

**FOREST RESOURCES DEPENDENCY OF THE
RURAL COMMUNITY: A CASE STUDY IN BOKEO
PROVINCE LAO PDR**

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	2
1.1 General Background	2
1.2 Statement of Problem	3
1.3 Objectives of Study	4
2.0 LITERATURE REVIEW	4
2.1 Products Cultivated and Harvested from Forestland (CFLPs)	4
2.2 Timber Forest Products (TFPs)	4
2.3 Non-Timber Forest Products (NTFPs)	4
2.4 Definition of “Forest Dependency”	5
2.5 Forest Dependency Based on Past Research Works	6
2.5.1 Nature of Forest Dependency	7
2.5.2 Dependency for Subsistence	7
2.5.3 Dependency for Income and Employment	7
2.5.4 Dependency for Inputs into the Household Production System	8
3.0 RESEARCH METHODOLOGY	8
3.1 Conceptual Framework	8
3.2 Research Method	10
3.2.1 Selection of the Study Site	10
3.2.2 Selection of Respondents	10
3.2.3 Selection of Enumerators	10
3.2.4 Preparation of Questionnaire	10
3.2.5 Questionnaire Pre-testing	10
3.2.6 Data Collection	10
3.2.7 Formal Interview	11
3.2.8 Informal Interview (Individual or Group Discussion)	11
3.2.9 Direct Observation	11
3.3 Operational Definition of Variables and their Measurement	11
3.3.1 Independent Variables	11
3.3.2 Family Size	11
3.3.3 Education	11
3.3.4 Family Income from Non-Forestry Activities	11
3.3.5 Labour Availability, Land Ownership, Land Allocation	12
3.3.6 Rice Sufficiency	12
3.4 Dependent Variable: Forest Dependency	13
3.4.1 Purposes of Products (TFPs, NTFPs & CFLPs) Utilization	14
3.4.2 Food	14
3.4.3 Fuelwood	14
3.4.4 Building Materials	14
3.4.5 Tools & Furniture	14
3.4.6 Income	14
3.4.7 Medicine	15
3.5 Categorization of Products	15

3.6 Quantity of Products	15
3.7 Prices of Products	15
3.8 Data Analysis	15
4.0 PROFILE OF THE 12 VILLAGES AND RESPONDENTS	15
4.1 Background Information of the 12 Villages	15
4.2 Categorization of 12 Villages on the Rice Sufficiency Basis	16
4.3 Categorization of 12 Villages on the Annual Family Income Basis	16
4.4 Collection of Products (TFPs, NTFPs & CF LPs) Collection	17
4.5 Places of Products (TFPs, NTFPs & CFLPs) Collection	17
4.6 Existing Land Use in the Study Site	18
4.7 Ethnic Groups by Villages	19
4.8 Profile of Respondents	19
4.8.1 Family Size	19
4.8.2 Ethnicity	20
4.8.3 Education	20
4.8.4 Family Income	20
4.8.5 Respondents by Income from Forest-based Activities	21
4.8.6 Contribution of Forest-based Activities to Total Family Income	21
4.8.7 Labour Availability	22
4.8.8 Land Ownership	22
4.8.9 Rice Sufficiency	23
5.0 FINDINGS AND DISCUSSIONS	23
5.1 Quantity of Products (TFPs, NTFPs & CFLPs)	23
5.2 Three Kinds of the Nature of Forest Dependency	24
5.2.1 Forest Dependency for Subsistence	24
5.2.2 Forest Dependency for Inputs into the Household Production System	25
5.2.3 Forest Dependency for Income and Employment	25
5.3 Total Value of Forest Dependency of the Studied Rural Community (12 Villages) in Nam Nhou and Nam Choam, Bokeo Province, Lao PDR	25
5.3.1 Degree of Forest Dependency of the Studied Rural Community	26
5.3.2 Comparison of the Monetary Value of Forest Dependency of the 12 Villages with Gross Domestic Products per capita (GDP) and the Poverty Threshold Rate (PTR) of Lao PDR	26
5.4 Factors Influencing Forest Dependency	26
6.0 SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS	27
6.1 Summary of Major Findings	27
6.2 Conclusions	28
6.3 Policy Implications	29
6.4 Recommendations for Future Research	29
REFERENCES	36

LIST OF TABLES

Table 1. Villages by rice sufficiency groups	16
Table 2. Villages by annual family income groups	16
Table 3. Places of products (TFPs, NTFPs & CFLPs) collection in the 12 villages	18
Table 4. Ethnic groups by villages	19
Table 5. Respondents by family size	20
Table 6. Respondents by ethnicity	20
Table 7. Respondents by education	20
Table 8. Respondents by family income	21
Table 9. Respondents by family income from forest-based activities	21
Table 10. Sources of total family income	22
Table 11. Respondents by contribution of the income from forest-based to the total family income	22
Table 12. Respondents by labour availability	22
Table 13. Respondents by land ownership	22
Table 14. Respondents by rice sufficiency	23
Table 15. Quantity of products (TFPs, NTFPs & CFLPs) utilized by 100 respondents' families from the 12 villages	23
Table 16. Description of forest dependency for subsistence, inputs, income and Employment, and total value of forest dependency of the 12 villages in Bokeo province, Lao PDR	25
Table 17. Degree of forest dependency of the respondents' families in the 12 villages	26
Table 18. Result of forest dependency model for 12 villages in the Nam Nhou And Nam Choam areas, Bokeo province, Lao PDR	27

LIST OF FIGURES

Figure 1. Conceptual Framework of the Forest Dependency of the Rural Community	9
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FOREST RESOURCES DEPENDENCY OF THE RURAL COMMUNITY: A CASE STUDY IN BOKEO PROVINCE, LAO PDR

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EXECUTIVE SUMMARY

This study used the Rapid Rural Appraisal Technique (RRAT) to examine the socio-economic situation of the rural community in Bokeo Province, Laos. It assesses the contribution of the forest resources to the rural community household's economy and addresses the problems associated with this forest dependency. This study aims to estimate the quantity and monetary value of various timber and non-timber forest products (TFPs & NTFPs), and the products cultivated and harvested from forestlands (CFLPs) on an annual basis. It also measured the rural household's income derived from these products and those intended for annual household consumption needs. Descriptive statistics were used to summarize the data and measure the rural community's forest dependency in the 12 villages of the Nam Nhou and Nam Choam areas, Bokeo province, Laos. Three kinds of nature of forest dependency were discussed in this study: (1) dependency for subsistence (2) dependency for inputs into the household production system and (3) dependency for income and employment.

The main findings of the study were summarized as follows (1) the family having bigger labor force is less dependent on forests, because such family has an advantage in allocating its labour force into different economic and agricultural activities in lieu of carrying out the forest based-activities; (2) the family having more income from non-forestry activities likes to diversify its economic activities and loves to move away from subsistence forest-based activities such as collecting NTFPs and engaging in the shifting cultivation, and consequently, it is not forest dependent family, and (3) the majority (67%) of the respondent-families are heavily (90%-100%) dependent on forests for their survival. They are the poor group of people, who do not have either an access to capital or other alternative sources of income, associated with a low or non-educational qualification.

The results show that the rural community (12 villages) are highly (85.66% of the total annual household consumption needs, obtained from resource use) dependent on the forests for their survival. It totally amounted to Kip 693. 91 million (US\$84,315.08) for 100 families per year. The study also identified factors influencing degree of forest dependency using multiple regression analysis and inventoried indigenous species of TFPs and NTFPs often utilized/consumed by the rural people. The paper suggests that the rural household's income could be increased through: (a) community's participatory sustainable forest management, and (b) augmentation of the family income from non-forestry activities (e.g. a promotion of livestock and aquaculture, labour wage, self-employment, small villager enterprises, cottage industry, and all forms of off-farm, but non-forestry activities). In this connection, the policy regarding the rural credit scheme of the Agriculture Promotion Bank (APB) should be revised to be more accessible to the poor farmers. The paper also addresses the issue regarding stabilization of the shifting cultivation as a major priority of the Lao government. This type of farming is the main cause of the environmental problems such as forest destruction and forestland degradation. In 1995, approximately 300,000 families were fully or partially engaged in shifting cultivation and roughly 100,000 hectares of primary and 300,000 hectares secondary forests are cleared annually. The land allocation program, which is a central activity of the land use planning process aiming to create a sustainable use of land, was also highlighted. This program calls for allocating a fixed plot of land for crop production using appropriate soil fertility improvement measures. The study suggests that the land allocation policy should be more flexible and participatory and focus more on land use planning rather than on merely allocating specific plots to the

farmers. The government should also ensure that the policies regarding the collection of non-timber forest products (NTFPs) do not lead to greater over-harvesting of those resources.

1.0 INTRODUCTION

1.1 General Background

The Lao People's Democratic Republic (Lao PDR) is a land locked country situated in the Peninsula of Indochina, sharing its border with China, Vietnam, Burma, Thailand and Cambodia. The country has an area of 236,800 sq. km of which about 75% is mountainous. Its total population has reached approximately 5.2 million, (FAO, 1999) comprising 68 ethno-linguistic minorities, which are categorized into three main groups namely Lowlanders (Laoloum) 55 %, Uplanders (Laotheung) 30% and Highlanders (Laosoung) 15%. The majority of the population (about 80%) lives in rural areas. The average annual growth rate of the population is estimated to be around 2.6% (Sisongkham, 1994).

In Lao PDR, shifting cultivation is dominant cropping system in the uplands and mountainous areas; it is the traditional farming practices for many generations of farmers who are living in this region. Upland rice and other upland crops are grown for family subsistence, wherever there is a shifting cultivation. Ministry of Agriculture and Forestry (MAF) in 1995, recorded that approximately 300,000 families or equal to about 1.8 million people or 40% of the total population are fully or partially engaged in shifting cultivation, and roughly 100,000 hectares of primary and 300,000 hectares of secondary forests are cleared or deforested annually. Assuming that each family plants about 1.5 hectare per year, the shifting cultivation area used annually would be around 450,000 hectares. The total area in the shifting cultivation cycle is difficult to assess, but it could be around 2-2.5 million hectares or equal to about 10% of the total land area of Lao PDR. The major environmental problems in the country are deforestation and unsustainable logging operations including shifting cultivation of families living in the uplands and mountainous areas. These practices cause depletion of forest cover, soil erosion, and reduction of soil fertility level, including recurrent floods and droughts (Phanusith, 1994).

Because of these environmental and social problems, stabilization of shifting cultivation is a major priority of the Lao Government. Therefore the government has set forth the development strategy (Department of Forestry, 1997), which includes the followings: (a) land allocation, (b) promotion of permanent cash cropping, (c) expansion of livestock production, (e) tree planting by farmers, (f) infrastructure development, and (g) socio-economic development work.

However, attempts to improve land use in shifting cultivation areas in Laos have proven difficult as adoption of new technology is constrained by the mountainous topography, limited infrastructure, low market demand, limited processing facilities, and the poverty of most shifting cultivators (Hansen and Sodarak, 1997).

Agriculture production is predominantly practiced with traditional techniques and is mainly dependent on rainfed conditions. Natural calamities such as floods, droughts, diseases, rodents, and pests have quite often affected agricultural production, resulting in food deficiency. This, together with poor infrastructure and bad access conditions, cause the rural population to live in distressed conditions. As a consequence they have to struggle for survival, leading to greater dependence on forest resources. Not only do forests play an important role in the survival of the rural people and socio-economic development of Laos as well, but they also provide intangible benefits, especially protection from the environment and amelioration of the climate. Moreover, they also contribute to national income and employment. With the political and economic reforms of the Lao Government during the late 1980, the demand to exploit natural resources has increased.

The forests provide a wide range of timber forest product (TFPs) and non-timber forest products (NTFPs), which are the main sources of the food, medicine, building material and shelter for rural people. These forest products play a crucial role in rural household food security. Hence, rural people draw a big share of their food from collecting forest products like edible fruits, leaves, tender shoots, climbers, wild vegetables, bamboo shoots, rattan shoots and tuberous roots. They totally depend and rely on the forest for their fuelwood requirement for cooking, for making tools and warmth. They also collected resinous materials such as damar

resin, oleoresin, and so on for household use and sale in both local and foreign markets. Animal produce and products derived from it and from fish are other important sources of food and income of villagers. Salter (1993) stated that hunting; fishing and gathering of wildlife play important roles in all villages in Laos. Most of wild animals hunted from the forests are for family consumption, but some of them are partially sold for household income generation through urban markets. These NTFPs not only serve as sources of food and income, but they also serve as a drugstore for the rural population. Today, traditional treatments with medicinal plants and animal products are gaining high popularity, not only among the rural people but also among urban dwellers. In Laos, about 40% of the population is estimated to be directly reliant upon the forest. The national economy is also heavily dependent on forest products. The export of timber and wood products provided about 40% of the total value of export (SUAN–EAPI–MAF, 1991).

1.2 Statement of Problem

The livelihood of rural communities of Laos is historically related to the forest resources and very closely associated with and dependent upon the continued existence of the forest. The forests and forestry activities affect household food security in a number of ways. Not only do they provide foods, medicines, fuel for cooking and food processing, and help to maintain environment stability, they also provide forestlands to the rural people for their subsistence farming as well as sources of cash income, employment and inputs into the household production which significantly contribute to household economy of the rural community.

Shifting cultivation has traditionally been important, if not the dominant feature of the highland landscapes, economies and cultures of Laos for centuries. Rural community depends not only on goods, products, materials and services from the forests, but they also depend on forestlands for their shifting cultivation to mainly produce the rice as a staple food for their family consumption needs. The forestlands are heavily cleared for shifting cultivation, it is estimated that in Laos there are approximately 187,000 to 300,000 families engaging in shifting cultivation and that the area each year is about 177,000 to 380,000 ha of the forestlands to practice a shifting cultivation (Chazee, 1994). So, the shifting cultivation has significantly contributed to the depletion of forest resources, although other factors, including population growth, the war, more recent economic development, illegal and legal logging, and forest fires, must also be taken into account in understanding the reasons for such decrease (Sinbandith 1989, cited in SUAN–EAPI–MAF, 1991).

Poverty of rural upland people of Laos is directly linked to the limitation of agricultural lands, land degradation and absence of alternative source of cash income to buy more rice, making them more dependent on the forest and its continued existence. They turn to the forest to hunt, fish, and harvest wild cardamom, bamboo shoots, rattan shoots, and wild vegetables, as well as resins, rattan canes and other products. They consume some of these directly. Others they sell to buy rice. For many of these people life is getting harder due to population growth, limitation of the agricultural land, government policy stopping shifting cultivation and outsiders encroaching on their forest.

The government of Laos has made a great effort in implementing many rural development projects supported by the Lao government, international development organizations (e.g. UNDP, GTZ, NCAP, JICA, etc.), financial institutions (e.g. ADB and World Bank) aiming at poverty alleviation, reduction of the forest dependency of the rural people, and improving the livelihood of rural inhabitants through the development of the rural infrastructure, establishment of the rural credit scheme, promotion of commercial crop and livestock production, and land allocation program. Still, the problem deserves more attention as poverty continue to persist and environmental deterioration remains a big problem.

There are only few studies in Laos on the estimation of the quantity and monetary value of the various timber and non-timber forest products (TFPs and NTFPs), and products cultivated and harvested from forestland (CFLPs). Dependency on the forest resources and livelihood patterns of the rural community seem to be widely discussed in many documents in Laos, but to what extent does the rural community depend on the forests, and what are the factors influencing forest dependency still need to be addressed.

The existence of the forest resources to sustain the rural community in the long-term should be considered in forest management. An important input to the development of a forest management plan is the

knowledge on the type, quantity, and value of products (TFPs & NTFPs) collected from the forest, and those cultivated and harvested from forestlands (CFLPs) annually utilized or consumed by rural community to meet its household needs and generate income.

1.3 Objectives of Study

1. To estimate the quantity and monetary value of various timber and non-timber forest products (TFPs & NTFPs) collected from the forests, and the products cultivated and harvested from forestland (CFLPs), annually utilized by the rural community in the study site.
2. To measure the forest dependency of the rural community in the study site
3. To identify factors influencing the dependency of the rural community on the forest resources.

2.0 LITERATURE REVIEW

This section discusses relevant concepts and findings of various studies dealing on forest dependency of rural community.

2.1 Products cultivated and harvested from forestland (CFLPs)

Products cultivated and harvested from forestland (CFLPs) in this context are all kinds of products grown and harvested from shifting cultivation, which is one type of forest resource use. This farming practice is the predominant cropping system in uplands and mountainous region, especially in the northern part of Lao PDR. In Northern Vietnam, since agricultural land for paddy is very limited and in the mountainous districts, people rely on shifting cultivation in forestland for more staple food such as hill rice, maize and cassava as the main upland crops, because hill rice and cassava are major staple foods and main source of income for many households (Nguyen Thi Yen et al., 1994). Shifting cultivator produces several varieties of upland crops of which the most important one is upland rice, which is considered a staple food. Apart from this, the popular forestland crops (upland crops) that villagers like to grow in their upland plot, are as follows: sweet corn, maize; chili, eggplant, sesame, pumpkin, cucumber, sweet potato, turnip, taro, cassava, and peanuts. For the purpose of comparing or computing the financial benefit, products cultivated and harvested products from forestland through shifting cultivation were treated as NTFPs, since they were grown on the cleared forestland provided by forests (Mohd Shahwahid, 1998), and they were mostly consumed by family, and partially used for animal feeding and generating income.

2.2 Timber Forest Products (TFPs)

The term “forest products” include wood and non-wood forest products (FAO, 1991). Wood forest products or timber forest products (TFPs) refer to round wood, sawn timber, wood-base panel, and wood chips and pulp, and usually involve commercial enterprises as well as the domestic use of unfurnished poles for construction purposes. In most cases, the rural communities utilize timber forest products for building materials such as for construction of houses, granaries, animal sheds, etc. Although, rural communities are not entitled to cut the trees from the forests owned by the state, the customary right allows them to do so, with an assumption that the royalty payment has to be made as an obligation to the government, because this payment will partially contribute to national revenue income. For example, the timber royalty payment provided 11% of national revenues incomes in 1997-1998 (Anon., 2000).

2.3 Non-Timber Forest Products (NTFPs)

The term “Non-Timber Forest Products” (NTFPs) encompasses all biological materials other than timber, which are extracted from forests for human use (de Beer and Melanie, 1989). These include foods,

medicines, spices, essential oils, resins, gums, latexes, tannins, dyes, ornamental plants, wildlife (products and live animals), fuel wood and raw materials, notably rattan, bamboo, small wood and fibers.

Despite their important contributions, NTFPs have thus far received relatively little attention in Laos. Although this has begun to change in recent years as government and non-governmental organizations are recognizing the potential of NTFPs to further contribute to economic stability of rural communities, to both subsistence and market oriented means, and to incentives they can provide towards more concerted efforts at forest conservation. Increased development of NTFPs for both subsistence and cash income could assist to alleviate the economic pressures, which compel rural communities to degrade their forest resources, while at the same time further reinforce the importance of preserving and protecting these valuable source bases (de Beer et al., 1994).

Nevertheless, forests also provide foods, which are often particularly important for poorer groups of rural people. They provide an available and accessible source of a diverse range of foods, and still contribute significantly to the diet of many rural households. In most cases, the rural households consume them though mostly on an occasional basis. They include seeds and nuts, fruits, and leaves, roots and tubers, mushrooms, wild vegetables, bamboo shoots, rattan shoots, fish and bush meat. In some cases the availability of forest foods may allow farmers to market a great share of their agricultural produce (Falconer and Arnold, 1991). Besides providing foods, forests also provide rural communities with fuelwood, which is the main energy source in most third world rural communities. Some species of NTFPs are well known and used as medicines among rural communities and urban residents as well. Plant medicines are used in both curative and preventive treatments. There are numerous species, which are taken to prevent sickness and to encourage growth and they are often added to soup and sauces. Most bush foods are added to soup as blood tonics.

Utilization of NTFPs in Lao PDR can serve as evidence of how rural people use NTFPs and to what extent; NTFPs contribute to rural family cash income. A survey on the use of NTFPs in 28 villages of four provinces of Lao PDR, namely: Champasak, Salavanh, and Oudomxay, and 5 villages in Nakai plateau, Khammouane province, was done by the World Conservation Union (IUCN) and Department of Forestry (DoF). The result showed that the main use of NTFPs is for subsistence, and bamboo shoots, fish, wild vegetables are considered by local people as the most important products from the forest, and NTFPs contribute about 55% (average) to rural family cash income. Both wealthy and poor families collect NTFPs such as cardamom (*Amomum avoideum*), fish, wildlife, and damar resin (*Shorea spp.*) and bamboo shoots for the market. Poorer families who often need cash to buy rice are much more dependent on NTFPs as they the only source of cash income (Joost and Sounthone, 1997).

Recently, increased attention has been given to the potential importance of Non-Timber Forest Products (NTFPs) towards meeting rural communities' needs for food, fiber and forage, as well as essential sources of cash and better incomes. In Lao PDR, within the last few years, there are some projects such as the World Conservation Union (IUCN) and Non-timber Forest Products Information Center (NIC), supported by international donors, which aim at investigating and making an inventory of the indigenous species of NTFPs, being used, consumed and sold in both domestic and foreign markets, and promotion of sustainable use of NTFPs for rural development and forest conservation (Anon., 1998).

24. Definition of "Forest Dependency"

Longhurt (1991) defined forest dependency as reliance on trees or forests for foods, and signals a vulnerability to change in the forest access or use. Forest foods include wild plants, animals, insects, honey, seeds, nuts, while tree foods also include those domesticated and found on farms, in home garden or in the fields.

Similarly, Subhadhira et al. (1987) defines forest dependency as the extent to which households depend upon the full range of forestland resources for their consumption needs. In this context consumption includes food, fuel wood, building materials, medicinal needs and the income produced from the sale of these items.

This study adopted Poffenberger (1990)' definition of forest dependency as a total volume or

percentage of annual household consumption needs obtained from the forest resources and products cultivated and harvested from forestlands.

2.5 Forest Dependency Based on Past Research Works

The importance of the forest in the survival life of the rural people in the developing countries is enormous. The forests provide the goods and services. The goods refer to the woody products obtained from the trunks of the trees; the products derived from other part of the trees (such as fruits, leaves, pharmaceutical products etc.); and also from other components of the forest community. These goods are essential to the household and community in meeting their basic needs. In addition, forests and forest products also generate income and employment opportunity in the rural community. Some traditional aboriginal communities are heavily dependent on the forests for their living. The disappearance or even disturbance of the forest environment may cause the destruction of these societies (Manivong, 1996).

Forests provide a substantial important supply of animal and plant foods, especially during the seasonal and emergency shortages of rice, with forest animals providing the predominant sources of animal protein year round in many rural communities. Forests are also the primary source of fuelwood and materials used for construction, implements, and handicrafts; as well as a source of medicinal plants and animals, and supplementary household income (de Beer et al., 1994).

Besides, providing foods, fuelwoods, building materials, medicinal plants and animals; forest products for cash income of the rural households, forests also provide forestlands for subsistence farming of the rural people. For example, in many mountainous areas of northern Vietnam, forests and forestlands are central resources for the livelihood and subsistence of villagers. People rely on forestlands for cultivation, and depend on forest and tree products not only for cash income, and for food security, but also for many of their basic needs such as for house construction, tools production, fuelwood, and medicine (Nguyen Thi Yen et al., 1994).

Moreover, in many rural food systems, forests and forestlands are of critical importance to food security at the household level. Since, the agricultural land for paddy rice is very limited, and in the mountainous districts, people rely on shifting cultivation in the forestland for major staple foods such as upland rice, maize or cassava. Therefore, farmers suffer difficulties from reducing area of forest, and increase in population, and food shortages, because agricultural land for paddy rice is very limited, the farmers have to depend on shifting cultivation of the hill rice or cassava (Nguyen Thi Yen et al., 1994). Villagers living close to the forest always depend on forest for foods and other forest products for incomes and food security. The government policy of closing the forest has affected both incomes from the forest and food security of the villagers (Saowakhontha Sastri et al., 1994).

Results of the study on dependency on forest and tree products for food security in Vietnam show that all households made some use of forest products to improve the quality of the diet, poor households used many foods directly for consumption, while better off households tended to gather and sell more valuable products. The research identified that the nature of dependency on forest and tree products for food security among Dao people in the community in Yen Huong is such that people depend on forestlands for food production and depend on forest products to improve diet quality and during food shortage periods. With the increased population pressure, the forestland is seriously degraded and the food insecurity is becoming worse. To meet the households' demands, emphasis needs to be placed on increased production in agricultural land in the area, in home gardens through agro-forestry and sustainable farming systems on the hills surrounding the villages, with a focus on ways to raise income and purchasing power (Nguyen Thi Yen et al., 1994).

While, studying forest dependency and forest use of Karen people in Thailand, Jin Sato (2000) developed two indicators to capture forest dependency namely (1) Income dependency is the percentage and amount of income that people obtain from selling forest products. He said, "It is important to note that we measure the relative proportion of income derived from forests. When one villager derives all his income from forests, whereas another derives only 50%, we can say that the former is more dependent on forests even though the two may have an identical income in absolute terms"; (2) livelihood dependency is measured by the variety and intensity of the product consumption in terms of food obtained in each meal. Direct use of forest

resources requires labour investment and must therefore reflect the importance attached to the activity by villagers. His two indicators to capture the forest dependency are almost consistent with the three kinds of nature of forest dependency defined by Arnold (1992). But, only he lacks dependency for inputs into the households production system. The results of this study indicate that the amount of the land under cultivation is strongly correlated with income dependency. The author's hypothesis was that, because the busiest time for planting and weeding with the bamboo harvest seasons, those with large land holdings cannot afford to allocate labour for obtaining forest resources. It was concluded that in terms of income dependency based on the amount of the land, less wealthy families tend to depend more on forest products (i.e. bamboo shoots).

Gunatilake (1998) did another study on forest dependency in his study on "The role of rural development in protecting tropical rainforests: evidence from Sri Lanka": a case study of Knuckles and Sinharaja. Results of his study showed that more off-farm and non-forestry employment, higher agricultural income, higher agricultural productivity, better education, and possibly the better access to the outside markets enhances biodiversity protection through the reduction of dependency on forest resources.

2.5.1 Nature of Forest Dependency

In general, the forest dependency demand on forests of the rural people is mainly for forest products and materials, and for food security. The nature of the dependency brought about by attempts to meet these demands may be broadly grouped into three kinds: (1) direct usage by the household for subsistence such as, food, medicinal plants, and animals, and other household materials; (2) source of income and employment; (3) and inputs into the household production system (Arnold, 1992).

2.5.2 Dependency for subsistence

Rural people live for a long time with the forests and have a long tradition of using products from the trees and forests. Their entire livelihood relates to the forests and forest use. In remote areas, where infrastructure development is still poor in many developing countries, there are a great number of people who remain heavily dependent on the forest for a critical portion of their food supplies.

There are between 140 - 200 million tribal people still living in or on the edges of tropical forests (Hafner, 1990, cited by Manivong K., 1996). These tribal communities are at different stages of economic development. Many of these people still live in isolation in a primitive way of life; some are at the food gathering and hunting stage with limited contact with the outside world, some are at the subsistence agricultural stage, who generally live near the urban center. Among them, the biggest group is the subsistence shifting cultivators, who are widely spread in the most forested areas of many countries. The intensity of shifting cultivation varies with the changing conditions of forest cover, rainfall, topography, density of population and accessibility. Tribal people as well as other rural communities depend primarily on the shifting cultivation system for their subsistence, in poor developed infrastructure areas, but where good infrastructure is developed they may marginally or partially depend on it. With increased population pressure these agriculture lands have become scarce, and the people have continued to rely on forestlands for agriculture, resulting in its serious degradation. This intensified pressure on the nearby land, coupled with failures in agricultural production due to prolonged droughts, pest and insect attacks, and other natural calamities, force rural people especially the landless and marginal farmers to increasingly depend on forests for their subsistence. In such a situation with low productivity in agriculture, non-timber forest products (NTFPs) have become important for their sustenance.

2.5.3 Dependency for income and employment

As, the income from farming is reduced; a change in occupational patterns takes place. Rural people whose education is generally low may find difficulty in getting good jobs in urban areas or employment in the area. Since local supplies of forest products are the principal sources of foods, materials, pharmaceutical products, and other products for household usage, and since in many areas, harvesting and distribution of those forest products are an important income-generating activity, most of the rural people increasingly turn to

depend on forest and forestlands. Forests contribute indirectly to household food security, through the generation of income and employment from the sale and exchange of the gathered and processed forest products such as fuelwood, rattan, bamboo and fibres. Forests provide the raw materials for many small-scale rural enterprises such as wood for furniture and implement making. In addition, fuelwood provides the main energy and raw materials for many other small-scale processing enterprises such as fish-smoking, charcoal production, and beer-brewing (Falconer and Arnold, 1991).

Forest products play an important role in generating income and employment among the rural poor. There is a wide range of forest products which rural people gather, produce and trade in order to derive income. Nowadays, million of rural people depend on money earned from gathering, processing and selling forest products to buy food and other necessities (FAO, 1989). The total volume and value of those commodities is extremely difficult to quantify, but they provide substantial income and employment, and are important not only for domestic economies of any community, and households, but also recognized as an important source of national foreign exchange earnings. Together with the growth of employment in commercial forestry, there has been a rapid increase in employment in the supplying of fuelwood and charcoal to urban market (Arnold 1978, cited by FAO, 1987). The collection of industrial products like resinous products and tannin content products, and the extraction of bamboo and rattan for sale to cottage industries, also generate job for rural people. With the existing local knowledge and basic skill of rural people, handicraft making such as baskets, weaving, mat making, wood carving, making ornamental items, and many other handicraft products by using forest products, has been well known as an occupation of rural people in many countries (FAO, 1986)

2.5.4 Dependency for inputs into the household production system

Forests, besides providing environmental stability to continued agriculture production, are an important input into the agricultural production system as a source of fodder, nutrients, and pesticides to a certain extent. They also offer a good site for growing many species of agricultural crops as well as important grazing land for livestock of rural people. Livestock is central to many agricultural systems as a source of draught power, to provide manure as a soil nutrient and for dairy production. Forests, forestland and areas of scrub are often the principal complementary source and arboreal fodder, which is often the main source of livestock feed in the dry season in the period of drought. This is particularly important in place where livestock are raised naturally (Arnold, 1992). In Laos, buffaloes, cattle, goats and even pigs are often left to graze or feed inside the forest, because of free-range animal husbandry. Besides, providing animal feeds, many plant species are used by farmers as green manure to fertilize their fields. Foliage and branches contain a large proportion of nutrient pool in vegetation. The higher nutrient concentrations are found in the tissues of these parts than in the wood (Waring and Schlesinger, 1985). Many forest trees are also known to be excellent sources of insecticides. The application of insecticides prepared from the leaves of some plant species (e.g. neem tree) is widely accepted as an environmentally sound practice in many countries. In addition to providing animal feeds, fertilizers, and pesticides, forests also provide diverse materials used for different purposes of the rural household production system (e.g. materials for the construction of granary, animals' sheds, fence around the farming plot, cattle and buffaloes stables, farming hut, and tools, instruments, and implements used for production purposes, etc.). In this case study, only the value of materials and crop seeds used for the rural household production purposes was estimated by the researcher as the forest dependency for inputs. The value of cropping lands, grazing areas, and fodder, which are provided by forests, and green manure used for fertilizing were not included, because of difficulty in valuing them.

3.0 RESEARCH METHODOLOGY

3.1 Conceptual Framework

The dependency of the rural community on the forest resources, through utilization of forest products namely timber and non-timber forest products (TFPs and NTFPs), and products cultivated and harvested from

forestlands (CFLPs), can be conceptually considered in many aspects. However, in this case study the main focus was placed on socio-economic factors (Figure 1). This conceptual framework illustrated here, is composed of three main components namely (1) socio-economic factors, (2) forest resources dependency of the rural community through utilization of the three types of products (TFPs , NTFPs & CFLPs); (3) expected outputs of the study. The socioeconomic factors in this case study act as “*Stimulus*” or independent variables. While, forest resources dependency plays a role of “*Response*” or dependent variable. Conclusively, this study looked at the effect of the socio-economic factors on the forest dependency of the rural community.

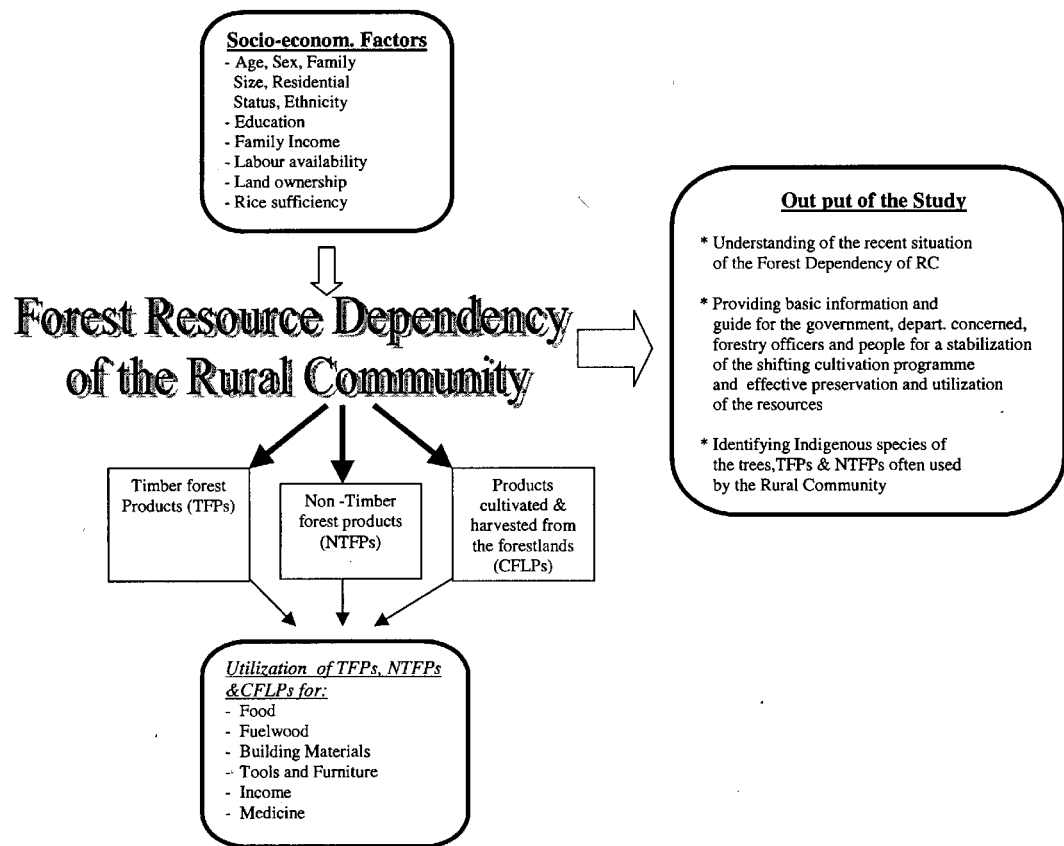


Figure 1 Conceptual Framework of Forest Resources Dependency of the Rural Community

3.2 Research Method

The research method has the following steps:

3.2.1 Selection of the Study Site

The study villages were selected based on some criteria such as being a rural community and inhabited by forest dwellers and shifting cultivators. Twelve villages of the total 20 villages with the population of 2,897, in Nam Nhou and Nam Choam areas of Bokeo province were selected as study sites. Five ethnic groups namely Lao loun, Khamou, Mhong, Ikor, and Kouï were found in these 12 villages.

3.2.2 Selection of Respondents

A stratified-systematic random sampling with a random interval of $k = 3$ has been used in selection of respondents. It means that one respondent (family) at random start, was selected at first and others respondents or families have sequentially been selected after every three respondents from the random start number or list provided by the headman. The selection process was continued until a sample size required of not more or equal to 100 respondents ($n \leq 100$) of was obtained.. This sample size is large enough to be a representative of the population size of 410 households.

3.2.3 Selection of Enumerators

The enumerators were chosen based on the following criteria:(1) familiarity with the villagers and local conditions in the study areas (2) good interpersonal communication skills and working experience and (3) good understanding the needs and requirement of the study. Three enumerators were selected, who have different work experience in fields such as forestry; agriculture and livestock; and health and nutrition. They were given training on the information and objective of the survey, and data collection and on the procedure of respondents' selection, and interview. The researcher closely supervised the work of the enumerators.

3.2.4 Preparation of Questionnaire

Two sets of questionnaire (Appendixes 1 & 2) were designed to solicit information from the sample families (households). The first set covers: (1) socio-economic information, (2) respondent's dependency on forest resources, and (3) factors contributing to forest dependency. The other set of questionnaire was designed to solicit information regarding the village profile, through group discussions using Participatory Rural Appraisal Approach (PRAA) or rural survey technique.

3.2.5 Questionnaire Pre-testing

The questionnaire was used to gather information from respondents. In order to make sure the questionnaire is valid, reliable and acceptable to the respondents, pre-esting of the questionnaire was carried out in two villages: Ban Houaidokthong and Ban Sayphathana. Twenty respondents were randomly selected and interviewed for pre-testing, and then they were excluded from the sample. Necessary changes were made on the original questionnaire.

3.2.6 Data Collection

Data collection was conducted since the mid of October 2000 until the beginning of January 2001. The data were gathered from both primary and secondary sources. The primary data were obtained using a number of socio-economic survey techniques including formal interviews with respondents, informal interviews, group discussions and direct observation at the village level. Secondary data were gathered from various related organizations: government and non-government, for example, District Agriculture and Forestry Service of Houai Xai; Agriculture and Forestry Department of Bokeo province, Rural development projects in Bokeo province, Central Department of Forestry in Vientiane, FAO, UNDP, and Ministry of Agriculture and Forestry of Laos.

3.2.7 Formal Interview

After the selection of respondents had been made, an appointment with each respondent was set up at a particular time and date. Interviews took place in individual respondent's house in order to avoid any influence from the predominant people in the village. For the first two villages, the researcher carried out the formal interview to make sure enumerators understood well the process of the interview. Then the interviewers were divided into two sub-groups to enable the interview process to proceed more easily and quickly.

3.2.8 Informal interview (individual or group discussion)

Informal interview was also done by the researcher to obtain further information from other informants like Village Development Committee (VDC) members and Village Administrative Committee (VAC) members, Women's Union (WU), etc. During the data collection, the researcher had a good opportunity in every study village to personally discuss with the headman or deputy and village forester and other people about their livelihood in general, and forest use in particular. All information was recorded in writing.

3.2.9. Direct observation

Direct observation was a useful way to evaluate the forest resources utilization of the village. It enabled the researcher and his enumerators to obtain information more accurately and precisely. During the formal interview, the researcher had the opportunity to personally visit several houses in many villages, and it was observed that most houses were constructed using local materials such as timber, sawn wood, bamboo, rattan, imperata grass (*Imperata cylindrica*), rattan leaves, and palm leaves for roofing. In addition, many families have a lot of sawn wood or timber collected under their house for permanent house construction in the near future. Meanwhile a significant portion of forest foods (e.g. palm fruits, bamboo shoots, rattan shoots, fishes, birds, and other species of wildlife) was found in daily meals of rural community family. It could serve as evident of the fact that rural people are dependent more on forest resources for their survival.

3.3 Operational Definition of Variables and their Measurement

3.3.1 Independent Variables

An independent variable is a variable, which is manipulated, measured, and selected by researchers in order to observe their relation to the subject's "response" or some other observed variable (i.e. dependent variable). An independent variable, then is, a variable that is employed to influence some other variables; it is antecedent condition to observe the behavior. In this case study, ten independent variables, which are considered to influence the dependent variable "*forest dependency*" are described as follows:

3.3.2 Family size

Family size refers to the actual total number of members of a respondent's family. The family size was categorized into 2 groups: small and big families. Those who have six family members and less than that would be considered as a small family, while more than six members would be a big family.

3.3.3 Education

Education refers to the literacy status of the respondents. A respondent who cannot read and write was considered as illiterate respondent, while the literate are those who have a capability at least to read and write. The educational attainment of the respondents is based on their number of schooling years. Basically, for the purpose of analysis, it was divided into 4 levels in this case, such as (1) literacy course (2) primary school (3) secondary school and (4) senior high school. Then they were measured by a ratio between educated and non-educated members of the family.

3.3.4 Family income, Family income from non-forestry activities

Family income refers to the amount of cash earned (in Lao Kip) by the family from various sources during a year. The family income could be derived from forest-based activities, agriculture, livestock,

aquaculture, off-farm activities, and non-forestry activities.

Family income from non-forestry activities refers to a part of the total annual family income earned from such activity like livestock, aquaculture, labour wage, small villager enterprises, and other off-farm and non-forestry activities.

3.35 Labour availability, Land ownership, Land allocation

Labour availability refers to the available number of full-time and part-time laborers, engaging in farm, off-farm and forest-based activities of the family. Family members, studying and elder members are considered part-time labourers. For the purpose of analysis, the actual number of respondent family laborers was taken into consideration.

Land ownership refers to the land or forestland holding in hectares of rural community (respondents) to produce rice and other crops, which have been allocated either by government under rules or regulations concerning land tenure and land allocation, or cleared by the family itself, or legal inheritance.

Land allocation refers to the distribution of forestlands to the villagers, so that they would have enough land for their permanent rice and other crop plantation. In the study site, the land allocation took place in the second 6 villages (from Phonhphay to Nammiang) of the Nam Choam area only. Whereas, the first 6 villages (from Houaidoktong to Sinxay villages) of the Nam Nhou area, the land allocation did not yet take place. For the purpose of regression analysis, a dummy variable (X) was created and coded by X = 1, for the family, which belongs to the village where the land allocation took place, and by X = 0, for the family, which belongs to the village where the land allocation did not take place.

3.3.6 Rice Sufficiency

Rice sufficiency refers to the condition in which the households or family can produce enough rice from either shifting cultivation or paddy field cultivation to support annual household needs. In this case study, rice sufficiency was considered, as a number of months per year during which the rice production could sufficiently support the household consumption. It was calculated based on the annual rice consumption rate determined as 350 kg of non-husked sticky rice per person per year for adults and 175 kg per person for children, below 10 years of age (Anon., 1993). The rice sufficiency was determined by the following formula:

$$C_{month} = \frac{Q_1 + Q_2}{12} \quad (1), \text{ and } S_{rice} = \frac{P_{rice}}{C_{month}} \quad (2)$$

We substitute equation (1) to (2), and obtain equation (3)

$$S_{rice} = \frac{P_{rice}}{Q_1 + Q_2} * 12 \quad (3)$$

Where:

C_{month} - Monthly family rice consumption need

Q_1 - Total quantity of the rice consumption need of adults in family per year

Q_2 - Total quantity of the rice consumption need of children below 10 years of age, in family per year.

12 - Number of the months in a year

P_{rice} - Total rice production of the family per year

S_{rice} - Rice Sufficiency

3.4 Dependent variable: Forest Dependency

Forest Dependency is defined as a percentage of annual households consumption needs, incorporating the needs for subsistence, income and employment, and for input into household production system, obtained from the forest resources and the products cultivated and harvested from forestland (products from shifting cultivation). The forest dependency was calculated using the mathematical formula shown below:

$$D_i = \frac{\sum_{j=1}^m V_j}{\sum_{j=1}^m V'_j} \quad (4)$$

Where: D_i – Forest dependency of studied rural community families i

$\sum_{j=1}^m V_j$ - Total value of forest products (TFPs & NTFPs), and products cultivated and harvested from forestland (CFLPs), annually utilized and consumed by studied rural community families i.

$\sum_{j=1}^m V'_j$ - Total value of all products and incomes from all sources annually utilized and consumed by studied rural community families i.

$i = \{ 1, 2, 3, 4, \dots, 100 \}$ – sample size (n)

$j = \{ 1, 2, 3, 4 \}$ – Products (TFPs, NTFPs, CFLPs, and Products from non-forestry activities)

All value of products were estimated by multiplying the unit price of the products by their total quantity, and using formula (5) as denoted below:

$$V_j = P_j * Q_j \quad (5)$$

Where: V_j – The total value of products j

P_j – The unit price of products j

Q_j – The total quantity of products j

To assess the forest dependency of the rural community, it is necessary to know the quantity utilized of the various timber and non-timber forest products (TFPs & NTFPs) and products cultivated and harvested

from the forestlands (CFLPs) as well as their value. This assessment was carried out on the basis of the annual utilization of three types of the above-said products by the rural community, and three kinds of nature of forest resources dependency namely: (1) dependency for subsistence; (2) dependency for inputs into household production system; and (3) dependency for income and employment. The quantity of products utilized was measured due to their heterogeneity by kilogram, liters, cubic meters, pieces, canes, and sheets as an indication of their volume or quantity, and ultimately valued in monetary terms based on the local market price at forest and farm gates.

3.4.1 Purposes of Products (TFPs, NTFPs & CFLPs) Utilization

Utilization of forest products (TFPS & NTFPs) and products cultivated and harvested from forestland (CFLPs) were categorized into six types: (1) Food, (2) Fuelwood, (3) building materials, (4) tools and furniture, (5) income, and (6) medicine.

3.4.2 Food

Food refers to wild plants, useable weeds, fungi, and their edible roots, tubers, bulbs, leaves, shoots, flowers, fruits, seeds, edible fats and oils, spices and flavorings, vegetables, wild animals including fishes, etc. These foods were collected by the rural people, from the forests, and harvested from forestlands to meet their household daily consumption needs, add variety to diets, improve palatability, and provide essential vitamins, proteins and calories for the rural family (Arnold, 1992). For the purpose of analysis, the quantity of the forest products (TFPs & NTFPs), and products from shifting cultivation falling into food category, annually collected/harvested and consumed by the rural people, was determined. These foods were measured in kilograms and valued in monetary terms based on the local market price.

3.4.3 Fuelwood

Fuelwood refers to dead stems, branches, roots, barks, and leaves of trees, timber, plants, bamboo and climbers collected from the forest used for warmth, cooking, and preparing food for animal feeding. It was measured in kilograms and valued in monetary terms based on the local market price.

3.4.4 Building materials

Building materials refer to all materials derived from forests such as timber and non-timber forest products (TFPs & NTFPs) used by the rural people for mainly construction of living house, granary and animal sheds, stables, farming huts and fence around the farmland and home garden. These materials were measured in cubic meters or pieces according to their heterogeneity and valued in monetary terms based on the local market price.

3.4.5 Tools & Furniture

Tools and furniture refer to all materials derived from forests used by the rural people for tools and furniture production. They were measured in pieces or units, and valued in monetary terms based on the local market price.

3.4.6 Income

Income refers to the cash earned from the sale of forest products such as timber and non-timber forest products (TFPs & NTFPs) and products cultivated and harvested from forestland (CFLPs), which were gathered and produced by the rural people for the market supply in view of generating income. The quantities of those products were measured in kilograms, cubic meters, pieces, liters, sheets, and valued in monetary terms based on the market price.

3.4.7 Medicine

Medicine refers to utilization of the indigenous medicinal plants, herbs, grasses, trees, and animals by the rural people to mainly treat or cure illness of peoples within the community or outside community and sometimes they are sold outside. The quantity of such medicine was measured in kilograms, and valued in monetary terms based on the local market price.

3.5 Categorization of Products for subsistence

Products utilized to meet the household needs of the studied rural communities for a year were categorized into timber forest products (TFPs), non-timber forest products (NTFPs), and products cultivated and harvested from forestland or products from shifting cultivation (CFLPs). A detailed listing of the products was given in Table 13 (Appendix 3).

3.6 Quantity of Products

Based on –previous research, there are two different types of quantities that are of interest: (1) inventory (the stock quantities in the forest), and (2) flow (the quantities actually used by people). Some researchers value the inventory (e.g., Caballero, Teledo, and Argueta 1978; Peters, Gentry, and Mendelsohn 1989; Prance et al., 1987), others the flow (e.g., Schwartzman 1989), and still others value both (e.g., Padoch and de Jong, 1989). For the most purposes, the value of the inventory quantities is a meaningless concept related neither to present nor to sustainable use. The difference between flow and inventory value can be large. For this case study, the author used the flow to determine the quantity of various products (TFPs, NTFPs, and CFLPs) actually extracted from forests and harvested from forestland annually utilized and consumed by the villagers by measuring, weighing and counting them in cubic meters, kilogram, and pieces, sheets, and liters, whichever is appropriate. Products were counted, weighed, and measured as they enter the village each day (e.g., Bergman 1986; Dufour 1983). The detailed quantity of products were presented in Table 15.

3.7 Prices of Products

The prices of three types of products extracted from forests and harvested from forestlands were imputed by villagers based on exchange value and /or use value concept (Chopra, 1993). Specifically, the prices of products were imputed according to the unit prices of each product category and based on the local market prices at the villages, without transportation cost and taxes.

3.8 Data Analysis

The Statistical Packages for the Social Science (SPSS 10.0.1 for Windows–was used for data analysis. Descriptive and frequencies statistics such as mean, standard deviation, maximum, and minimum were applied to present and summarize the data. Meanwhile, the multiple regressions analysis was also applied to test factors affecting forest dependency.

4.0 PROFILE OF THE 12 VILLAGES AND RESPONDENTS

This section describes firstly the background information of 12 villages and their grouping by rice sufficiency and family income, secondly the profile of respondents in the 12 villages.

4.1 Background Information of the 12 Villages

Twelve villages in Nam Nhou and Nam Choam areas, Houai Xai, Bokeo province, have been identified as the study villages. Previously, these 12 villages had different original locations in northern provinces of Lao PDR. The rationale of villages' movement to resettle in the Nam Nhou and Nam Choam areas, was mainly to search agricultural lands, due to the population growth and civil war during 1970 -1975. The movement of the villages gradually occurred at different times. In addition, the shifting cultivation

stabilization program of the government partially convinced many hill tribes to move down from the top of mountains or jungles to resettle along the mountain valley or lowland to be engaged in lowland rice plantation.

4.2 Categorization of 12 Villages on the Rice Sufficiency Basis

Rice sufficiency is one of the important indicators of wealth in the rural areas. According to the respondents' opinion, the rice sufficiency for their family consumption is the top priority need. As a result of analyzing the data from the survey, the 12 villages were categorized into 3 main groups in terms of rice sufficiency (Table 1). It was found that 7 of the 12 villages namely Houadokthong, Thamphabath, Phonhphay, Phouti, Nammiang, Onh, and Tongkrang have a medium rice-sufficiency for 6-11 months per year on the average. Only Namkor Village has a low rice sufficiency of only 4.6 months per family per year. Four villages

(Saychaleunh, Sayphathana, Siliheuang, and Sinhxay) belong to high rice sufficiency category. Rice sufficiency ranges from 11.42 and 52 months per family per year.

Table 1. Villages by rice sufficiency groups

Name of Village	Rice-sufficiency groups		
	Low: 2.05–5.55 (Month/year)	Medium: 6.23–10.97 (Month/year)	High: 11.42–52 (Month/year)
1. Houaidokthong		9.98	
2. Saychaleunh			20.32
3. Sayphathana			12.21
4. Siliheuang			17.81
5. Thamphabath		9.25	
6. Sinhxay			14.77
7. Phonhphay		9.72	
8. Phouti		8.44	
9. Onh		10.87	
10. Tongkrang		10.08	
11. Namkor	4.6		
12. Nammiang		7.13	

4.3 Categorization of 12 Villages on the Annual Family Income Basis

The 12 villages were also categorized into three groups such as low, medium, and high in accordance with their total annual family income. Table 2 indicates that the majority (9) of 12 villages namely Houaidokthong, Saychaleunh, Sayphathana, Thamphabath, Sinhxay, Phonhphay, Phouti, Onh, and Namkor belong to the medium-income group, with income ranging from Kip 1.01 million and Kip 3.93 million per family per year. Only three villages (Siliheuang, Tongkrang, and Nammiang) fall in the high-income group (Kip 4.00 million and Kip 17.45 million.)

Table 2. Villages by annual family income groups

Name of Village	Family income groups		
	Low: 120,000–1,000,000 (Kip)	Medium: 1,010,000–3,933,200 (Kip)	High: 4,000,000–17,450,000 (Kip)
1. Houaidokthong		2,251,866	
2. Saychaleunh		3,241,378	
3. Sayphathana		1,588,756	
4. Siliheuang			4,000,455
5. Thamphabath		1,528,222	
6. Sinhxay		2,975,800	
7. Phonhphay		2,281,753	
8. Phouti		3,640,550	

9. Onh		1,799,172	
10. Tongkrang			4,266,429
11. Namkor		1,903,800	
12. Nammiang			4,955,625

Exchange Rate?

4.4 Collection of Products (TFPs, NTFPs & CFLPs)

The actual survey revealed that both poor and wealthy families carried out collection of forest products in 12 villages since forest products are good sources for food; building materials; and supplementary family income. Usually, the collection of forest products is done year-round. Timber forest products harvesting can be done at any convenient time depending on when do the villagers have a free time or specific time allocated for this activity. Non-timber forest products (NTFPs) are also collected year-round. During the rainy season (May until October) villagers collect wild vegetables, bamboo shoots, rattan shoots, mushrooms, bamboo canes, rattan canes, rattan fruits, cardamom, wild taros, tubers, sugar palm fruits, wild edible fruits, fodder, fuel-wood, palm leaves, rattan leaves, imperata grasses (*Imperata cylindrical*), tiger grasses (*Thysanolaema maxima*), eaglewood (*Aquilaria crassna*), medicinal plants, fibers and damar resin. Fish and other aquatic animals like frogs, shrimps, soft-shelled turtles, crabs and mollusks are also collected during this time. Hunting can be carried out in both rainy and dry seasons while shifting cultivation products or products cultivated and harvested from forestland (CFLPs) are harvested between September and November of every year. During the dry season, the villagers carry out some activities related to forest products collection such as harvesting stand timbers for living house construction, collecting some species of non-timber forest products such as damar resin, bamboo canes, rattan canes, fuelwood, eaglewood (*Aquilaria crassna*), fishing and hunting and some of them have partially created employment opportunity.

4.5 Places of Products (TFPs, NTFPs & CFLPs) Collection

Nam Nhou and Nam Choam are the rural and mountainous areas located about 45-60 km to the northeast of Houaixai city, Bokeo province. There are totally 20 villages of which 12 villages were included in the study site. Ethnic minority groups, who are mostly engaged in the shifting cultivation, populate these villages. In both areas, there is a similar condition in terms of where the villagers collect forest products. The Nam Nhou area includes 6 villages namely Houaidokthong, Saychaleunh, Sayphathana, Siliheuang, Thamphabath, and Sinhxay villages. The collection of forest products of villagers, in the Nam Nhou area, is done in different locations depending on where the products are available (Table 3). Since these villages are surrounded by forests and very close to the forests, the villagers easily get to the forests to collect non-timber forest products and harvest timbers in the village forests or community forests and state owned forests as well. In addition, the villagers also like to go different distances to search for and collect forest products from 0.1 km up to 16 km from the village. Some products that are available from nearby forests include bamboo shoots, rattan shoots, bamboo canes, wild vegetable, stand timbers, and some species of aquatic animal and wildlife. In the Nam Nhou area, there are three main rivers namely Nam Nhou, Nam Houaidokthong, and Nam Phabath, which provide villagers with fish and other aquatic animals. Meanwhile, some villagers like to go to the Nam Toui and Nam Pha areas, although it is quite far from the villages. It takes about 4 to 5 hours of walking or about 12 to 16 km, because of its abundant forests, which could provide villagers with numerous non-timber forest products (NTFPs). Some of these NTFPs have a high value and market demand namely eaglewood (*Aquilaria crassna*), sugar palm fruits, and so on. On the other hand, Nam Toui and Nam Pha rivers are rich in fish and other aquatic animals.

Table 3. Places of products (TFPs, NTFPs, CFLPs) collection in 12 villages

<i>Name of village</i>	<i>Products</i>	<i>Comm. Forest</i>	<i>State-owned Forest</i>	<i>Shifting cultiv. Plot</i>
<u><i>Nam Nhou area</i></u>				
1. Houaidokthong	- Timber forest Products (TFPs)	*	*	0
2. Sayphathana		(0.1-3 km)	(0.1-3 km)	
3. Saychaleunh	- Non-timber forest products (NTFPs)	*	*	0
4. Siliheuang		(0.1-3 km)	Namtoui, Nampha & other places (3–16 km)	
5. Thamphabath	- Products cultiv. & harves. from forestland	0	0	*
6. Sinhxay				(0.05–9 km)
<u><i>Nam Choam area</i></u>				
	- Timber forest Products (TFPs)	*	*	0
		(0.3-8 km)	(0.1-8 km)	
7. Phonhphay	- Non-timber forest products (NTFPs)	*	*	0
8. Phouti		(0.1-8 km)	Namdeua, Nam Ong, Nam Nga, Nam Choam, Namphak, Namtoui, Namkor, Houaichalor, & other places (3–12 km)	
9. Onh				
10. Tongkrang				
11. Namkor				
12. Nammiang				
	- Products cultiv. & harves. from forestland (CFLPs)	0	0	*
				(1–10 km)

Note: (*) Collection of forest products (TFPs & NTFPs) and products cultivated and harvested from forestland (CFLPs) takes place in this location

(0) Collection of forest products (TFPs & NTFPs) and products cultivated and harvested from forestland (CFLPs) does not take place in this location

The other 6 villages (Phonhphay, Phouti, Onh, Tongkrang, Namkor, and Nammiang) in the Nam Choam area have similarly carried out collection of forest products in different locations, depending on where the needed forest products are available. The villagers easily get to the forests (community forests and state – owned forests) surrounding the villages. They are located close to the villages at about 0.1 km up to 8 km, to collect some species of non-timber forest products (NTFPs) and harvest stand timbers as well for their living house construction and for other building materials. They also like to walk long distance to search for and collect more non-timber forest products (NTFPs), not only for subsistence, but also for the market. The Namdeua, Nam Ong, Nam Nga, Nam Choam, Nam Phak, Namtoui, Namkor, and Houaichalor areas located at about 3 km to 12 km from the villages, are the most preferred places for collecting of non-timber forest products, especially eaglewood (*Aquilaria Crassna*), sugar palm fruits, damar resin for the market.

4.6 Existing Land Use in the Study Site

The existing land use of all 12 studied villages can be divided into two main categories (1) primary land use type includes shifting cultivation plot or *hai*, and paddy rice field or *na*, and (2) secondary land use type composes of: (a) home gardens, (b) separate maize and cassava gardens usually characterized by typical farming of the Hmong people, and (c) fish ponds. These types of land use are considered as an integral part of swidden-based system (shifting cultivation) and paddy field rice plantation, since they provide supplementary or additional food sources and complementary support (as diversified sources of cash income generation in both short-term and long-term perspective) for achieving a normal livelihood in the difficult environment of the uplands.

However, the secondary types of land use are distributed proportionally across studied villages

(except for home gardens which are found in all 12 villages). As an example, fish ponds are found in Houaidokthong village, Thamphabath village, Sinhxay village, Phonhphay, village, Phouti village, Onh village, and Nammiang village. Separate cassava and maize gardens are found in Sayphathana, Siliheuang, and Thamphabath villages. In addition, villagers carry out free-range animal husbandry wherein animals are freely released to graze in the forests or in paddy fields and shifting cultivation plots after harvesting the rice. It is implicitly understood that any grassland located close to any person's agricultural land is assumed to be his or her belongings.

Of the various types of land use, the shifting cultivation is predominant, with 73. % of the villagers engaged in it. The six villages in the Nam Choam areas were under the land allocation program of the government since 1999. The six villages in the Nam Nhou area are still in the process of the land allocation but expects to get this process completed in a year's time. After three years of temporary use of land, they will get a land title, which ensures them permanent land tenure right. Usually, paddy fields, shifting cultivation plots, and fishponds of villagers are located close to the village and within the village boundary in the radius of between 0.05 km and 10 km from the village.

4.7 Ethnic Group by Villages

As mentioned earlier, the study site includes 12 villages with different ethnic groups. According to their ethno-linguistic class, culture, and location of settlement, the population in the study site was officially categorized into three main groups namely (1) Lao loun (Lowlanders); (2) Lao theung (uplanders-Khamou); and (3) Lao soung (Highlanders - Mhong; Ikor, Koui, Mosem) (Table 4)

Table 4. Ethnic groups by villages

<i>Name of the Village</i>	<i>No. of Families</i>	<i>No. of Households</i>	<i>Ethnic Group</i>
1. Houaidokthong	32	32	Lao Loum (5), Khamou (27)
2. Saychaleunh	45	40	Lao loun (15) Khamou (25)
3. Sayphathana	52	42	Mhong (30), Ikor (8), Koui (4)
4. Siliheuang	35	32	Ikor (27), Lao loun (5)
5. Thamphabath	64	55	Koui (35) Mosem (15) Lao loun (5)
6. Sinxay	16	15	Khamou (3), Lao loun (12)
7. Phonhphay	62	58	Khamou
8. Phouti	20	18	Khamou
9. Onh	45	43	Khamou
10. Tongkrang	30	24	Khamou
11. Namkor	28	23	Khamou
12. Nammiang	36	28	Khamou
Total:	465	410	

Note: The figures in the parentheses indicate the total number of the particular ethnic group households in the village

4.8 Profile of Respondents

This section describes the socio-economic background of the respondents, which includes family size, ethnicity, education, family income, labour availability, land ownership, and rice sufficiency.

4.8.1 Family Size

In Lao PDR, the right size of family based on the Lao state family planning, is 6 persons, consisting

of father, mother, and four children. However in this case study, the family size was divided into two groups: small and big families. The family with 6 or less members was considered as a small family. While the family possessing more than 6 members was categorized as a big family. The family sizes of respondents ranged from 2 to 17 persons, with an average family size of six members. Majority (61%) of the respondents' family size was small with 6 or less members (Table 5)

Table 5. Respondents by family size

<i>Family size</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Up to 6 persons	61	61
More than 6 persons	39	39
Total:	100	100

4.8.2 Ethnicity

Bokeo province is populated by various ethnic groups and hill tribes namely such as Lao, Leu, Nhuanh, Phouthai, Kalom, Samta, Khamou, Keanh, Laomeat, Leanteanh (Laohouay), Mhong Khao, Mhong Dam, Mhong Lai, Moser Khao, and Moser Dam, Ikor, Koui, Phounoy. In this case study, only five ethnic groups were included in the study site namely (1) Lao loun; (2) Khamou; (3) Mhong; (4) Ikor; and (5) Koui. Majority (62%) of the respondents were Khamou ethnic group. While Lao loun, Mhong, and Koui ethnic groups were found only 9% of each, and Ikor ethnic group 11% (Table 6).

Table 6. Respondents by ethnicity

<i>Ethnicity</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
1. Lao loun	9	9
2. Khamou	62	62
3. Mhong	9	9
4. Ikor	11	11
5. Koui	9	9
Total:	100	100

4.8.3 Education

The educational levels of the respondents in the 12 villages are generally low. It was found that 36% of the respondents were illiterate; 22% were literate through adult literacy programs conducted by the government or other rural development programs; 31% had primary schooling level; only 9% possessed a secondary schooling level; and only 2% were at senior high school level.

Table 7. Respondents by education

<i>Educational level</i>	<i>Number (Person)</i>	<i>Percentage (%)</i>
1. Illiterate	36	36
2. Literacy course	22	22
3. Primary school	31	31
4. Secondary school	9	9
5. Senior high school	2	2
Total:	100	100

4.8.4 Family Income

Annual family income of respondents is obtained mainly from two different sources such as forest-based activities and non-forestry activities. The forest-based activities involve all forms of collecting, harvesting forest products (TFPs & NTFPs), and engaging in a subsistence shifting cultivation. While non-forestry

activities encompass livestock, aquaculture, , labour wage, villager small enterprises, and all forms of off-farm activities. Table 8 shows that the annual income of respondents' families varies from Kip 120,000 to Kip 17.45 million of which the medium family income ranging from Kip 1.01 million to Kip 3.93 million was predominant (51%). The low and high family incomes were found in 25% and 24 % of respondents' families, respectively. Their income ranges from Kip 120,000 to Kip 1 million; and Kip 4 million to Kip 17.45 million, respectively.

Table 8. Respondents by family income

<i>Family income (Kip)</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Low: 120,000–1,000,000	25	25
Medium: 1,010,000–3,933,200	51	51
High: 4,000,000–17,450,000	24	24
Total:	100	100

Exchange rate:

4.8.5 Respondents by Income from Forest-based Activities

Income derived from forest-based activities was separately summarized in order to compare with those obtained from other sources such as livestock, agriculture, off-farm and non-forestry activities. Table 9 shows that the majority (50%) of respondents' families have a medium family forest-based income, whose value ranged between Kip 610,000 and Kip 1.87 million. While low and high respondent family forest-based incomes were found 22% and 28% of the respondents' families, respectively. These incomes hold value of between Kip 120,000– Kip 600,000 and Kip 2. 03 million– Kip 8. 60 million, respectively.

Table 9. Respondents by family income from forest-based activities

<i>Family income from forest – based activities (Kip)</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Low: 120,000–600,000	22	22
Medium: 610,000–1,873,000	50	50
High: 2,036,000– 8,604,000	28	28
Total:	100	100

Exchange rate:

4.8.6 Contribution of Forest-based Activities to total Family Income

Table 11 indicates that the majority (43%) of respondents' families derived most of their income (80.39% - 100%) from forest- based activities. For 25% of the respondents , income from forest-based activities was also substantial at 60% up to 79.43% to the total annual family income. Ten per cent of the respondents earned 50% up to 58. 33% of total family income from the forest while the remaining 22% had 1..39% - 49.55% to their total annual family income derived from the forest. On the average, forest-based income contributes 59. 54% to the total annual family income of respondents; the rest was contributed by non-forestry activities (Table 10).

Table 10. Sources of the total Family Income

<i>Sources of family income</i>	<i>Amount (Kip)</i>	<i>Average (Kip)</i>	<i>Percentage (%)</i>
Income from forest- based activities	170,908,100	1,709,081	59.54
Income from non-forestry activities	116,127,200	1,161,272	40.45
Total:	287,035,300	2,870,353	100

Exchange rate

Table 11. Respondents by contribution of forest-based activities to total family income

<i>Contribution of income from forest-based activities (%)</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Low: 1.39–49.25	22	22
Medium: 50.00–58.33	10	10
High: 60.00–79.43	25	25
Very high: 80.39–100.00	43	43
Total:	100	100

4.8.7 Labour Availability

Labour availability refers to the available number of full-time and part-time labourers engaging in farming activities, as well as off-farm activities. To describe the labour availability, it was categorized into three groups (1) low labour availability (1-2 persons); (2) medium labour availability (3-5 persons); and (3) high labour availability (6 persons and above). Table 12 shows that the majority (54%) of respondents' families have a medium labour availability, and then the low labour availability occupies a second place (42%), a high labour availability was found only 4%.

Table 12. Respondents by labour availability

<i>Labour availability (Person)</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Low: 1-2	42	42
Medium: 3-5	54	54
High: 6 and above	4	4
Total:	100	100

4.8.8 Land Ownership

Land ownership refers to the land holding of respondents used mainly for rice and other crops production. Table 13 shows that the majority (48%) of respondents' families have land in between 1 and 2 hectares. While 32% of respondents families possess land less than 1 hectare; and 20 % of them have land more than 2 hectares.

Table 13. Respondents by land ownership

<i>Land ownership (ha)</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Less than 1	32	32
Between 1 and 2	48	48
More than 2	20	20
Total:	100	100

Usually, agriculture lands or forestlands are very limited in mountainous areas; ethnic minority groups and hill tribe could occupy lands along the riverbank or valley of mountains for their shifting cultivation or other form of land use.

4.8.9 Rice Sufficiency

Rice sufficiency refers to the condition in which the family can have enough rice for family consumption need, from either shifting cultivation or paddy field plantation. Rice sufficiency of the studied respondents' families was categorized into three groups namely (1) low rice-sufficient families (2) medium rice-sufficient families and (3) high rice-sufficient families. Table 14 shows that the medium rice-sufficient respondents' families are predominant (39%) and have rice sufficiency for more than 6 and less than 11 months per year. While low rice-sufficient and high rice-sufficient-families were 27% and 34%, respectively, whose rice sufficiency reached 2.05 to 5.55 months, and 11.42 to 52 months per year (Table 14).

Table 14. Respondents by rice sufficiency

<i>Rice sufficiency (Month)</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Low: 2.05–5.55	27	27
Medium: 6.23–10.97	39	39
High: 11.42–52	34	34
Total:	100	100

5.0 FOREST RESOURCES DEPENDENCY

This section is divided into three parts. The first part described in detail forest resource dependency using three measures, namely: (1) forest dependency for subsistence (2) forest dependency for inputs into the household production system and (3) forest dependency for income and employment. The second part discusses the valuation of the forest dependency, its degree, and its comparison with Gross Domestic Products per capita (GDP) and Poverty Threshold Rate (PTR) of Lao PDR. The third part describes factors influencing forest dependency.

5.1 Quantity of Products (TFPs, NTFPs & CFLPs)

Table 15 shows the total quantity of products (TFPs, NTFPs & CFLPs) annually utilized by the respondents' families by types of products or product categories and species.

Table 15. Quantity of products (TFPs, NTFPs & CFLPs) annually utilized by 100 respondents' families from the 12 villages

<i>No.</i>	<i>Products</i>	<i>Unit</i>	<i>Total quantity</i>
<i>i.</i>	<i>Timber forest products (TFPs)</i>		
1	Timber	m ³	118,02
2	Timber	Piece	22,459
<i>ii.</i>	<i>Non-timber forest products (NTFPs)</i>		
1	Bamboo canes	Cane	26,715
2	Bamboo shoots	Kg	6,529
3	Rattan canes	Cane	2,768
4	Rattan shoots	Kg	2,470
5	Rattan fruits	Kg	2,205
6	Palm fruit	Kg	17,109
7	Leafed thatch	Sheet	20,991

8	Bamboo thatch	Sheet	66,990
9	Eaglewood (scented wood)	Kg	16,907
10	Fiber	Kg	483
11	Damar resin	Kg	5,817
12	Cardamom	Kg	2642
13	Wild vegetable	Kg	2,031
14	Wild fruits	Kg	2,106
15	Honey	Liter	9
16	Spice	Kg	149
17	Fuelwood	Kg	277,650
18	Medicinal plants	Kg	71.8
19	Tiger grass	Kg	335
20	Fish	Kg	1,883
21	Crab	Kg	258
22	Shrimp	Kg	80.9
23	Snail	Kg	585
24	Eel	Kg	11
25	Amphibians	Kg	241
26	Wildlife	Kg	2,977
27	Birds	Kg	446
28	Reptiles	Kg	139
29	Medicinal animal	Kg	10
iii.	<i>Products cultivated and harvested from forestland (CFLPs)</i>		
1	Upland rice	Kg	103,165
2	Maize	Kg	11,887
3	Pumpkin	Kg	2,067.2
4	Cucumber	Kg	6,152.1
5	Chili	Kg	664
6	Eggplant	Kg	764.2
7	Sesame	Kg	204.3
8	Gourd	Kg	468.9
9	Cassava	Kg	14,354
10	Turnip	Kg	405
11	Taro	Kg	230
12	Sweet potato	Kg	1,158
13	Quadrangle bean	Kg	211
14	Long bean	Kg	784
15	Banana	Kg	100
16	Ginger	Kg	190
17	Peanut	Kg	27

Table 15 (Concluded)

5.2 Three Kinds of Nature of Forest Dependency

5.2.1 Forest Dependency for Subsistence

Forest dependency for subsistence refers to all materials and forest products including timber and non-timber, products cultivated and harvested from forestland, and wildlife which were directly used and consumed by the rural people to meet their family sustenance needs for their survival, for example, materials for house construction, fuelwood for cooking warmth and, food for family consumption, and medicinal plants and animals for curing family members, tools and instruments used for subsistence purposes (Table 16). The forest dependency value for subsistence was 54.88% of the total value of all products and incomes from all sources, utilized over a year. It amounted to kip 444.11 million-or equivalent to US\$54,023.24 and kip 4.44 million per family per year or equivalent to US\$540.23. This amount covered 64% (Table 16) of the total value of the forest products (TFPs & NTFPs), and products cultivated and harvested from forestland (CFLPs), annually utilized by the rural community

5.2.2 Forest Dependency for Inputs into the Household Production System

Forest resources used as inputs into the household production system include materials for the construction of granaries, animal sheds, stables (for cattle, buffaloes, goats etc.), fences around the farm land, home gardens, farm hut construction as well as materials, instruments, tools, and agricultural implements used for agricultural production, livestock, and aquaculture. These uses were valued at 9.67% of the total value of all products and incomes from all sources, utilized over a year. It amounted to Kip 78.39 million or US\$9,525.88 with an average of Kip 783,980 or US\$95.25 per family per year (Table 16)

Table 16. Description of forest dependency for subsistence, inputs, income and employment, and total value of forest dependency of 12 villages in Bokeo province, Lao PDR

<i>Description</i>	<i>Sum</i>	<i>Mean</i>	<i>Percentage</i>
*Total value of TFPs, NTFPs & CFLPs, annually utilized for only subsistence (x 200 Kip)	2,223,056.50	22,230.565	64.07
*Total value of TFPs, NTFPs & CFLPs, annually utilized for only inputs (x 200 Kip)	391,990	3,919.90	11.29
*Total value of TFPs, NTFPs & CFLPs, annually utilized for only income & employment (x 200 Kip)	854,540.50	8,545.405	24.62
*Total value of TFPs, NTFPs & CFLPs utilized for subsistence, inputs, and income (x 200 Kip)	3,469,587	34,695.87	100
*Total value of all products and incomes from all sources, annually utilized by the rural community (x 200 Kip)	4,050,223	40,502.23	-
*Forest Dependency for Subsistence (%)	54.88	54.88	-
*Forest Dependency for inputs into the household production system (%)	9.67	9.67	-
*Forest Dependency for income and employment (%)	21.11	21.11	-
*Total value of Forest Dependency (%)	85.66	85.66	-

Note: * n = 100

* Thai Baht was converted into Lao Kip and US\$ at the rate of 200 K/Baht and 8,230 K/US\$

5.2.3 Forest Dependency for Income and Employment

Forest dependency of rural people on forests for income and employment includes all products (TFPs, NTFPs & CFLPs), which were utilized to supply the market demand in order to generate a cash income for the family. The process of supplying such demand could create good employment opportunities for the rural people (Table 16). It was found that the value of forest dependency for income and employment was at 21.11%, amounting to Kip 170.90 million or US\$20,766.47. This amount was 24.62% of the total value of overall products (TFPs, NTFPs & CFLPs) annually utilized. On a per family basis, the average value of such products used for income and employment was Kip 1.70 million per year or US\$207.66.

5.3 Total value of Forest Dependency of the Studied Rural Community (12 Villages) in the Nam Nhou and Nam Choam Areas, Bokeo Province, Lao PDR

The total value of forest dependency of the rural community was determined as the ratio of total value of products (TFPs, NTFPs & CFLPs) annually utilized by the community for subsistence, inputs into household production system, and income and employment, and the total value of all products and incomes obtained from all sources used by the rural community over a year (Formula 4). The value of forest dependency of whole studied community as well as per respondent family was found at 85.66%. It amounted

to Kip 6.93 million or US\$843.15 per family per year. The 12 villages in the Nam Nhou and Nam Choam areas, Bokeo province, Lao PDR are highly dependent on forests for their survival.

5.3.1 Degree of Forest Dependency of the Studied Rural Community

To what degree does the rural community depend on forest resources for their survival? In response to this question, the forest dependency of the rural community was categorized into four degrees such as (1) low (2) medium (3) high and (4) very high (Table 17).

Table 17. Degree of forest dependency of the respondents' families in the 12 villages

<i>Degree of forest dependency (%)</i>	<i>Number (Family)</i>	<i>Percentage (%)</i>
Low: 16-48	3	3
Medium: 51-66	5	5
High: 71-89	25	25
Very high: 90-100	67	67
Total:	100	100

Table 17 shows that the majority (67%) of respondent families have a very high degree of forest dependency ranging from 90% to 100%. A significant number (25%) depend on the forest for 71% to 89% of their total income. A small proportion of respondent families have medium (5%) and low (3%) degree of forest dependency (Table 17). It was found that the majority (67%) of the respondents' families are poor and that they rely very much on the forests.

5.3.2 Comparison of the monetary Value of the Forest Dependency of the 12 villages with Gross Domestic Products per capita (GDP) and the Poverty Threshold Rate (PTR) of Lao PDR

The results of this study show that the forest dependency of the studied rural community is very high at 85.66%. This corresponds to Kip 6.94 million or US\$843 per family per year. On a per capita basis, income from forest resources amounted to US\$138 per year. Income from the forest was slightly higher than the poverty threshold rate of US\$121 (Kongkeo and Syvilay, 2001). This indicates the significant role that the forest plays in alleviating poverty in rural communities of Lao PDR. Income from the forest also comes about to 39% the gross domestic products per capita (GDP) of US\$350 (FAO, 1999).

5.4 Factors Influencing Forest Dependency

Theory and empirical evidence on the socio-economic factors influencing forest dependency have drawn little attention in social science literature in the past. Therefore there is limited prior knowledge on socio-economic determinants of forest dependency and the nature of their impacts. However, there are some related studies. The findings of such studies have been used to develop the hypotheses of this study. Seven socio-economic factors such as (1) family Size, (2) education, (3) family income from non-forestry activities, (4) labour availability, (5) land ownership, (6) land allocation and (7) rice sufficiency were hypothesized to influence the degree of forest dependency. To test these hypotheses, the multiple regressions analysis has been applied to study the effect of independent variables on dependent variable.

Multiple regression analysis is a statistical technique for modeling and investigating the relationship between two or more variables. In this case study, the intention is to investigate the relationship between seven independent variables namely family size, education, family income from non-forestry activities, labour availability, land ownership, land allocation, and rice sufficiency and the dependent variable, –forest dependency (Table 18).

The fitted forest resources dependency model shows an R^2 value of 0.77 indicating that the independent variables included in regression equation explains 77% of the total variation in forest dependency. The F statistic for the overall goodness of fit of model is 43.918, which is significant at $\alpha = 0.01$. Almost all of the variables show the signs expected by the postulated hypothesis, therefore, the results are in harmony with the theory discussed earlier. Family size shows a positive relationship with forest dependency and the relationship is significant at $\alpha = 0.05$. The result indicates that the family having more family members is more dependent on forests since its family consumption needs are higher.

Table 18. Result of forest dependency model for 12 villages in the Nam Nhou and Nam Choam areas, Bokeo province, Lao PDR

<i>Independent Variables</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>t-value</i>	<i>Sig.</i>
- Intercept	0.982	0.027	36.981	0.000 ^b
- Family size	0.007828	0.004	1.942	0.055 ^a
- Education	-0.0003243	0.000	-1.114	0.268
- Family income from non-forestry activities	-0.00001058	0.000	-15.893	0.000 ^b
- Labour Availability	-0.02421	0.008	-3.134	0.002 ^a
- Land Ownership	0.004967	0.011	0.451	0.653
- Land allocation	-0.007271	0.016	-0.450	0.653
- Rice sufficiency	0.0005843	0.001	0.514	0.609

Note: * $R^2 = 0.770$; Adjusted $R^2 = 0.752$; $F = 43.918$; $P = 0.000$

* Dependent variable: Total value of forest dependency (TVFD)

^a Significant at $\alpha = 0.05$ level; ^b Significant at $\alpha = 0.01$ level

Family income from non-forestry activities shows an expected strong, negative-relationship with forest dependency. The relationship is significant at $\alpha = 0.01$. It indicates that the family having a high income from non-forestry activities, loves to move away from forest-based activities for subsistence, and shifting cultivation, because such family likes to diversify its economic activities and has other alternatives to generate cash income and supply its family consumption needs as well. It is consistent with the results of works done in the past by Godoy (1993), Godoy and Bawa (1993), Gunatilake et al., (1993). Labour availability shows a negative relationship to forest dependency. The relationship is significant at $\alpha = 0.05$. The result indicates that the more labourer a family has, the more workers can be assigned to non-forest based activities such as agriculture.

Education, land ownership, land allocation policy dummy, and rice sufficiency are found to be non-significant, indicating that tenure security and access to land –as well as education and rice sufficiency conditions–will have no impact in altering forest resource dependency of the rural communities.

6.0 SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

This final section summarizes the major findings and results of the study, its significance, and conclusion in conjunction with policy implications, limitation of study, as well as recommendations.

6.1 Summary of Major Findings

An unproductive swidden economy, faced with limitation of the agriculture land due to its mountainous region as the case in Nam Nhou and Nam Choam areas, Bokeo province, Laos, has to become

more dependent on forests for its survival. This case study was conducted in 12 villages of Bokeo Province, in order to analyze the forest dependency of upland community. Rapid Rural Appraisal Techniques (RRAT) and structured questionnaire were used to assess the community's socio-economic status and the contribution of forest resources to the community's household economy. A face-to-face interview combined with direct observation and group or individual discussion was used to solicit the information from respondents. The information on the socio-economic situation, profiles of villages and respondents' forest dependency and farming practices from all villages was collected at the village level. The total sample size was 100 households (families) of five ethnic groups (Lao loun, Khamou, Mhong, Ikor, and Kou) out of 410 households in total, but the distribution of sample size was unequal among villages, depending mostly on village size and the percentage of shifting cultivators of the village.

All products cultivated and harvested from forestland (CFLPs) or shifting cultivation products were valued based on the farm gate prices. In collecting information about the quantities of NTFPs extracted over a one year, a list of NTFPs was prepared with the help of key informants, because it was felt that villagers tend to forget and omit some products. The list of NTFPs was used to remind villagers about certain species of products they might not remember. Forest-gate prices were used to value NTFPs.

Forest dependency is the percentage of annual household's income contributed by forest resources for subsistence, income and employment, and for inputs into household production system. Such percentage of the annual household needs is substantial, indicating the importance of the forests to the rural communities of Lao PDR. Using statistical packages for social science (SPSS 10.01 for windowS) in analyzing the data, it was found that forest dependency of the 12 villages in the Nam Nhou and Nam Chaom areas, Bokeo province, Laos, was very high at 85.66% of which 54.88% was dependency for subsistence, 9.67% - dependency for inputs into the household production system, and 21.11% - dependency for income and employment. The majority (67%) of respondent families is poor and has a very high degree of forest dependency value ranging from 90 % to 100% (Table 17). Meanwhile, 25% of respondent families have a high degree of forest dependency value of between 71% and 89%. While the medium and low degree of forest dependency value ranging between 51% -66% and 16% - 48% correspondingly, were found in only 5% and 3% of the respondent families, respectively.

Based on the results of the regression analysis and descriptive statistics' application, the main findings of the study were summarized as follows: (1) the big sized family relies very much on forests than the small sized family; 2) the family having large labour number is less dependent on forests, because such family has an advantage in allocating its labour force into different agricultural and economic activities in lieu of carrying out the forest based-activities. Consequently, such family has more sources of income; and (3) the family having more income from non-forestry activities likes to diversify its economic activities and loves to move away from subsistence forest-based activities such as collecting NTFPs and engaging in the shifting cultivation

6.2 Conclusions

Forests are a major source of goods, materials, and products on which hundred of thousands of rural communities rely. The current situation of the people's livelihood in the rural areas of Laos is dependence on forest resources for their survival. The results of this case study showed that the studied rural community in both Nam Nhou and Nam Choam areas, Bokeo province, are highly dependent (85.66%) on forests for mainly their subsistence, inputs into the household production system, and income and employment. The high forest dependency found in the rural studied community was found not connected with sufficiency in rice production, nor with the household's participation in the land allocation program of the government. The main factor that will reduce dependence on the forest in the greater reliance of the community on non-forest based activities. This finding was consistent with the case study done by Gunatilake (1998) in Sri Lanka, which show that the involvement in non-forestry activities to generate income in rural areas would significantly reduce the forest dependency of the rural community. Thus, availability of government and private sector jobs, self-employment such as small villager enterprise, shop keeping, carpentry, and constructional work would divert people from forest dependent extractive activities.

6.3 Policy Implications

The significance of this study is to provide government policy makers, departments concerned and forestry officials with important information (e.g. the magnitude of forest dependency per capita per year - US\$138, etc.) on the utilization of forest resources by rural people. Results of the study showed that the rural community relies very much on forest resources for its survival. The high dependence of the community on forest resources makes it necessary that the rural people be involved in a participatory sustainable forest management incorporating indigenous forest management practices, which would ensure the sustainable use of the forest resources and forest products availability for the community in long-term period. The government community's forestry policies should focus on the secondary and degraded forests poor people depend on. The government should also ensure that policies concerning the collection of non-timber forest products do not lead to greater over-harvesting of those resources.

Since, the results of the study shows a very high correlation and expected negative strong significant relationship between forest dependency and income from non-forestry activities, it could therefore induce the government policy to be focusing on augmentation of the rural community household's income not only from forest-based activities, but also from promotions of various non-forestry activities such as livestock, agriculture, aquaculture, small scale villager enterprises, constructional work, self-employment, cottage industry, handicraft and other off-farm activities not related to forestry. With this regards, the government of Lao PDR should revise and improve the policy related to the existing rural credit scheme that the Agricultural Promotion Bank (APB) in order to give an opportunity to the poor farmers getting access of this credit scheme so that they would be able to run their non-forestry activities. Presently, poor farmers did not have an access to such rural credit scheme provided by APB, because they do not have any fixed asset to mortgage the bank for borrowing the money. Another difficulty in the getting an access to the rural credit scheme is isolation and remoteness of the rural areas coupled with the dissemination on the credit scheme is still poor to these particular areas. If the APB would provide the poor group of farmers with an access of such credit scheme, so they would consequently be diverted from the forest-based subsistence activities and be able to diversify their own economic and non-forestry activities such as livestock, agriculture production, aquaculture, cottage industry, textile, small scale villagers' enterprises and other off-farm activities. Meanwhile, the APB should provide an appropriate support at the earlier stage of the credit scheme by conducting a necessary training course on the rural credit scheme running and marketing. Simultaneously, the rural development intervention of the government should take place in these particular areas.

6.4 Recommendations for Future Research

To strengthen the value of the research on "forest dependency" the author would like to recommend some points that should be taken into consideration for the future research as follows: (1) Future research should take the biological diversity status of forests into consideration. It includes an abundance of flora and fauna, stand timbers, and non-timber forest products, forest types as well as wildlife, if there is any possibility. In order to assess the economic value of forests and their abundance in terms of plants and animals (e.g. TFPs, NTFPs and wildlife), it is assumed that different biodiversity status of forests would probably yield different effects on forest dependency of rural people; (2) Since this case study was conducted in the mountainous and shifting cultivation regions, the results of this study could probably be replicable in the mountainous regions only. Further studies on forest dependency in other categories of communities such as those with more paddy fields than uplands in Laos are recommended to do in order to see whether or not the results are replicable countrywide as well as in other tropical countries; (3) Valuation of forestlands for the cropping and grazing should be taken into consideration, as far as forestlands contribute significantly to inputs into the households production system.

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