UNIVERSITI PUTRA MALAYSIA

IMPACT OF AGROFORESTRY PRACTICES ON THE SOCIO-ECONOMY AND ENVIRONMENT OF VIENTIANE PROVINCE, LAO PDR

BOUNHEUANG NINCHALEUNE

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2007

IMPACT OF AGROFORESTRY PRACTICES ON THE SOCIO-ECONOMY AND ENVIRONMENT OF VIENTIANE PROVINCE, LAO PDR

By

BOUNHEUANG NINCHALEUNE

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

October 2007

DEDICATION

This endeavour is dedicated to my loved beloved parents - Pho Ma and Mae Phasy Ninchaleune; my beloved wife and children - Khamnang, Bounik, Bikfa and Chanthavisouk Ninchaleune; and my parents-in-law - Phothao Sisavath and Maethao Xay Pouangpadith, who laid my academic career foundation. It is also dedicated to all Ninchaleune and Pouangpadith family members for constant moral support and inspiration.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Chairman: Associate Professor Mohamad Azani Bin Alias, PhD

Faculty: Forestry

In Lao PDR, deforestation is mainly caused by inappropriate logging, and shifting cultivation. These unsustainable agricultural practices and forest utilization have resulted serious natural catastrophe in many parts of the country.

The poverty of the three main ethnic groups namely: Lao Loum (lowlander), Lao Theung (uplander) and Lao Soung (highlander) in the rural areas is directly related to land degradation, limitation of agricultural land and absence of alternative source for cash income. In addition, due to high population growth, this people have encroached into the natural forests to produce the food security. For example, they cleared the forest land areas for practising of shifting cultivation. They also legally and illegally harvested the timber forest products (TFPs), collected the non-timber forest product (NTFPs) and hunted wildlife to generate family income, especially during the rice shortage.

In Vientiane Province, the hill tribes live closer to lowlander through resettlement and land and forest allocation programs of Lao Government. Based on this condition, Vientiane Province is suitable and meaningful for this study. Nine villages were selected to represent the three main ethnic groups.

The three main ethnic groups practice different agricultural practices, and utilize the forest products. The accessibility to the study site is possible through all-weather-road.

The general objectives of this study are to assess the impact of agroforestry practices on socio-economic and environmental of Vientiane Province, Lao PDR. The collection of socio-economic data applied the technique of Rapid Rural Appraisal/Participatory (RRA/PRA). Additionally, the Braun-Blanquet method was used for collecting of vegetation data. The main findings of this study are summarized as follows:

There were differences in paddy rice cultivation, home garden, tree planting, and livestock raising among these three main ethnic groups. The production of upland rice, bananas, papaya, maize, and showed no differences. This indicates that three main ethnic groups had similarly agricultural production. The change in agricultural practices among three main ethnic groups was dependent on the Lao Government Policies. The study also found that most of Lao Theung and Lao Soung (hill tribes) preferred practicing paddy rice cultivation. However, they still lacked capital and labour in changing their

shifting cultivations to paddy rice cultivation. The paddy rice, home garden, agroforestry, and fish pond are considered as good agricultural practices. The result showed that these required relatively smaller size compared to unsustainable practices like shifting cultivation, maize, and grazing land, which are considered to have negative effects to the environment.

The forest utilization in terms of quantity among the three main ethnic groups was difference of timber exploitation, and collecting of NTFPs. As a result, Lao Soung and Lao Theung harvested more TFPs than Lao Loum. However, utilization of bamboo, firewood, and hunting were not different. These indicate that all three main ethnic groups utilized the NTFPs. In the 1-, 5-, and 15-year-old fallows, logged-over and primary forests, 170, 209, 227, 236 and 237 individual species were identified, respectively. These five vegetation types comprised of 1097 species with 909 genera and 376 families. Forty-five of relevés could be differentiated in twelve plant communities. The natural recovery had a greater similarity to primary forests, particularly to logged-over forests with similarity value of 0.429 (42.29%). However, 15-, 5- and 1-year-old fallows have similarity value of 0.399 (39.90%), 0.348 (34.80%), and 0.261 (26.10%), respectively. This indicates that three fallow types have been heavily degraded, and requires long time for its natural recovery.

The result of regression analysis shows that the farmer's income from agro and non-agroforestry activities was affected by AG, EDU, FS, HLB, LS and LEX. The AG, EDU, and LS had relationship with income. However, there

were not statistically significant. The FS, HLB, LEX, AGROD, LLD, LTD and LSD had relationship with farmer's income in both models, which had positively expected sign. Therefore, government should consider these factors such as FS, HLB, LEX, AGROD LLD, LTD and LSD when implementing an agroforestry project to increase farmer's income. The result of the regression analysis of farmer's agricultural production function shows that the farmer's agricultural production function was affected by LAB, CAP, LLD, LTD and LSD. This function also had relationship with LAB, CAP LLD, LTD and LSD in both models, which possessed positively expected sign. Based on this result, the Lao Government should consider LAB, CAP, LLD, LTD and LSD when increasing the agricultural production in this study area. In conclusion, all farmers are in need of financial and technical support to practice permanent agriculture. In responding to this need, Lao government should encourage them by providing financial and technical support. In addition, degraded forestland should be rehabilitated with commercial tree and NTFPs species through technical support of the local authorities.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafa**h**

KESAN AMALAN PERHUTANAN-TANI TERHADAP SOSIAL-EKONOMI DAN PERSEKITARAN DI DAERAH VIENTIANE, LAO PDR

Oleh

BOUNHEUANG NINCHALEUNE

October 2007

Pengerusi: Profesor Madya Mohamad Azani Bin Alias, PhD

Fakulti: Perhutanan

Pada kelazimannya, pengurangan hutan di Lao PDR adalah disebabkan oleh ketidak sesuaian teknik pembalakan dan pertanian pindah. Ketidaklestarian amalan-amalan pertanian dan penggunaan hutan telah menyebabkan masalah alam sekitar yang serius di banyak tempat di dalam negara.

Kemiskinan tiga kumpulan etnik yang utama, iaitu Lao Loum (Penduduk tanah pamah), Lao Theung (Penduduk tanah tinggi) Lao Soung (Penduduk pergunungan) adalah berkait secara terus dengan penyahgredan tanah, keterbatasan tanah pertanian dan ketiadaan sumber kewangan alternatif. Tambahan pula, dengan peningkatan penduduk secara mendadak, mereka telak mencerobohi hutan dara untuk memastikan sumber makanan terjamin. Dalam kejadian sedemikian, mereka menebang dan membersihkan kawasan tanah hutan untuk mengamalkan pertanian pindah. Mereka juga menuai sumber hutan berkayu (TFPs), memungut hasil bukan kayu (NTFPs) dan memburu hidupan liar secara sah dan tidak untuk menambahkan pendapatan keluarga terutamanya apabila bekalan padi tidak mencukupi.

Penduduk bukit tinggal di Wilayah Vientiane berhampiran dengan penduduk tanah pamah melalui program-program penempatan semula dan pembahagian semula tanah dan hutan oleh kerajaan Lao. Oleh itu Vientiane merupakan satu kawasan kajian yang amat sesuai dan bermakna bagi kajian ini. Sebanyak sembilan perkampungan telah dipilih sebagai sampel dalam kajian ini. Perkampungan dalam kajian ini menggambarkan ketiga-tiga kumpulan etnik utama ini yang mempunyai perbezaan dalam kegiatan pertanian dan penggunaan produk hutan. Kawasan kajian ini adalah mudah dihubungi melalui jalan yang sedia ada dapat diakses sepanjang tahun dalam semua keadaan cuaca.

Secara amnya objektif kajian ini adalah untuk menilai impak amalan perhutanan tani ke atas sosio-ekonomi dan aspek-aspek persekitaran di wilayah Vientiane, Lao PDR. Pengumpulan data sosial-ekonomi adalah menggunakan teknik Rapid Rural Appraisal/Participatory (RRA/PRA). Manakala, kaedah Braun-Blanquet digunakan untuk mengumpul data vegetasi. Berdasarkan pada hasil kajian, penemuan utama telah diringkaskan seperti berikut:

Terdapat perbezaan di antara tiga kumpulan etnik utama dalam penanaman padi, tanaman halaman, pokok tanaman, dan pemeliharaan ternakan. Manakala, pengeluaran padi bukit, pisang, betik, jagung dan sayur-sayuran di tanah tinggi tidak menunjukkan perbezaan. Ini menunjukkan ketiga-tiga kumpulan etnik mempunyai pengeluaran pertanian yang hampir sama. Perubahan corak penggunaan tanah dikalangan ketiga-tiga kumpulan etnik

utama ini bergantung kepada dasar kerajaan Lao. Kajian ini mendapati kebanyakan Lao Theung dan Lao Soung lebih gemar mengamalkan penanaman padi. Walau bagaimanapun, mereka masih kekurangan modal dan tenaga buruh untuk bertukar dari pertanian pindah kepada penanaman padi. Penanaman padi, tanaman halaman, hutan tani dan pemeliharaan ikan kolam telah dikenalpasti sebagai amalan pertanian baik. Keputusan menunjukkan amalan ini memerlukan saiz tanah yang lebih kecil secara relatifnya berbanding kepada amalan yang tidak lestari seperti pertanian pindah, penanaman jagung dan padang ragut. Amalan-amalan ini dikenalpasti mempunyai kesan buruk terhadap persekitaran.

Terdapat perbezaan dalam penggunaan hutan dari segi kuantiti di antara ketiga-tiga kumpulan etnik dalam penggunaan kayu dan mengutip hasil bukan kayu. Keputusan menunjukkan Lao Soung dan Lao Theung menuai lebih banyak sumber kayu daripada Lao Loum. Walau bagaimanapun, tiada perbezaan di antara kumpulan etnik dalam penggunaan buluh, kayu api dan memburu. Ini menunjukklan ketiga-tiga kumpulan etnik menggunakan sumber bukan kayu. Sebanyak 170, 209, 227, 236 dan 237 spesies telah dikenalpasti terdapat di dalam tanah rang 1 tahun, 5 tahun, 15 tahun, hutan yang sudah dibalak dan hutan primer. Kelima-lima jenis vegetasi mengandungi 1097 spesis yang tergolong dalam 909 genus dan 376 famili. Empat puluh lima sampel vegetasi boleh dibahagi kepada dua belas komuniti tumbuhan. Keputusan menunjukkan pemulihan semulajadi mempunyai persamaan yang lebih dekat dengan hutan primer, terutamanya pada masing-masing hutan yang sudah dibalak dengan nilai persamaan 0.429

(42.29%). Walau bagaimanapun, 15 tahun, 5 tahun dan 1 tahun tanah rang dedah masing-masing mempunyai nilai persamaan iaitu 0.399 (39.90%), 0.348 (34.80%), dan 0.261 (26.10%). Ini menunjukkan tiga jenis tanah rang dedah ini mempunyai tahap kerosakan yang tinggi dan memerlukan masa yang lama untuk pemulihan secara semulajadi.

Keputusan analisis regresi menunjukkan pendapatan para petani daripada kegiatan aktiviti perhutanan tani dan bukan perhutanan tani telah dipengaruhi oleh faktor AG, EDU, FS, HLB, LS dan LEX. Faktor-Faktor AG, EDU, dan LS adalah berhubung kait dengan pendapatan tetapi tidak ketara dari segi statistik. Dalam kedua-dua model, faktor FS, HLB, LEX, AGROD, LLD, LTD dan LSD mempunyai hubung kait yang positif dengan pendapatan para petani. Oleh itu, kerajaan haruslah mengambil kira faktor-faktor seperti, FS, HLB, LEX, AGROD LLD, LTD dan LSD apabila melaksanakan projek perhutanan tani untuk meningkatkan pendapatan para petani. Keputusan analisis regresi bagi fungsi pengeluaran pertanian menunjukkan fungsi ini adalah dipengaruhi faktor-faktor LAB, CAP, LLD, LTD dan LSD. Fungsi ini juga mempunyai hubung kait secara positif dengan LAB, CAP LLD, LTD dan LSD di dalam kedua-dua model. Berdasarkan keputusan ini, dalam kajian meningkatkan pengeluaran pertanian kerajaan Lao haruslah mengambil kira faktor LAB, CAP, LLD, LTD dan LSD. Kesimpulannya, kesemua petani ini memerlukan sumber kewangan dan bantuan teknikal untuk mengamalkan pertanian tetap. Kerajaan Lao haruslah memberi galakan kepada mereka dengan menyediakan bantuan kewangan dan juga teknikal. Tambahan pula, kawasan tanah hutan yang telah dinyahgred haruslah dipulihkan dengan

spesis pokok komersial dan spesis tumbuhan bukan kayu dengan bantuan teknikal daripada pihak berkuasa tempatan.

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First of all, I would like to express my heartfelt gratitude and my most sincere appreciation to the chairman of my supervisory committee, Associate Professor Dr. Mohamad Azani Bin Alias, for his helpful and valuable advice, comments, guidance and encouragement throughout the process of my research study at UPM.

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I certify that an Examination Committee has met on 2nd October 2007 to conduct the final examination of Bounheuang Ninchaleune on his Doctor of Philosophy thesis entitled "Impact of Agroforestry Practices on the Socio-Economy and Environment of Vientiane Province, Lao PDR" in accordance with University Pertanian Malaysia (Higher Degree) Act 1980 and University Pertanian Malaysia (Higher Degree) Regulation 1981. The Committee recommends that the student be awarded the degree of Doctor of Philosophy.

Members of the Examination Committee were as follows:

Azmy Mohamed, PhD
Associate Professor
Faculty of Forestry
University Putra Malaysia
(Chairman)

Anuar Abd Rahim, PhD
Associate Professor
Faculty of Agriculture
University Putra Malaysia
(Internal Examiner)

Mohd Zaki HAmzah, PhD
Associate Professor
Faculty of Forestry
University Putra Malaysia
(Internal Examiner)

Khairulmaini Osman Salleh, PhD
Professor
Faculty of Art and Social Science
University Malaya
(External Examiner)

_____
HASANAH MOHD. GHAZALI, PhD
Professor and Deputy Dean
School and Graduate Studies
University Putra Malaysia

Date: 21st February 2008

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Mohamad Azani Alias, PhD
Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Chairman)

Dato' Nik Muhamad Abd. Majid, PhD
Professor
Faculty of Forestry
Universiti Putra Malaysia
(Member)

Awang Noor Abd. Ghani, PhD
Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Member)

Ismail Adnan Bin Abd. Malek, M.Sc.
Lecturer
Faculty of Forestry
Universiti Putra Malaysia
(Member)

AINI IDERIS, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 21st February 2008

DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

BOUNHEUANG NINCHALEUNE

Date: 2nd October 2007

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