP plantations can generate important upland cropping options for farmers.

This paper is adapted from: "Indigenous Agroforestry Practices in Two Districts in the Northern Part of the Lao PDR" in *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland livelihoods.* NAFRI. 2005.

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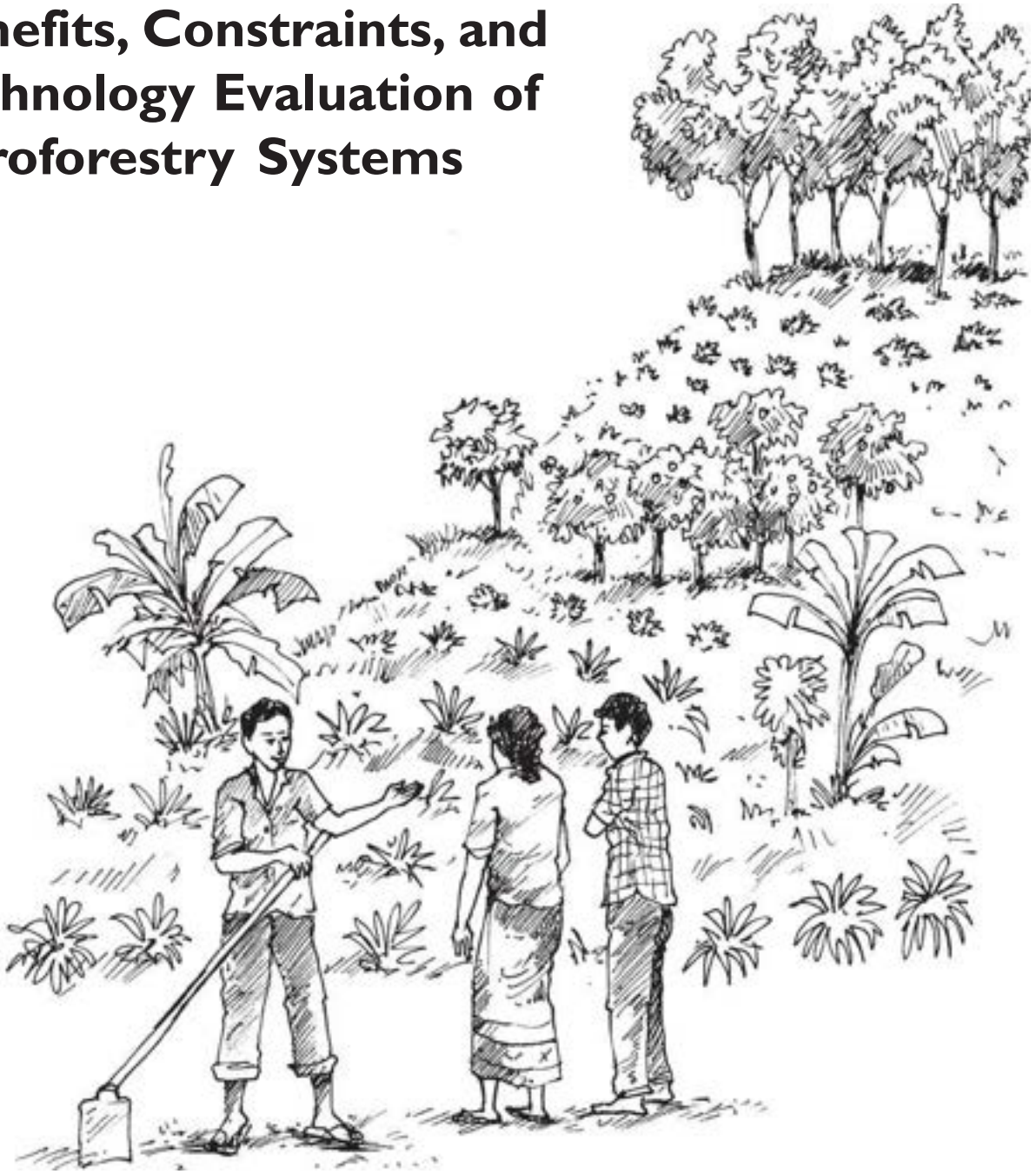
Benefits, Constraints, and Technology Evaluation of Agroforestry Systems



Shifting cultivation is the dominant cropping system in the uplands of Laos, often combined with other agroforestry systems, such as economically enriched fallows, homegardens, taungya and living fences. Population pressure and government restrictions are increasingly undermining the productivity and sustainability of traditional shifting cultivation systems. Alternative agroforestry systems that focus on soil conservation and plant nutrient management have been introduced in recent years, but adoption by farmers has been very limited. Adoption of conservation farming technologies is, however, likely to increase as the need and opportunities for agricultural intensification develop. An understanding of the benefits and constraints of agroforestry and how to evaluate agroforestry technologies will be important in helping extension agents and farmers to make informed decisions on which technology to adopt.

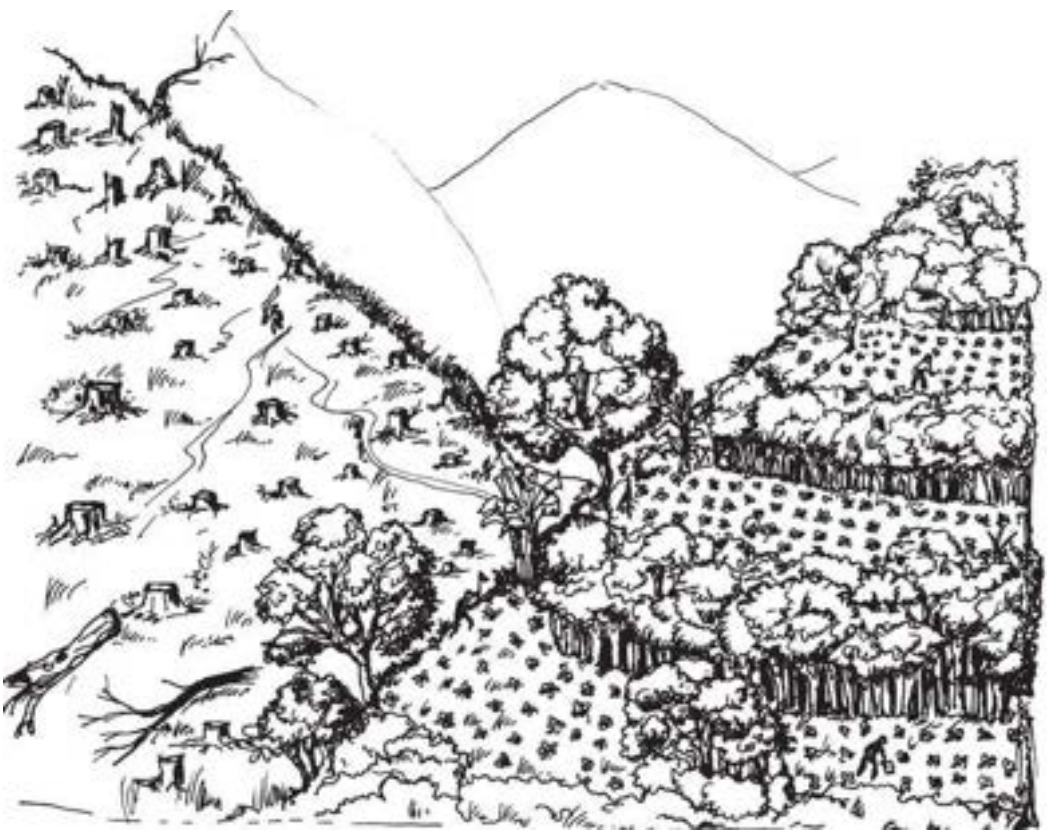
Benefits and constraints

The limited market, infrastructure and processing facilities in most shifting cultivation areas reduce the scope for commercial agroforestry products, such as wood and fruit. In areas with road access however, enriched fallows (particularly with paper mulberry), commercial fruit production and teak planting have increased dramatically during the past four to five years. Alternative agroforestry systems, such as biologically improved fallows, alley cropping and contour hedgerows, have been introduced on a trial basis. These systems aim mainly at plant nutrient management and erosion control, but may also produce firewood, fodder and mulching material. Adoption has been very limited though, probably because these systems provide farmers with few or no immediate economic benefits - real or perceived. Their adoption is further hampered by the relatively easy access to land, fuel wood, grazing and forest products in the uplands. The table opposite shows the benefits and constraints of traditional and new agroforestry systems in shifting cultivation areas of Laos.

Technology evaluation

Description and evaluation of existing agroforestry technologies may provide considerable knowledge for modification of research priorities, extension recommendations and even policy strategies. Evaluation studies should include adequate description of the technologies and of the local environment, socio-economic conditions and production systems. The agroforestry systems may then be evaluated regarding:

1. **Productivity:** how does the return on land or labour input compare to alternative land uses?
2. **Sustainability:** does the technology improve the land-use sustainability?
3. **Equitability:** does the technology facilitate equitable access to resources and production outputs?



Agroforestry system benefits and constraints in shifting cultivation areas of Laos				
Agroforestry type	**Description**	**Benefits**	**Constraints**	**Examples from Laos**
Traditional systems				
Shifting cultivation	Alternating periods of tree growth and agricultural crops.	▪ Restoration of soil fertility. ▪ Suppression of weeds and crop pests.	▪ Requires long fallow periods: low yields with short fallows. ▪ Government condemnation.	Most widespread cropping system in Laos.
Economically improved fallows	The economic benefit of the natural fallow is improved through manipulation of the fallow vegetation.	▪ Increased income or output from the fallow.	▪ Increased labour needs. ▪ May require long fallow period.	Production of paper mulberry bark, cardamom, and benzoin.
Living fences	Hedges of woody species planted around agricultural fields.	▪ Mainly to fence off agricultural fields, but also for leaf fodder, mulch, firewood, and wind reduction.	▪ Efficient only after several years. ▪ May compete with crops.	Widely used around permanent fields and gardens.
Plantations and orchards	Various other combinations of trees and crops, such as multi-storey gardens, home gardens, and estate plantations.	▪ High productivity. ▪ Good use of the available resources.	▪ Herbaceous components suppressed in older plantations. ▪ Rational management may be difficult.	Home gardens and multi-storey gardens common in older villages all over Laos.
Taungya	Cultivation of agricultural crops during the early stages of tree establishment.	▪ Economic return from during the early years. ▪ Ensures weeding during cropping periods. ▪ Cheap to set up.	▪ Agricultural land is lost. ▪ Land-use rights may be transferred to investors. ▪ Farmers may become labourers.	Common along river banks in the north, and now also in upland areas. Traditional planting method of the forestry authorities.
New systems				
Biologically improved fallows	The bio-physical effects of natural fallows are improved through enrichment planting or other manipulation.	▪ Increased restoration of soil fertility. ▪ Increased suppression of weeds and pests.	▪ May develop a serious weeds problem during cultivation periods.	Experimental stage at the moment. No extension recommendations.
Alley cropping	Belts of woody species alternated with belts of agricultural crops.	▪ Nutrient recycling and nitrogen fixing. ▪ May also produce leaf fodder, fire-wood and mulch material.	▪ Occupies agricultural land. ▪ Woody part may compete with the agricultural crops. ▪ Requires additional labour.	Introduced by various projects, but little or no adoption by farmers.
Contour hedgerows	Woody species planted in hedges along the contours, alternating with belts of crops.	▪ Mainly for erosion control ▪ May have benefits similar to alley cropping.	▪ Occupies agricultural land. ▪ Woody part may compete with the agricultural crops. ▪ Requires additional labour.	Introduced by various projects, but little or no adoption by farmers.

4. **Adoption:** who and under which circumstances adopts the technology?

5. **Adaptation:** how do farmers adapt technologies to fit their household resources and production conditions?

Improved productivity, soil conservation and nutrient management may be achieved through means other than agroforestry systems. Agroforestry should therefore be compared with alternative technologies, including both traditional methods and innovations such as lay farming, grass strips, cover cropping, strip cropping, mulching and various forms of terracing.

Conclusion

Research into traditional and innovative agroforestry systems in Laos can help improve land use, especially in shifting cultivation areas. To make best use of the available resources, agroforestry research must focus on solving concrete land-use problems, and should take maximum advantage of already existing information. High priority should be put on understanding the existing land-use types, their relation to environmental and socio-economic conditions, and their constraints and potential.

This paper is derived from:
Hansen, P. & Sodarak, H. 1996. *Agroforestry research for development in shifting cultivation areas of Laos*. Technical Report #5. Shifting Cultivation Research Sub-programme, Lao Swedish Forestry Programme.

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Smallholder Timber Production: Example of Teak in Luangprabang

Mountainous topography, undeveloped infrastructure, limited market demand and relative poverty slows farmers' adoption of new technologies. However, teak planting by shifting cultivators has expanded rapidly since 1988. Teak provides high income and is readily adopted by farmers, but the benefits of teak planting are currently limited by:

- Poor management of teak plantations.
- Inferior genetic material.
- Competition with agriculture for arable land.
- Inability of farmers to hold on to plantations for 20-30 years.

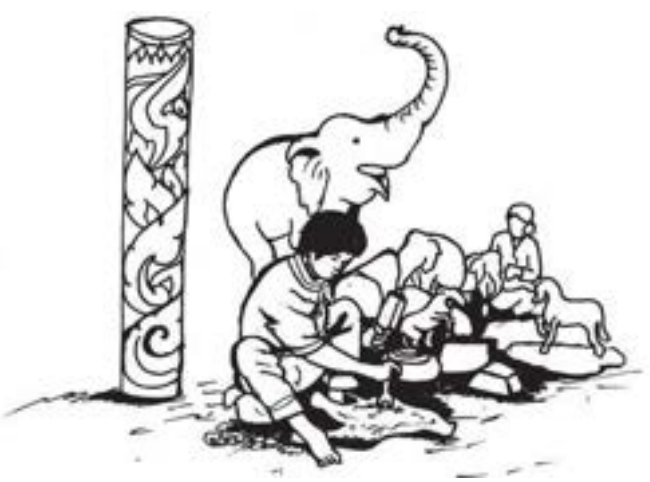
There are also concerns that plantations may be susceptible to serious pest attacks, excessive erosion and soil depletion. Teak planting may provide an alternative or supplement to shifting cultivation, but is not likely to have a role in improved fallow systems.

History

The first farmer-owned teak plantations in northern Laos were established around 1950 under the French colonial regime. Since the late 1980s, farmers have been expanding the teak plantations. Luangprabang Province has been the main centre for this expansion because of the relatively better infrastructure, and the presence of older plantations that can supply seed.

It is significant that teak was adopted by shifting cultivators and expanded into the uplands where previously very little tree planting had taken place. This means that more ethnic groups have adopted teak, especially the Khamu.

After the 1975 revolution, a centrally-planned economy took ownership of all land and introduced state farms. During these years, the government attempted ambitious plantation programmes in all provinces, mostly carried out by state forest enterprises.



Properties and use of teak

Teak has exceptional properties that make it one of the most sought after and expensive timber species, both locally and in the international market. The wood is structurally strong, durable, and resistant to fungus and termites. There is little risk of splitting and warping during drying and processing. Teak is easily carved and this makes it useful for house construction, boat railings, and furniture.

Teak's high market price makes long distance transport economically feasible. This is not the case with industrial tree species such as eucalyptus and acacia, which depend on nearby processing facilities for pulp or board production.

In Laos, teak is used for a few secondary purposes. A yellow dye for silk yarn is made from boiling the dry leaves. Thinning and pruning the trees provides firewood, and leaves may also be used to thatch roofs and for packaging.

Propagation

Teak is usually established from stumps, which though sensitive to dry spells in the first two months after planting, are inexpensive, easy to transport and plant and produce a higher

quality tree. Since 1993, many private nurseries have produced stumps for family use or sale. Seedlings are more expensive, difficult to transport, and produce a lower quality tree.

The advantage of genetic improvement of teak is well established and selecting superior trees can increase production by 10-15% (Hedegart 1995). Little systematic selection of seed trees, stands or provenances takes place in Laos and the plantations established in recent years were propagated from genetically unknown and possibly inferior sources.

The rapid expansion of teak planting in northern Laos has created a seed shortage, and it is likely that inferior seed will be used for many years. The scarcity of seed is reflected in the price, which in Luangprabang province increased from 35 to 800 Kip per kilogram between 1992 and 1996. Even at the higher price, seed costs represent only 5-10 Kip per seedling, equivalent to 10-20% of the price of a teak stump.

Management

Teak is inter-planted with agricultural crops during the first one to three years. This ensures adequate weeding and protection in the early years and promotes growth. Few farmers have sufficient labour available to do this if crops and teak are planted separately.

Teak stumps are planted in June or July after the first weeding of the associated crop. Planting after mid-July is not recommended as small trees are vulnerable to weed competition, animals and dry season fires. When inter-planting ends after one to three years, little management is necessary except for slashing taller weeds and controlled burning early in the dry season.

Phenology of the teak tree in Laos

Month	Phenomena
December-January	Leaf fall
February	Leafless
March-April	Leaf emergence
May	Full foliage
June	Full foliage + flowering
July	Full foliage + flowering + fruit set
August-October	Full foliage
November	Beginning of leaf fall

Regrettably, few farmers prune low branches or forked trees, and the latter sometimes occurs in more than 50% of the plants. Thinning usually takes place too late, often when the trees are ten to fifteen years old. Pruning during years one to three not only promotes growth but also prevents knots, resulting in a more valuable tree. Teak is usually sold by the tree and not by volume.

Teak is preferred to alternative perennials because it is easy to manage, grows quickly in the early years and is fire-tolerant. The expansion of teak planting has lead to concerns that teak mono-cropping may lead to pest attacks, especially by bee-hole borers and caterpillars. Teak offers little soil protection and soil erosion is often seen in older plantations.

Factors facilitating adoption of teak in shifting cultivation

1. The possibility of securing private land tenure.
2. Promotion and extension by government agencies.
3. The permanent settlement pattern adopted by most villages.
4. The expansion of the road system, making plantations possible in new areas.
5. Land allocation schemes that give additional land for production of perennials.
6. The depletion of wood from natural forest and the emergence of a market for younger teak timber.
7. Promotion by private investors through financial support, production of stumps and information dissemination.

Income generation

- Commercial teak rotations are usually 50-80 years, with plantation teak cut at 15-25 years. The minimum size of round wood accepted by local sawmills is 20 cm diameter at breast height. In Luangprabang Province this size is attained at about 15 years. On average, four trees of 18 cm make up one cubic metre of round wood.
- Farmers currently receive about US$25 per 18-20 cm tree, equivalent to about $100 per m^3. The trader sells the timber for $130-140 per m^3 to provincial sawmills. Round wood sold in Vientiane is about $230 per m^3 and at the export market $350-$600 per m^3. In Luangprabang and Vientiane planks sell for about $450 and $650 per m^3 respectively.
- Waiting 20-30 years for the income is a problem for farmers, so many have sold their young plantations to investors. While land is still plentiful in most of the country, it is generally scarce in areas where teak planting is most common and feasible. The rapid expansion of teak in parts of northern Laos could result in poor farmers losing much of their best land to wealthy investors.
- On the other hand, teak can provide farmers with money that would be very difficult to obtain by other means. Depending on the location (especially near cities), and age of the trees, plantations sell for $700 to $2,000 per hectare, against a mean annual household income of $500 for shifting cultivators.

Environmental suitability and geographical distribution

The main environmental limitation is elevation, as teak does not thrive above 700-900 m. Flood-prone, gravelly or strongly acidic soils are also unsuitable. These site requirements effectively exclude teak from about 40-45% of the northern region. They also mean that teak plantations do not optimise the use of marginal land.

More than 95% of plantations are established along roads and rivers. Because teak is confined to areas with road or river access, it is planted in the more populous areas, i.e. where shifting cultivation is under pressure. In such areas, fallow periods are generally only 2-6 years and few farmers produce sufficient rice for their household requirements. Rice deficiency is often a farmer's stated reason for selling their plantations.

Integration with agriculture and livestock

Teak is usually planted with other crops. Thus, plantations necessarily occupy agricultural land, although much of this land is unsuitable to permanent cultivation. The number of years teak is inter-planted depends on whether a reasonable return is expected from the agricultural crop. With a 2m x 2m spacing, usually only one year of inter-cropping is possible. The more common spacing of 3m x 3m allows two to three years of inter-planting.

The crop species influences how many years of inter-planting can take place. Upland rice can be produced for only one or two years because of weed competition and a rapid yield decline when planted in consecutive years. Other crops, such as pineapple, maize or sugarcane, may be planted for two or three years.

The possibility of replacing some shifting cultivation with teak planting may be technically and economically feasible, but farmers

Fallows: where does teak fit in?

Using teak in improved fallows is limited by the long production cycle of 15-25 years, compared to the 2-6 year fallows available to most farmers. Even if long fallow periods were possible, teak plantations as currently managed would probably have limited or negative effects on soil fertility. If farmers could keep their teak plantations until logging starts, the high income would make crop production irrelevant.

The most realistic role for teak is as a supplement to shifting cultivation, i.e. planting teak on part of the farmland while continuing upland cropping on other land. Relatively small plantations would be suitable for most farmers if they apply proper management and retain ownership.

would have to wait 25 years to see any return. The value of the annual increment of teak plantations and the return on labour far exceeds that of upland rice cropping, so it would seem possible to devise schemes which finance farmers' plantations until logging can start. Ownership of plantations could lie with private investors, with the farmers or be a matter of shared ownership.

Extension

It is possible to improve the growth and quality of teak through simple measures. These include timely weeding, thinning, pruning and fire control, as well as improved propagation methods and selection of seed sources. Better silviculture enables quicker log sales and helps farmers retain their teak plantations. Initiatives to improve plantation management include:

- Promoting the establishment of smaller plantations (50-200 trees), which farmers can more easily maintain over many years.
- Formulating technology recommendations for propagation and plantation management.
- Producing better information material for farmers and extension workers.
- Establishing sites for demonstrating improved management techniques.
- Promoting teak planting in areas without road or river access.
- Providing timber and seed sources for local usage.

Conclusion and recommendations

The potential income and economic spin-off from teak planting in the uplands of northern Laos is high compared with current land use. Further expansion of teak planting is possible in areas of degraded forest. Road improvements can expand the potential for teak planting to new areas.

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Tree Species Options for Community Woodlots

Identification of tree species for community woodlots

NAFRI has identified, through its DANIDA-supported Lao Tree Seed Project, a number of priority tree species (mostly indigenous) for community woodlots. The species were identified to match planting sites knowing that, in general, (a) growth and survival of tree seedlings is low; (b) there is little maintenance after planting; and (c) there is too little local involvement. Identified tree species are given in the tables below. Species monographs are also available from NAFRI-FRC.

Recommended tree species for the uplands

List of tree species recommended for Northern Laos

Scientific names	Lao names	Purpose	Plantation type
Tectona grandis	*Mai sak*	Sawlogs	Plantation forestry
Chukrasia tabularis	*Mai nhom hin*	Sawlogs	Agroforestry
Pterocarpus macrocarpus	*Mai dou*	Sawlogs	Agroforestry
Swietenia spp.	*Mai ham ngoua*	Sawlogs	Private tree lots
Paramichelia baillonii	*Mai champa pa*	Sawlogs	Enrichment planting
Afzelia xylocarpa	*Mai te kha*	Slice veneer	Plantation forestry
Anthocephalus chinensis	*Mai sako*	Paper pulp, light interior construction	Agroforestry, Enrichment planting
Melia azedarach	*Mai kadao sang*	Construction, fuelwood	Agroforestry
Senna siamea	*Mai khilek ban*	Firewood, charcoal	Agroforestry
Eucalyptus spp.	*Mai wick*	Construction, pulp	Plantation

List of tree species recommended for Xieng Khouang plateau

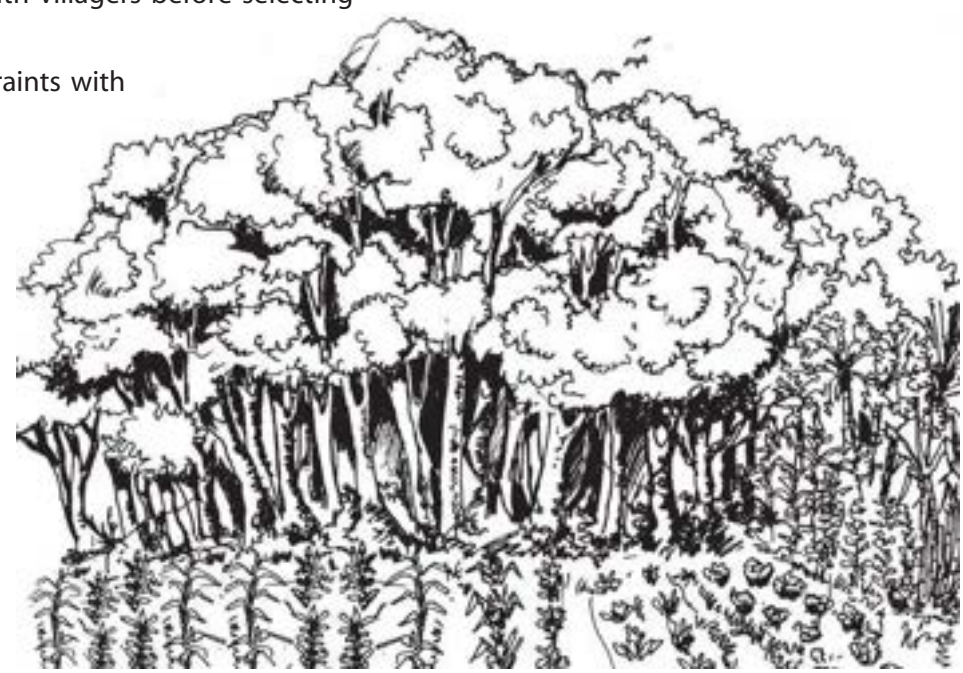
Scientific names	Lao names	Purpose	Plantation type
Pinus merkusii	*Mai pek song bai*	Sawlogs	Plantation by direct sowing
Pinus kesiya	*Mai pek sam bai*	Sawlogs	Plantation by direct sowing
Eucalyptus spp.	*Mai vick*	Firewood, construction, pulp	Plantation

List of tree species recommended for Sourthern Laos			
Scientific n ames	**Lao names**	**Purpose**	**Plantation type**
Aquilaria crassna	*Mai ketsana*	Agar wood production	Plantation, Agroforestry
Tectona grandis	*Mai sak*	Sawlogs	Plantation
Eucalyptus camaldulensis	*Mai vick*	Construction, pulp	Plantation
Acacia mangium	*Mai kathin the pha*	Firewood, construction	Plantation

Some recommendations

NAFRI foresters recommend the following:

- Carefully select priority tree species to match biophysical conditions.
- Balance socio-economic and bio-physical parameters of tree species when establishing community woodlots
- Use problem analysis with villagers before selecting particular tree species.
- Discuss identified constraints with local authorities and communities.



This paper is adapted from given at the NAFRI workshop on *Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of the Lao PDR: Technologies, approaches and methods for improving upland livelihoods.* Luangprabang, January 27-30, 2004.

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Improving Women's Involvement in Forestry Projects

Women have many other activities that often prevent them from participating in planning meetings

At village level, it is women who collect fuelwood and non-timber forest products (NTFPs) both for household consumption and for sale. Women's ability to provide food and income for their family is therefore closely related to the condition of the surrounding forest area. However, despite their role as the main users of forest resources, women are often not taken into consideration when projects are planned: their needs and priorities are often overlooked.

Impacts of deforestation on the lives of women

Lack of food security and increased poverty

- If families cannot turn to the forest for food to supplement their diet, or for products they might be able to sell, there will be an increase in poverty.

Health risks

- Lack of variety in the diet and/or supplemental protein and vitamins provided by forest products could lead to mal- and under-nourishment, particularly among children.
- Forest destruction leads to soil erosion and the drying up of springs and streams. Shortages of safe drinking and irrigation water for crops lead to increased health problems.

Increased workload

- Women have to walk longer distances in order to provide for their family: finding clean water, fuelwood, animal fodder, and forest foods.

Disruption of family life due to migration of men for work

- Fathers lose contact with their children and mothers become overburdened with daily work.
- Men who are far from their families (in search of work) might take on second wives or engage in sexual practices that increase their chance of contracting HIV/AIDS.
- Women's workload increases greatly as they try to carry out both men's and women's work and take on full responsibility for family subsistence.
- Girls from poor families need to earn income for their parents since the family can no longer live from farming and collecting forest products. They can be drawn into prostitution, as they do not have education or access to other ways of earning cash income.

Loss of traditional knowledge and traditional access and control of community land and forests

- Traditional knowledge about forest products and traditional systems of protecting the forest are lost or forgotten.
- Traditional customary land use rights, e.g. inheritance from mother to daughter, begin to disappear as more land is allocated or registered as individual property in the man's name.
- Land around the community forest is turned into plantation or farm land, and is no longer available for growing or gathering firewood.
- There is increasing conflict between the state and the community, or between plantation and logging companies and communities.
- Women in the community lose access to remaining land and no longer have their traditional control and decision-making role concerning land-use practices.

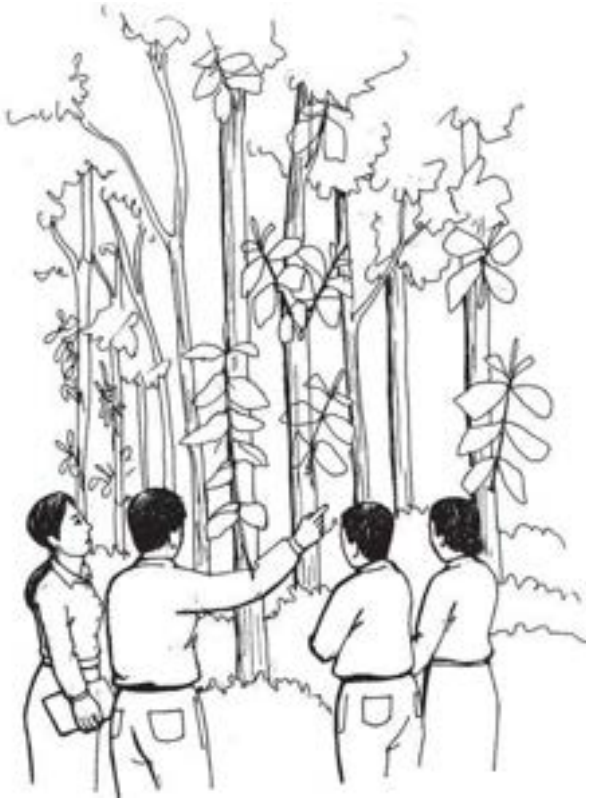
Improving women's involvement

Correcting male bias in agriculture and forestry work

When projects gather information and implement activities, it is often a case of male staff approaching male heads of house-holds. Having more women actively involved in extension work would help relations between women and men to become more equal as it would decrease the often-present gap in knowledge of new technologies, regulations and methods. Women should be encouraged to enter the technical and decision-making levels in the forestry and agriculture sector.

Ensuring women's land rights

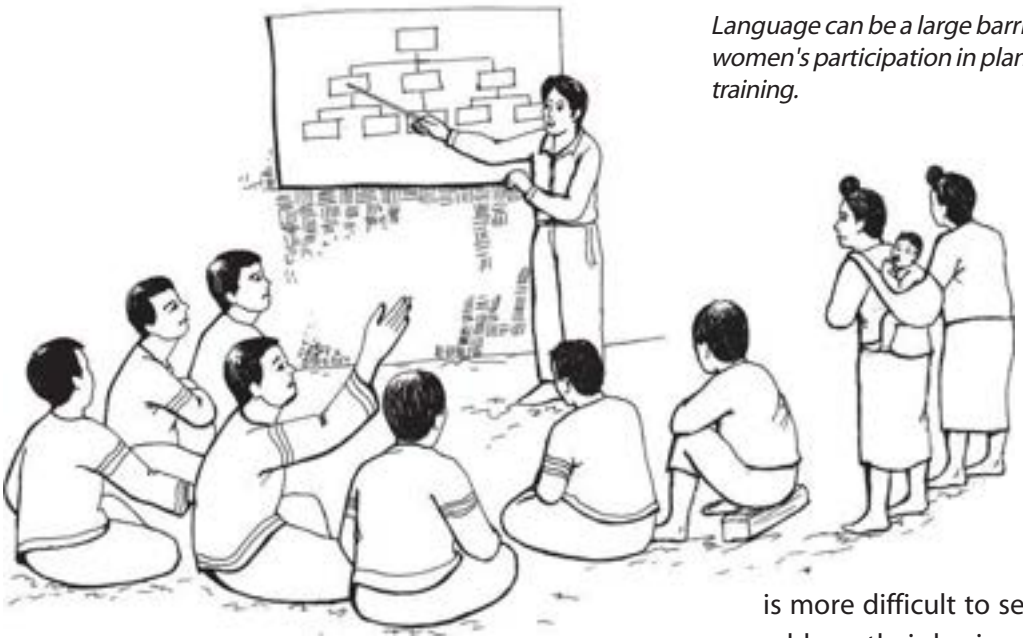
As there is a move from customary land use patterns and inheritance to more official land allocation, titling and management policies, there is a strong risk that women will lose access to and control over both family and community land. It is of vital importance that the policy of ensuring that both men and women's names are included on land documents continues to be followed.



Cultural and social constraints

Women of all ethnic groups face cultural constraints, since the traditional division of labour assigns women responsibility for family work and men responsibility for 'official business' such as meetings and roles in community groups or organisations. Lack of education can also affect women's self-confidence. Furthermore, women of ethnic minorities often face a greater language barrier than their menfolk do, since they have less exposure to the world outside of their community and are less likely to speak the Lao language. For these reasons, women are often very reluctant to speak out in meetings or join in decision-making groups.

Implementing a policy of equality means that both women and men will need to work actively to change attitudes, to encourage education and participation, and to provide opportunities for self-development and confidence-building.

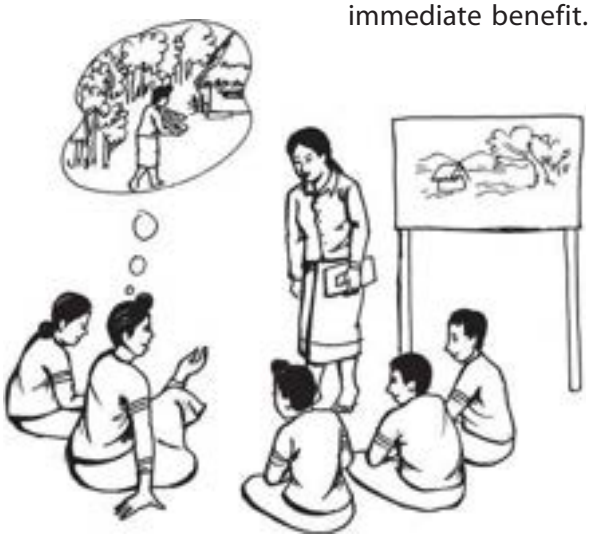


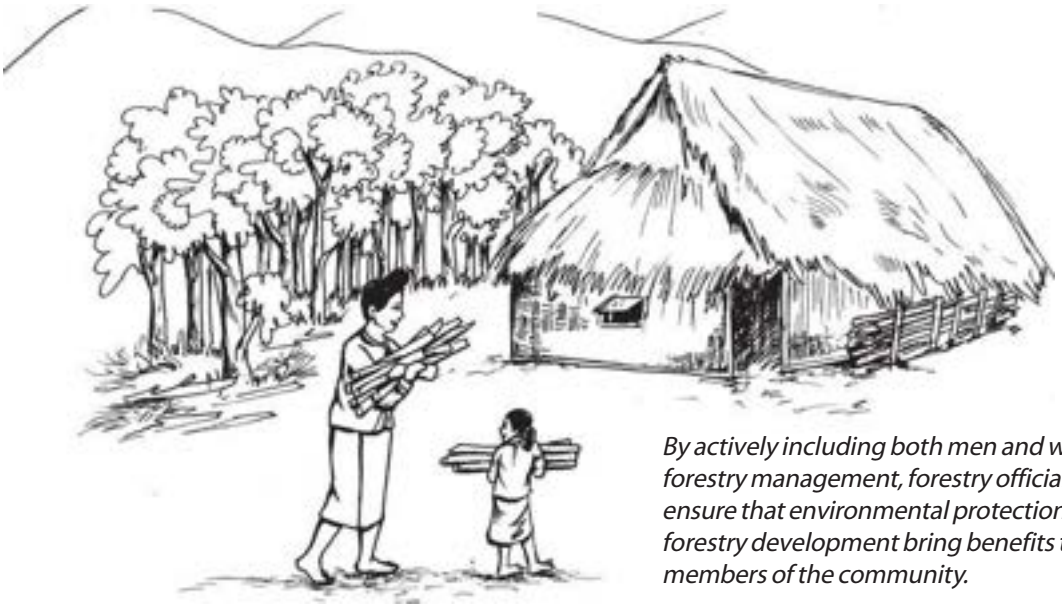
Language can be a large barrier to non-Lao speaking women's participation in planning meetings and training.

Designing projects that empower women and address their priorities

There are a number of steps that can be taken to help projects better address women's priorities:

- Using participatory methods that will involve women when collecting information for preparing rural development plans. Projects could use female staff trained in gender and development to carry out interviews and discussions.
- Consulting women for their opinions and involving women in the planning and implementation of forest projects.
- Encouraging women to participate in the management decisions concerning village forests.
- Taking women's priorities when designing activities to help them improve their situation. Although the connection between environmental work and income-generating, health and education activities is more difficult to see, helping women to address their basic needs will also help improve their status, ability to participate in decision-making, and confidence. Certain activities, like improved water supply, may also ease women's work burden thereby freeing up time for them to join meetings and activities.
- Ensuring that technical activities do not just reflect male priorities. For example, planting only commercial trees that can be sold by the head of household, rather than planting fuelwood trees that could improve household security and decrease women's work burden, may actually serve to increase women's work load without any immediate benefit.





By actively including both men and women in forestry management, forestry officials can ensure that environmental protection and forestry development bring benefits to all members of the community.

Examples of suggestions from women for improved forest management

- Regulations on the yearly rotation of firewood collection and cutting, in order to give the forest a chance to grow back.
- Village authorities to provide leadership in replenishing firewood, either by planting it in the natural forest or by setting up a village plantation.
- Village to allocate land so that each household can plant their own fuelwood.
- Energy saving stoves should be used in each household.
- Village authorities to support charcoal making at the household level while also placing restrictions on making charcoal for sale.

Information from a survey carried out by the Lao Women's Union Gender Resource Information and Development Centre (GRID), 1999

Paper extracted from: Lao Women's Union GRID Centre. 2001. Fuel for life: Women, men and the fuelwood cycle in the Lao PDR. Lao Women's Union Gender Resource Information and Development Center. Vientiane, Lao PDR.

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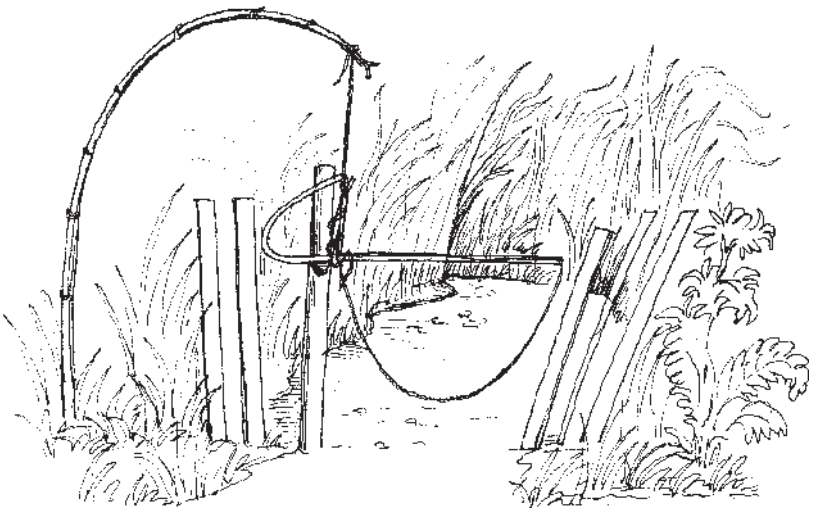
Wildlife Hunting and Use

Hunting of wildlife is an important part of rural livelihoods and nutrition in Laos. At the same time, wildlife populations are in serious decline from over-harvesting for subsistence and trade. In a threat assessment of the Nam Ha National Protected Area (NPA), over-harvest of wildlife was identified by NPA staff as one of the main problems contributing to a decline in abundance of many wildlife species (Johnson 2000). Recommendations for dealing with this conservation and development problem are discussed in the next paper of this source book, "Managing Hunting and the Wildlife Trade".

Successfully combining wildlife management and rural development requires baseline information on wildlife use, as well as on the status of wildlife populations and habitats. This study on wildlife hunting and use among the villages inside and on the border of Nam Ha NPA, in Luangnamtha, finds results that are relevant to the design of wildlife management and rural development strategies in the Lao uplands.

Survey methods



Surveys were conducted in 24 villages inside and near the boundary of the NPA by final-year students from the National University of Laos. Wildlife Conservation Society (WCS) staff trained and supervised the students in collaboration with the Nam Ha Protected Area Management Unit.

Data was collected at village and household levels, with emphasis on the latter (see Johnson et. al. 2003 for details). The 24 villages surveyed represented 59% of villages in and on the border of the NPA. Surveys were conducted in an average of 32% of households per village. The villages were from the Akha ethnic group (fourteen villages), the Khamu (three), Mien (three), Hmong (two), Kui (one) and Tai (one).

Hunting and the Law

Ministry of Agriculture and Forestry Regulation No. 0524/2001 on the Management of National Protected Areas, Aquatic Animals and Wildlife (MAF 2001): the regulations list protected animals under two separate categories, A) Restricted, and B) Controlled species.

A) Restricted animals: species that it is illegal to hunt or trade in.

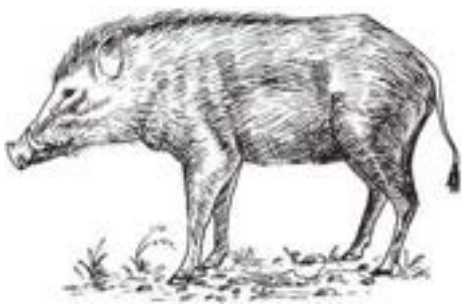
B) Controlled animals: animals that can only be hunted during the specified season (Nov 1- April 30). These animals cannot be hunted inside NPA restricted zones and corridors. The method of hunting is also controlled by the law (no semi-automatic guns or explosives, no poisons or electricity) and trade in these species is forbidden. Communities are supposed to hunt "at a sustainable rate".

Wildlife hunting

Hunting of the majority of animals was reported to be greatest from September to February. Frogs were an exception to this pattern, with harvesting occurring largely in May and June at the beginning of the rainy season. Across the year, the results of the ranking indicated that the 15 most frequently hunted animals on a monthly basis were animals less than 2 kg in size (mostly birds, rodents such as squirrels and bamboo rats, and frogs). Guns are the most common method reported for capturing wildlife (56% of animals caught were shot), followed by snares (26%). 14% of animals were captured by 'other' methods and <1% were hunted with bows. Guns were the most commonly used weapon for capturing arboreal animals and medium to large terrestrial wildlife (>2 kg).

Nam Ha National Protected Area

- 22,300 hectares of hill evergreen and broadleaf woodlands.
- Core protected zones are important wildlife habitat (Tizard et al. 1997).
- The fourth largest protected area in the country (Hedemark 2003).
- Over 288 bird species, 37 large mammal species (Tizard et al. 1997).
- Larger species are considered globally threatened or vulnerable (Duckworth et al. 1999).



Nam Ha has a high human population density for an NPA: an estimated 67% of the NPA has been affected by human activity (Hedemark 2003). Inside and on the NPA border are 41 villages whose principle area of natural resource use is within the protected area boundary. Hill rice and livestock are the major food sources for most villages. NTFPs, including wildlife, are reported to be a food source in the event of rice and livestock shortages (Phengsopha 2000).

Most households responded that they usually hunt near their upland rice fields (guns are often kept in the fields) and less so in forested areas away from fields. This is because it is more difficult to access forested areas, not because the animals are not there. Hunters reported that they do go to forested areas for larger animals. More hunting was reported near upland fields than paddy fields, which is likely to be due to the larger areas of forest that remain close to upland fields.

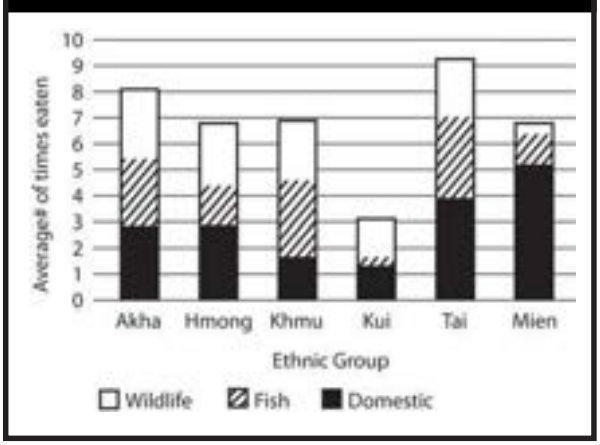
40% of households reported that outsiders also come to hunt in their village area. Households in villages farther away from a main road reported more outsiders coming to hunt in the village area. Villages farther from roads are often thought to have more wildlife than easily accessible villages. It is possible that new roads to previously inaccessible forests do initially attract more outside hunters.

Wildlife use

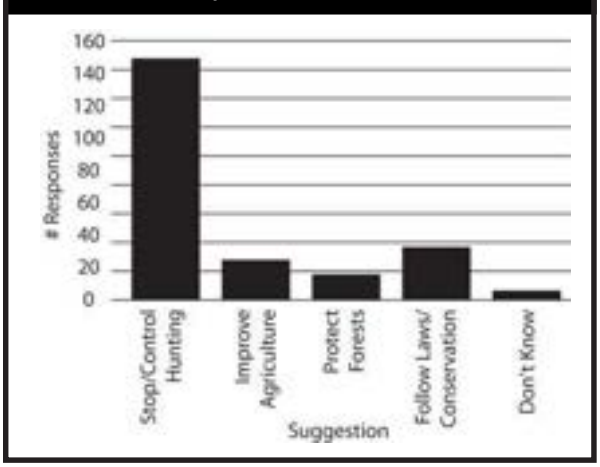
During the peak hunting periods of January-March and September-October, the survey gathered information on how villagers consume the wildlife they catch.

- Across the villages, households eat meat or fish an average of 6.7 times per week.
- Wildlife was reported eaten 1.9 times in the week prior to the survey.
- Wildlife and fish cover 66% of meat consumed.
- Relatively small amounts of meat are consumed per meal but meat is present in most meals.
- On a monthly basis, small songbirds, rodents, frogs, pheasants and partridges made up the bulk of wildlife consumed.

Average meat consumption in the week prior to the survey (n=317 households)



Suggestions from villagers of what to do about the problem of wildlife decline



Across ethnic groups, the Akha were unique in that slightly more households reported a preference for wildlife to domestic meat.

Twenty-one (38%) of the animals were reported as used for medicine. Eight of these are listed as restricted species in MAF 0524.

Animals most frequently used as medicine included Southern Serow, Slow Loris and Pangolin. Other significant findings included:

- Local sale prices were obtained for 42 animals.
- Rodents and birds made up 87% of animals most frequently sold.
- Average price for animals used as medicine was higher (62,700 Kip) than for animals not used for medicine (13,000 Kip).
- Trade in wildlife was directed for sale in the local area, with 97% of reported sales being to people from Luangnamtha Province, and 35% to people in the same village.
- 31% of households reported that outsiders come to their village to buy wildlife.
- Contacts for sale from villages in and around the NPA seem to be predominantly local.

Wildlife populations

Household assessment of decline in animal numbers was largely consistent with the threat status assigned to animals both nationally and globally. Animals listed in Duckworth et al. (1999) under various categories of risk in Laos were more commonly reported by households to be decreasing in abundance or were not reported at all. Overall,

- 65% of households identified decreases in animal abundance as a problem.
- Of these, 41% further explained that wildlife decline affects livelihoods (food and income).
- A majority suggested that stricter control of hunting is needed to resolve the problem.
- Only 32% of responses indicated a problem with wildlife increasing in abundance and causing damage to crops and livestock.
- The majority of households (69%) felt that an increase in animal abundance was not a problem, while 35% of these specifically mentioned the use of these animals for food as the reason why increases were a positive trend.

Hunting summary

Hunting in northern Laos is largely opportunistic, occurring in forested areas near upland fields, and usually during periods of upland field preparation and harvest. In addition to village use, wildlife is also traded from villages

Wildlife most frequently used as medicine

Animal	n	% Households	Status MAF 0524
Southern Serow	10	90%	R
Slow Loris	10	30%	C
Pangolin	15	20%	R
East Asian Porcupine	65	17%	C
Pig Tailed Macaque	27	11%	C
Large Flying Squirrel	50	8%	R
Large Indian Civet	14	7%	
Sambar Deer	14	7%	R
Wild Pig	57	7%	C
Crested Serpant Eagle	19	5%	R
Leopard Cat	22	5%	
Silver Pheasant	114	4%	R
Red lunglefowl	118	3%	C
Big Headed Turtle	38	3%	
Red Muntjac	90	2%	C
Masked Palm Civet	62	2%	R
Grey Peacock Pheasant	106	1%	R

n=Number of respondents; Species with n<10 are not listed; C=Controlled species, R=Restricted

and hunted by outsiders. Wildlife trade and overhunting is contributing to the decline of common species important for village food and of less common species that are already rare and in decline. Of immediate concern to both rural livelihoods and biodiversity conservation is the fact that the animals most frequently used by villages now are small-bodied (<2 kg in size), while the majority of large-bodied mammals and birds, and all reptiles, were reported as rare.

The majority of households felt that decline in wildlife abundance is a problem and that more effective management of hunting is needed. This trend towards consumption of small-bodied animals and decline in larger animals was reported over ten years ago in similar habitats and cultures in northern Thailand (Tungittiplakorn and Dearden 2002). Today, several of the larger mammals and birds that were then in decline (eg. large and medium cats, Sambar Deer, Southern Serow, most primates, and hornbills) have now vanished from these northern Thai sites and people eat squirrels and other animals that were previously undesired for consumption. The lesson learned is that managing hunting and stopping the trade of wildlife in northern Laos today is critical in order to avoid extinguishing animal populations that are important food for rural villagers and a unique part of the nation's biodiversity.

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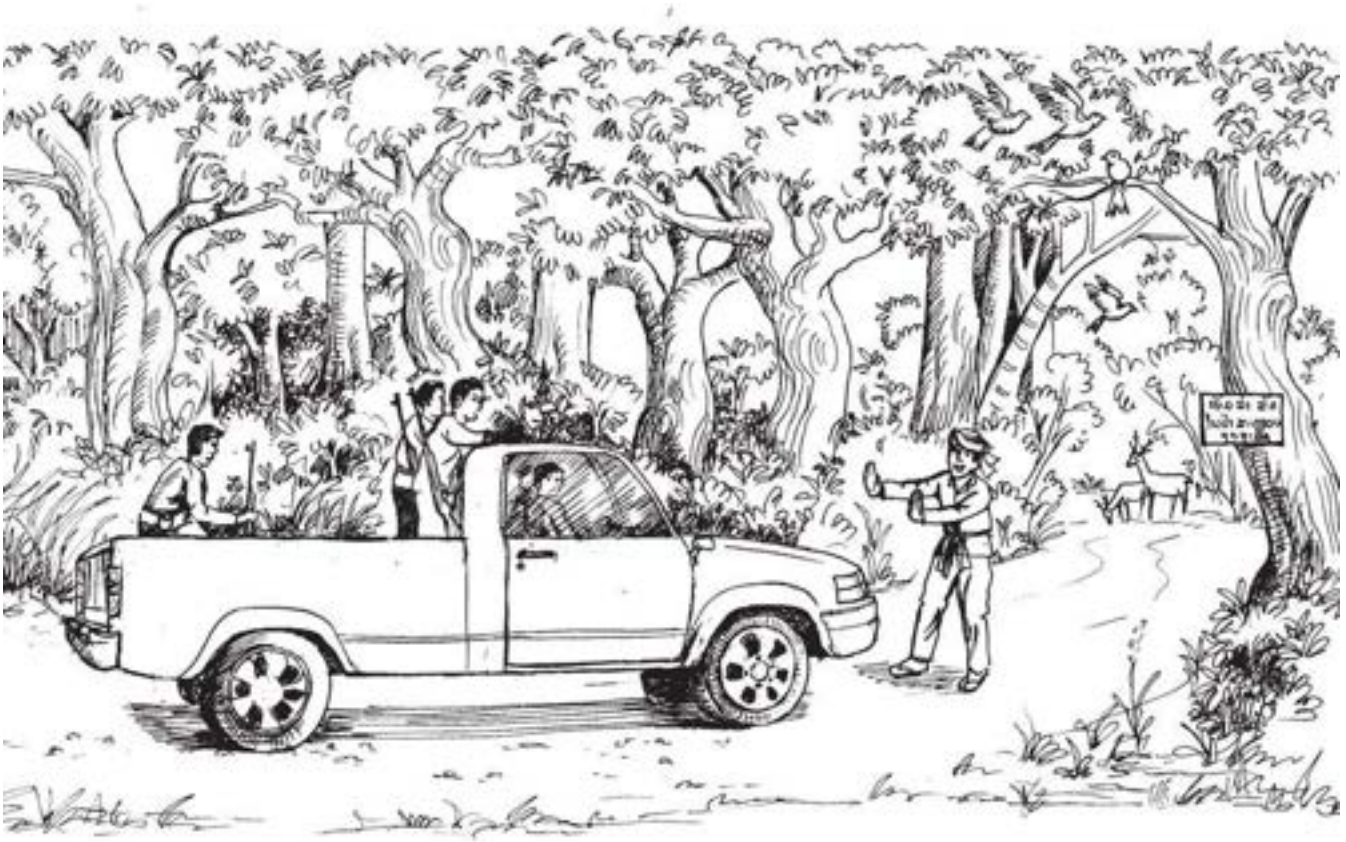
Managing Hunting and the Wildlife Trade



This article expands on the information found in the WCS survey, described in the article "Wildlife Hunting and Use".

Poverty alleviation and forest management policies in Laos aim to reduce unsustainable rates of wildlife hunting and trade while increasing rural food security. However, many species continue to decline in the uplands, a trend which affects not only biodiversity, but also threatens the nutritional status and future livelihoods of villages around National Protected Areas (NPAs).

The Wildlife Conservation Society (WCS) conducted household surveys in 24 villages near the Nam Ha NPA in Luangnamtha to evaluate the harvest, consumption, and trade of commonly used mammals, birds and reptiles. Results were compared with national policy for achieving sustainable harvest rates of managed species alongside food security. It was found that to arrest the decline of larger animals in northern Laos and assure the availability of wild meat for rural livelihoods in the future, several management actions are needed.

Managing wildlife trade and illegal hunting by outsiders

1. Wildlife trade

Most of the animals included in the WCS study are traded to some degree. Given the illegality of trading wild animals and the reluctance of households to discuss it, what was reported probably represents a very conservative estimate of the scale and extent of the trade. This is a rural livelihoods concern for several reasons:

- Wildlife trade directly violates national policies for poverty alleviation by extracting common animals designated for sustainable use as food by village residents.
- It contributes to the decline of animals that are already over harvested, making sustainable use more difficult and unlikely to be achieved.
- Illegal trade of restricted species reduces animal populations that are already rare, including unique animals with potentially high long-term economic value. Animals such as primates and hornbills could be attractions for nature-based tourism, a potentially important source of revenue for upland villages near protected areas.

Recommendations

- Support efforts to block or control access by outside trucks and motorbikes along existing roads and on tracks to the interior of protected areas. Avoid construction of new roads and tracks in these areas.
- Encourage efforts to make the public aware that trading wildlife anywhere in the uplands is counter to government policies for poverty alleviation and threatens both rural livelihoods and the viability of the nature-based tourism industry. Aim education campaigns at wildlife buying urban populations with disposable income, and disseminate information at wildlife markets and at road check points.

- Support efforts to increase the frequency of enforcement in urban markets and road checkpoints to stop sale of all animals. Although the sale of common animals, such as squirrels, bamboo rats, pheasants, partridges and songbirds, is often thought of as harmless, results from this study suggest that these are most important for village consumption.

2. Hunting by outsiders

Despite regulations that limit hunting in NPAs to village residents only, 40% of households surveyed reported that outsiders hunt in their village areas. Hence, the extent of wildlife harvest recorded in the survey represents only a portion of the total wildlife harvest in these areas. New roads and tracks into previously inaccessible regions enable outsiders to hunt (and buy) wildlife. Elsewhere in Laos, roads are associated with the increased sale and eventual decline of NTFPs, having greater negative impacts on families that are already poor and underprivileged (Chamberlain et al. 2002). Creating more access for motorised traffic invites outside hunting into the final frontiers of protected areas, making it harder for government staff and villagers to effectively enforce existing wildlife regulations.

Recommendations

The steps outlined on the previous the page will also limit hunting by outsiders. In addition, the local authorities can:

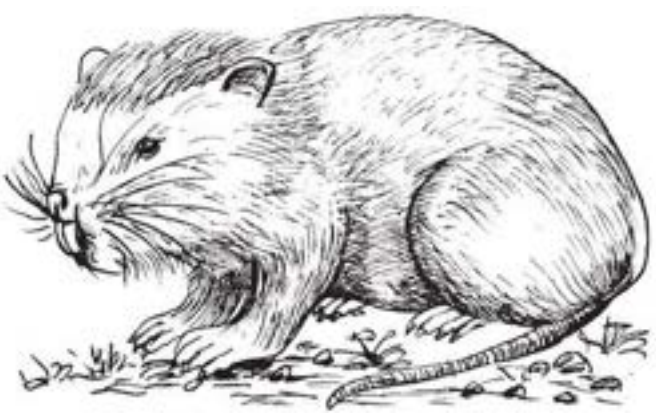
- Support efforts to educate the public (through sign posting and mass media) about the location and boundaries of protected areas, and on who has rights to legally hunt in management zones.
- Encourage efforts to strictly enforce the ban on hunting by outsiders in protected areas as stated in MAF 0524.

Managing hunting by NPA villages

3. Hunting seasons and zones

Hunting pressure for most animals is highest from September to March. This is also the period when upland rice harvest food shortages occur (September-October), when farmers are in the fields harvesting (October-December), and a period of free time (December-February) that precedes forest cutting (February-March) for new upland rice plots (NAFRI 2003; and data from this study). Hunting in September and October, and for frogs in May and June, is outside of the six-month period (November-April) during which hunting is legally permitted under MAF 0524.

Given the opportunistic nature of hunting and the use of wildlife for food and medicine, it is difficult and unrealistic to stop hunting of common (controlled and uncontrolled) species during the prohibited season, especially during rice shortages. Even if domestic livestock are available at this time, villagers will probably hunt wildlife and reserve domestic animals for sale when cash is needed. As most villagers prefer wild to domestic meat, they will very likely hunt even when domestic animals are available, unless hunting regulations can be enforced by local authorities.



Recommendations

- Due to the importance of some common animals (small squirrels, bamboo rats, bulbuls) for food security, it may be more realistic to limit hunting by geographic location rather than by season. This would allow some harvest of common animals by villages in NPA management zones throughout the year, while increasing efforts to strictly enforce hunting bans on all animals within NPA core zones. The hunting ban on restricted species needs to be enforced at all times in all areas.
- The role of wildlife in rural food security in Laos is not well documented or understood. Recent nutritional studies (see papers by Clendon and Krahn in this publication) suggest that wild meat still plays a critical role in rural diets. More detailed information on the type, frequency and quantities of wild meat consumed in villages, relative to other sources of protein, needs to be collected to guide wildlife management strategies in protected areas.

4. Hunting methods

Despite ongoing gun collections in NPA villages over the years, guns are still the most common hunting method, prominent in the capture of larger rare animals often reported as declining. Guns in NPA villages include an array of unregistered homemade muskets as well as semi-automatic AK47s issued to village militia. As in other areas, government issued cartridges for village militia weapons are altered to change the solid lead bullet to lead shot, and are reloaded and reused (Hansel, in press). In addition to guns, a wide variety of specialised snares are employed for hunting ground birds, and terrestrial and volant mammals.

Recommendations

- Gun collections should be continued and their frequency increased. Gun control is not likely to threaten village food security since the most frequently eaten animals are captured by snares or other methods. Efforts should focus on villages that actively sell animals or that report outsiders hunting, as these activities pose the most immediate threats to rural livelihoods and biodiversity conservation. Stronger efforts should be made to confiscate guns from anyone at any time in protected areas.
- The use of village militia weapons for hunting probably poses a greater threat than muskets, since when reloaded with lead shot they are more effective in hunting larger rare animals and small animals. Closer management of village militia weapons and ammunition is needed to ensure that they are not used for hunting in protected areas.
- Gun collections alone will not limit the extent of hunting of many animals (especially terrestrial birds and mammals). It is possible that use of snares will increase if guns are effectively limited. Therefore, strict delineation and enforcement of the core zone protection areas where hunting is prohibited will be critical in assuring effective animal refuges.
- Snares do not discriminate in prey selection and can inadvertently trap rare and restricted species. In order to determine how large a problem this is, hunting with common snares, such as long fence line noose snares (*heo pan*) and log drop snares (*heo tham*), should be evaluated to identify the frequency of types of animals caught. Likewise, snare types should be reviewed to determine which pose a threat to restricted species and to species under some degree of risk. For example, specialised snares for capturing bears (*heo mii*) and trip wire spear or gun traps (*heo hao*) used to kill large mammals should be prohibited. Since the latter can also easily injure a human, their use also poses a threat to NPA visitors.

The future

No guidelines currently exist to help government staff or villages to know if harvest of controlled species is within sustainable limits. To determine sustainability, ongoing information is needed on the abundance, harvest and use of controlled and heavily utilised animals. A priority for research and monitoring is information on the status and use of frequently hunted animals, including pheasants, partridges, pigeons, civets, and small ungulates. This information should be used to design and adapt village wildlife management plans that will assure population viability and availability of these animals as a food source for the future.

More enforcement is needed in urban centres and villages around protected areas to stop the hunting and use of restricted species. These animals are under some degree of risk in Laos or are globally threatened, and were commonly reported as decreasing in abundance. If the recommendations made in this paper are carried out and adapted after further research, villagers in and around NPAs should be able to continue harvesting enough wildlife to maintain their traditions and balanced diets, while also conserving animal species for future generations.

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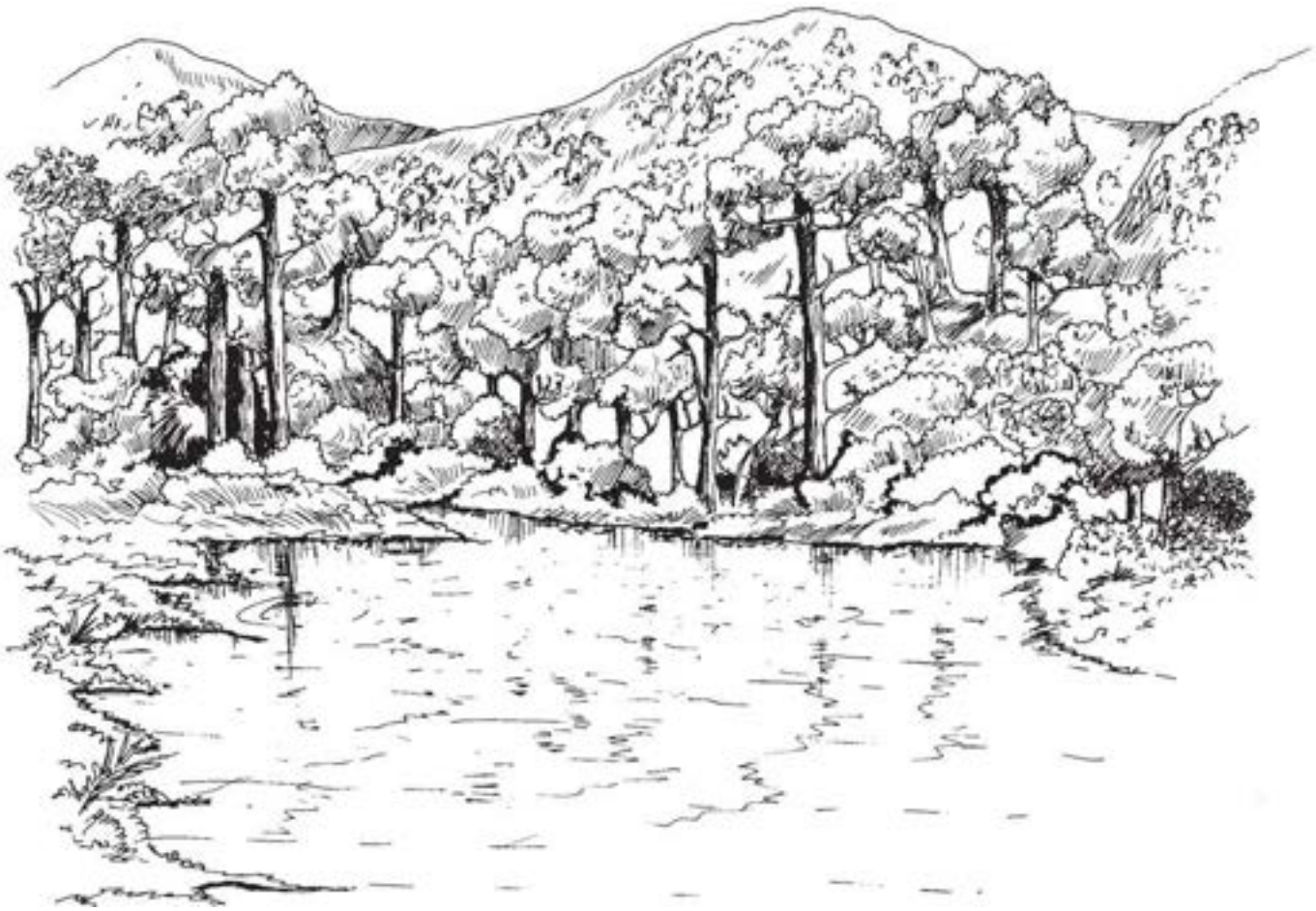
Economic Returns from Conserving Natural Forests in Sekong Province



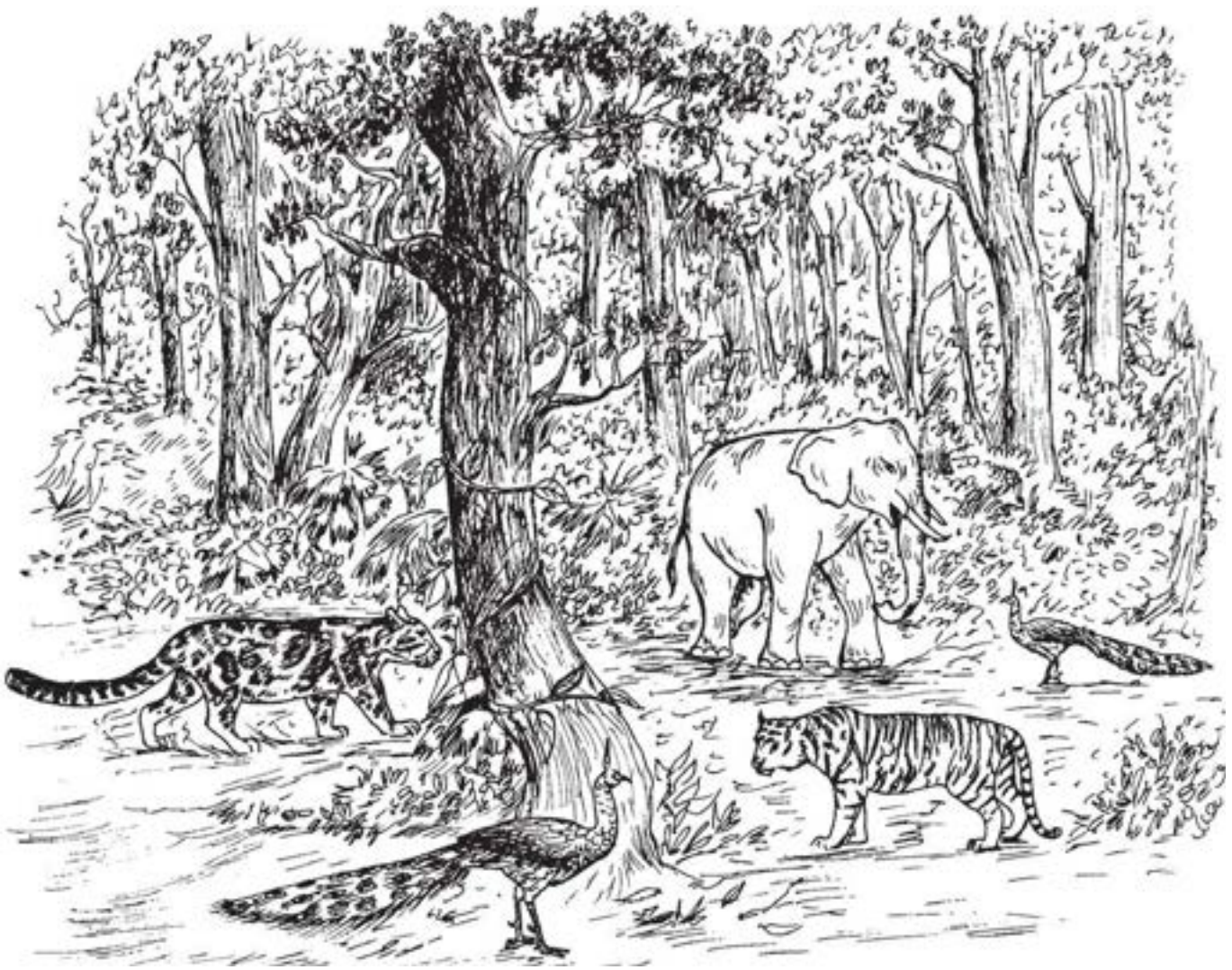
Among Asian countries, the Lao PDR is noted for its high forest cover (41.5%). However, this is currently decreasing at the rate of 100,000-200,000 hectares per year. A major reason is that some decision makers, monoculture commercial farmers and loggers consider only the forest's commercial value (e.g. timber), and not its importance for biodiversity and local livelihoods (e.g. NTFPs).

There is a growing recognition that protecting watersheds secures local livelihoods. Some efforts to increase forest cover (e.g. reduced slash-and-burn agriculture and reforestation programmes) are being undertaken. Given the dependence of local communities on NTFPs, there is an ongoing debate about whether degraded forests should be transformed into plantation forests to increase long-term national and provincial income, or whether they should be allowed to regenerate naturally thereby favouring biodiversity and protecting the livelihoods of current and future generations.

To demonstrate the links between biodiversity and current sectoral priorities and development needs, a joint study was carried out by the Lao National Mekong Committee, the Ministry of Agriculture and Forestry, and the National Economic Research Institute to calculate the economic returns from conserving forests in Sekong Province. The objective was to persuade development and economic sectors to integrate biodiversity issues into their policies, plans, and budgets by highlighting the economic value of maintaining naturally regenerating forests.

Rural poverty and abundant natural resources

Most of the pristine forest in Laos is located in the south. The provincial government estimates that 66% of Sekong's households are poor and GDP per capita is estimated at US$120, well below the national average. In 2001, the population was 71,386 (35,987 female) over 7,665 km^2, making Sekong the second smallest province in Laos with the lowest population density in the country (9.5 persons/km^2).



The Annamites are a significant source of livelihoods, providing:

- Watershed protection for flood prevention and urban water supply
- Biodiversity-based activities e.g. agriculture and aquaculture
- Hydropower and associated activities
- Non-timber forest products (NTFPs)
- Timber

Sekong is part of the Central Annamites, a mountain chain that runs along the Lao-Vietnamese border down into Cambodia and is one of five priority regions in the World Wildlife Fund's Ecoregion Conservation Programme. Of particular importance is the presence of rare, endemic and threatened taxa, including large mammals such as Tiger, Clouded Leopard, and Asian Elephant. Biodiversity is high, with 178 species identified including three of international importance - Crested Argus, Green Peafowl and Spotbellied Eagle Owl.

With Sekong's high level of poverty, many rural communities have difficulty meeting subsistence needs, especially at the end of the dry season, when NTFPs become an important component of their diet. The incidence of acute malnutrition and chronically energy deficient children is high in Sekong compared to in other provinces.

Economic development is high on the provincial agenda and given the relative good state of the forests, the provincial government has put forward a strategy to increase income by harvesting its natural resources. In compliance with national strategies, a vital component of the five-year socio-economic development plan for Sekong is to stop slash-and-burn activities and forest degradation. To meet national and provincial quotas on timber harvesting while simultaneously increasing the forest cover, certain degraded forests are being allocated for tree plantations.

Measuring forest economic values

The economic value of Sekong forests includes direct and indirect use values derived through

Economic benefits and beneficiaries of Sekong forests

NTFP harvests	→	Village/Community Level
Timber revenues	→	Provincial Government
Watershed protection	→	Watershed Catchment
Carbon sequestration Biodiversity conservation	→	Global Community

the following study sub-objectives:

a) Direct use values in terms of their contribution to livelihoods.

b) Financial returns from sustainable uses, mainly sustainable timber harvesting.

c) Indirect use values in terms of their contribution to watershed protection, biodiversity conservation and carbon sequestration.

Two methods were used to calculate NTFP values. The first took the market prices of goods together with the estimated harvest. Focus groups in three villages discussed specific species and quantities harvested. The second was the Participatory Environmental Valuation technique whereby local villagers expressed NTFP

Economic benefits from forests			
Use/ benefit		**Annual value (US$)**	**Annual value (US$/ha)**
Direct uses	NTFPs	4,906,942 - 6,472,725	398-525
	Timber revenues	605,000	10.35
Indirect uses	Watershed protection		
	Fisheries and aquatic resources	135,919	0.47
	Agricultural production	714,550	2.5
	Micro-hydropower facilities	792-5,367	.003 - .02
	Potential hydropower supply	67,255,472-455,575,755	233 - 1,581
	Flood control	26,597,000	92.3
	Biodiversity conservation		
	Conservation expenditures	1,887	0.07
	Bio-prospecting	13,658 - 68,289	0.11 - 0.55
	Carbon sequestration	649,400,000	1,284

values within the context of their own perceptions, needs and priorities rather than through conventional cash-based techniques.

Cash measurements are of little relevance in subsistence economies, and worth is better expressed through a product that is accepted and accorded a high value in the village. It is important that the product has a market value, even if the respondents are not aware of how much that may be. In this study, rice was used. Villagers were asked to rank all the products extracted from the forest by placing counters on each product harvested. The number of counters signifies the importance placed on that particular product. The value of each product was then expressed relative to the value placed on rice. Results of the Participatory Environmental Valuation and the focus groups were compared to validate each other. Ideally, surveys should be random to include more respondents.

The indirect values were watershed protection, biodiversity conservation and carbon sequestration. Watershed protection considers the forest as protecting downstream users from irrigation facilities, micro-hydropower, lowland agricultural production, and against floods and sedimentation. The production value of fisheries, agriculture and hydropower are estimated. The avoided costs from these damages represent the value of watershed protection.

Biodiversity conservation was estimated using the 'revealed willingness to pay' of the government, as expressed by its expenditure on forest

conservation. The benefit-transfer method was used to calculate carbon sequestration. This is an approach that involves taking the results from one or more primary economic studies with estimated values for similar impacts, and modifying them to the area being studied.

Sekong forests - how much are they worth, and for whom?

Estimates of direct use values show the annual value of NTFPs to be between US$398 and $525 per household, well above the provincial average income of $120. NTFPs are an important source of non-cash income for Sekong households, particularly for the poorest. Their value can be correlated with knowledge of the forest and its resources. As households move out of poverty, so the relative contribution of NTFPs towards their livelihoods declines.

Sekong forests provide considerable earnings for the provincial government. In 2003, revenues were $520,000 plus tax earnings of $85,000. However, history has proven that unsustainable logging leads to significant economic and environmental costs. Short-term gains brought by continuous logging can be wiped out by the long-term negative impacts it causes. Indirect use values emphasise the importance of natural forests to people's lives, and watershed protection allows enormous economic costs to be avoided.

Judging from the findings, conserving natural forests in Sekong is a worthwhile undertaking and it is imperative that goals the provincial government set out to pursue (e.g. improved livelihoods, sustainable development and natural resource use), translate into the promotion and conservation of natural forests.

This case study is adapted from Rosales, R., Kallesoe, M., Gerrard, P., Muangchanh, P., Phomtavong, S. & Khamsomphou, S. 2003. *The Economic Returns from Conserving Natural Forests in Sekong, Lao PDR*. IUCN / The World Conservation Union Asia Regional Environmental Economics Programme and WWF Lao Country Office, Vientiane. For further information contact: pauline.gerrard@wwflaos.org

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