「国際研究発信力強化プログラム・リサーチ C&M 成果報告シリーズ」

刊行にあたって

本書は、京都大学学際融合教育研究推進センター・総合地域研究ユニット・臨地教育支援センターが実施している「国際研究発信力強化プログラム・リサーチ C&M」プログラムの成果です。このプログラムは、専攻、講座、学年の枠を越えた複数名の大学院生が、ひとつのグループを組織し、分野、地域を横断する大きな研究テーマを設定して研究することにより、各自の研究課題をより大きな文脈のなかに位置づけ、比較の視点をもちながら研究を実施することを目的としています。海外提携大学の大学院生や若手研究者と国際共同研究をおこない、国内外で研究集会を組織・運営すること、さらに、最終的な研究成果を報告書として編集し、発信する作業すべてを、アドバイザーとなる教員と臨地教育支援センターのサポートのもとで、大学院生が主体的に実施しています。こうした経験をとおして、高度な研究能力とともに、高度なコミュニケーション能力の研鑽を目指しています。

なお、「国際研究発信力強化プログラム・リサーチ C&M」プログラムの実施、および、本報告書の刊行は、平成 25 年度 京都大学全学経費「アフリカ・アジア相互理解のための臨地研究事業実施経費」、および、特別経費（プロジェクト分）「変貌するアジア・アフリカで活躍するグローバル人材の育成」の支援を受けて実現しました。記してお礼を申し上げます。

臨地教育支援センター

センター長　重田　眞義

Graduate School of Asian and African Area Studies,
Kyoto University

Environmental Issues and Livelihood Concern in Myanmar

Nyein Chan
Ph.D. candidate
Division of Southeast Asian Area Studies

Granted by '2013 Research Collaboration & Management Support Course for International Research Output Training'

(In front; left to right) Ei, Reiji Suzuki, Tint Lwin, Shinya Takeda, Ei Ei Swe Hlaing, Ishimaru, Kanae

(Back; left to right) Bo San, Aye Aye Saw, Yasuyuki Kosaka, Thwe Thwe Win, Sota Yamamoto, Thinn Thinn, Khin Cho Win, Mya Thandar Toe, Wei Phyo Oo, Susumu Nakatsuji, Nyein Chan

Time: March 02, 2014

Place: AA447, Research Building No.2, 4th floor, ASAFAS

Preface

This publication is the output of the workshop titled by “Environmental Issues and Livelihood Concern in Myanmar” which could be held jointly with international workshop “Sustainable Forest Management and Indigenous uses of Forest Resources in Myanmar” at Kyoto University on March 1~3, 2014.

Myanmar is a country in democratic transitions, getting an increasing attention by the internationals. The economic sanctions on Myanmar were gradually released, while foreign investment laws and regulations were also issued. Consequently, the international as well as domestic investments were getting momentum in various sectors. Every development goes along with environmental and social impacts. We need to prepare how to make a balance among economic development and environmental and social impacts, by comprehensively understanding the current situation.

In this publication, many researchers presented about the environmental issues related socio-economic concerns in different corners of Myanmar. The studies covered lowland to mountainous areas, rural to urban and environmental issues to livelihood concern. In addition, the great comments by invited commentators are included. Also, at the end, there are extra information about the publication collection by the participants.

Until now, the documentation about Myanmar, especially in environmental and social research database, is still limited. Therefore, Myanmar research students and scholars in Japan, who are conducting their researches in Myanmar, were gathered and closely discussed on environmental issues and livelihood concerns.

Contents

Acknowledgements

I would like to thank all the participants who joined with us at the workshop on March 1~3, 2014. Firstly, my sincere thanks go to the group members, Dr. Ei Ei Swe Hlaing (Staff officer, Forest Research Institute, Yezin, Myanmar), Ms. Thwe Thwe Win (Ph.D. candidate, The University of Tokyo), Mr. Wei Phyo Oo (Ph.D. candidate, Yokohama National University), Ms. Thiri Aung (Ph.D. candidate, Yokohama National University), Ms. Thinn Thinn (Ph.D. candidate, Kyoto University) and Ms. Nang Phyu Sin Than Myint (Master student, Kobe University) for their great contribution to the workshop as well as the follow-ups.

I am very thankful to the three (actually four, if we count Dr. Ei Ei Swe Hlaing as a commentator) commentators, Mr. Tint Swe (Director, Forest Department, Ministry of Environmental Conservation and Forestry, Myanmar, Dr. Vipak Jintana (Associate Professor, Kasetsart University, Thailand) and Dr. Lamphoune Xayvongsa (Associate Professor, National University of Laos) for their great comments on the research output presented by the group members and for their suggestion to improve the future researches.

Special thanks go to Dr. Kanae Ishimaru for her kind support since the beginning of the workshop proposal application, to Dr. Suzuki Haruka and Dr. Kana Yamamoto for their kind help so that the workshop could be held and for their guidance on follow-up repot and publication, and to the participants who help everything during workshop.

In addition, I am very grateful to my supervisor, Dr. Shinya TAKEDA, for his active support on workshop and for giving us a special chance to jointly hold this one with his international workshop.

Lastly, but not least, I would like to thank JSPS and Kyoto University for financial support so that this workshop could be organized.

Nyein Chan

Ph.D. candidate

Graduate School of Asian and African Area Studies,

Kyoto University, Kyoto JAPAN

Workshop

on

"Environmental Issues and Livelihood Concern in Myanmar"

Organized by

Kyoto University Special Research Project "International On-site Education Program (IOSEP) for Global Human Resources"

京都大学学際融合教育研究推進センター総合地域研究ユニット臨地教育支援センター・院生発案国際共同研究 森林班

Date: 2nd March, 2014

Venue：Room AA447, 4th Floor, Research Bldg. No.2, Main Campus, Kyoto University

Program

Time	Presentation
09:30-09:40	Opening greeting
09:40-10:00	"Assessment of biomass recovery in fallow forests of Myanmar and Laos: Case studies in a Karen village, Myanmar and a Khmu village, Northern Laos"
	Nyein Chan (Kyoto University) et al.
10:00-10:20	"Conservation prioritization of dry forest communities and species in Myanmar: Ecological and social perspectives"
	Wei Phyo Oo (Yokohama National University) et al.
10:20-10:30	Coffee break
10:30-10:50	"Assessment of mangrove recovery in cyclone-affected areas in the Ayeyarwady Delta, Myanmar"
	Thinn Thinn (Kyoto University) et al.
10:50-11:10	"Population genetic structure of teak in Myanmar based on Microsatellite Analysis"
	Thwe Thwe Win (Tokyo University) et al.

Time	Presentation
11:10-11:30	"Can biological traits predict potential invasion risks of alien plant species in the central dry zone of Myanmar?"
	Thiri Aung (Yokohama National University) et al
11:30-12:00	Discussion
12:00-13:30	Lunch break
13:30-13:50	"Feminization of poverty in Myanmar: A case study of poor single elderly women in Yangon City (Urban area)"
	Khin Cho Win (Ritsumeikan University)
13:50-14:10	"Comparative study of environmental impact assessment in Myanmar and developing countries"
	Nang Phyu Sin Than Myint (Kobe University)
14:10-14:30	"Edaphic and micro-topographic effects on the variation in species composition of a dry forest in Myanmar"
	Bo San (Kyoto University) et al.
14:30-14:50	"Spatial and temporal variability of rainfall and its impact on vegetation phenology in the Central Dry Zone, Myanmar"
	Mya Thandar Toe (Kyoto University) et al.
14:50-15:10	"Local particularity of *taungya* participants' livelihoods at the teak plantations in the Bago Mountains, Myanmar"
	Ei (Kyoto University) et al.
15:10-15:20	Coffee break
15:20-15:50	Discussion
15:50-16:20	Comments Ei Ei Swe Hlaing (Forest Department, Myanmar)
	Tint Swe (Forest Department, Myanmar)
	Vipak Jintana (Kasetsart University, Thailand)
	Lamphoune Xayvongsa (National University of Laos, Lao PDR)
16:20-16:30	Closing remark

List of participants

1. Kobayashi Shigeo
   Professor, Graduate School of Asian and African Area Studies, Kyoto University
   Email:skobayashi@asafas.kyoto-u.ac.jp

2. Vipak Jintana,
   Associate Professor, Faculty of Forestry, Kasetsart University, Thailand
   Email: fforvij@ku.ac.th

3. Lamphoune Xayvongsa
   Associate Professor, Faculty of Forestry, National University of Laos, Lao PDR
   Email: lamphoune.xayvongsa@gmail.com

4. Shinya Takeda
   Associate Professor, Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan
   Email: takeda@asafas.kyoto-u.ac.jp

5. Tint Swe
   Director, Forest Department (Head office), Ministry of Environmental Conservation and Forestry, Naypyitaw, Myanmar
   Email: utintswe82@gmail.com

6. Ei Ei Swe Hlaing
   Staff Officer, Forest Research Institute, Yezin, Naypyitaw, Myanmar
   Email: eieiswehlaing@gmail.com

7. Reiji Suzuki
   Associate Professor, Kyoto Gakuen University, Kyoto, Japan
   Email: suzuki@kyotogakuen.ac.jp

8. Sota Yamamoto
   Associate Professor, Kagoshima University, Kagoshima, Japan
   Email: sotayama@cpi.kagoshima-u.ac.jp

9. Yasuyuki Kosaka
   Assistant Professor, Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan
   Email: kosaka@asafas.kyoto-u.ac.jp

10. Susumu Nakatsuji
    Assistant Professor, Konan University, Kobe, Japan
    Email: nakatuji@center.konan-u.ac.jp

11. Andi Amri
    Associate Professor, Faculty of Marine Science and Fisheries, Hasanuddin University, Indonesia
    Email: andiamri@gmail.com

12. Titipol Phaledeewanich
    Lecturer, Faculty of Political Science, Ubon Ratchathani University, Thailand
    Email: titipol@hotmail.com

13. Kanae Ishimaru
    Researcher of Scientific Research, Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan
    Email: ishimaru@asafas.kyoto-u.ac.jp

14. Nicolas Cesard
    Visiting Researcher, Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan
    Email: ncesard@asafas.kyoto-u.ac.jp

15. Thwe Thwe Win
    Ph.D. student, the University of Tokyo, Tokyo, Japan
    Email: ttw74kk@gmail.com

16. Wei Phyo Oo
    Ph.D. student, Yokohama National University, Yokohama, Japan
    Email: wphyomyint@gmail.com

17. Thiri Aung
    Ph.D. student, Yokohama National University, Yokohama, Japan
    Email: thiriaungmyint@gmail.com

18. Khin Cho Win
    Ph.D. student, Ritsumekan University, Kyoto, Japan
    Email: kcwin2007@gmail.com

19. Nyein Chan
    Ph.D. student, Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan
    Email: nchan08@gmail.com

20. Mya Thandar Toe
    Ph.D. student, Faculty of Agriculture, Kyoto University, Kyoto, Japan
    Email: myathandartoe@gmail.com

21. Thinn Thinn
    Ph.D. student, Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan
    Email: thinn07@gmail.com

22. Ei
    Ph.D. student, Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan
    Email: ei@asafas.kyoto-u.ac.jp

23. Bo San
    Ph.D. student, Faculty of Agriculture, Kyoto University, Kyoto, Japan
    Email: bosan007@gmail.com

24. Aye Aye Saw
    Ph.D. student, Faculty of Agriculture, Kyoto University, Kyoto, Japan
    Email: sawaye6@gmail.com

25. Nang Phyu Sin Than Myint
    Master student, Kobe University, Kobe, Japan
    Email: phyusin82@gmail.com

26. Kay Khaing Oo
    Research student, Faculty of Agriculture, Kyoto University, Kyoto, Japan
    Email: kkhaing1@gmail.com

Opening greeting

Good Morning, distinguished guests! I wish you all peace of mind and sound in body!

It is, indeed, my great honour and pleasure to welcome you all on this occasion of the international workshop on sustainable forest management and indigenous uses of forest resources in Myanmar.

Today is the second day of the workshop. The main theme for today workshop is Environmental issues and livelihood concern in Myanmar.

This workshop was funded by Kyoto University special research project which is a new special project launched in 2013 for ASAFAS students in order to enhance necessary skills for organizing international workshops/conferences and to encourage international collaborative researches under Research Collaboration & Management Support Course for International Research Output Training.

Nowadays,in Myanmar like other developing countries, we are facing environmental issues with social concerns such as the population pressure, deforestation, soil degradation, loss of biodiversity, climate change, etc. To address such environmental issues and social concerns, we, my supervisor and colleagues applied for this special project grant in order to hold this workshop.

In Japan, there are many Myanmar students studying in various fields of their interest. Today, we organized those Myanmar students whose fields are majorly related to the theme of today's workshop. I believe that all the today's presentations and the discussion would contribute to the development of our country to some extent.

In conclusion, my special thanks go to this research grant supplier, to my supervisor, to my teachers and staff at this graduate school, to all the participants.

Thanks you very much!

Abstracts by presented at workshop

Assessment of biomass recovery in fallow forests of Myanmar and Laos:

Case studies in a Karen village, Myanmar and a Khmu village, Nothern Laos

*Nyein Chan[1], Shinya TAKEDA[1], Reiji SUZUKI[2], Sota YAMAMOTO[3], Yasuyuki KOSAKA[1], Lamphoune Xayvongsa[4], Khamsing Keothoumma[4]

[1]Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, Japan

[2] Faculty of Bioenvironmental Science, Kyoto Gakuen University, Kyoto, Japan

[3] Research Center for the Pacific Islands, Kagoshima University, Kagoshima, Japan

[4]Faculty of Forestry, National University of Laos, Lao PDR

*Email: nchan08@gmail.com

Abstract

This study was conducted in the secondary forests after swidden cultivation in Myanmar and Laos to assess the biomass recovery of the fallows. In total, 34 sample plots in Myanmar and 23 sample plots in Laos were set up using a chronosequence approach through a nested sampling design of 10 m × 10 m. For biomass estimation, destructive sampling of trees, bamboo, and understory was done. The average total above-ground biomass (AGB) (including trees, bamboo, understory, and climbers) in 1-, 5-, 10-, 15-, 20-, 25-, and 30-year-old fallows and in the nearby old forests in a Karen village, Myanmar was 13.91, 31.31, 52.96, 66.52, 103.12, 88.45, 92.42, and 112.48 Mg ha^{-1}, respectively. The average total AGB in 3-, 5-, 7- and ≥9-year-old fallows in a Khmu village, Northern Laos was 13.67, 31.39, 35.89, and 68.15 Mg ha^{-1}, respectively, while it was 73.03 Mg ha^{-1} in the conservation forests. Despite being ≥9-year-old fallows, the average AGB is about 93% of the total AGB in the conservation forests. In conclusion, the biomass accumulation in the latter study site is very rapid compared to fallow recovery in Myanmar, where the AGB accumulation in 30-year-old fallows is about 83% of the total AGB in the old forests.

Conservation prioritization of dry forest communities and species in Myanmar: Ecological and social perspectives

Wei Phyo Oo, Fumito Koike*

Graduate School of Environment and Information Sciences

Yokohama National University

Email: wphyomyint@gmail.com

Introduction

Tropical dry forests are more threatened, less protected, and more vulnerable to deforestation compared to tropical rain forests. Dry forests in Myanmar have been disturbed by humans for over a millennium. A number of dry forest conservation efforts have been carried out in the form of reforestation, restoration, and rehabilitation activities. However, because of limited resources and research, it is not known which vegetation community types and species should be given priority for conservation. The objective of this study is to develop a conservation prioritization procedure for dry forest community types and species via the feasible effort of field surveys and the use of available maps under conditions in which there are limited data.

Methodology

A vegetation survey was carried out in 1139 sample plots of 15 m × 15 m, and a questionnaire survey was carried out in 14 villages in a 100 km × 100 km area in the central dry zone of Myanmar. Woody vegetation was divided into 14 types. To identify prioritized communities, a decision procedure was applied taking into account lower human impact, diverse plant functional type, extreme environment, and rarity. Prioritized species were chosen based upon community specificity and rarity. The respondents to the questionnaire included 15 foresters and 29 local people. To evaluate our prioritization method, the respondents were asked whether the 14 community types and 206 species listed on the questionnaire required for conservation. Another questionnaire was conducted among the local people to ascertain the importance of those community types and species for their livelihood.

Results and Discussion

A total of 330 species were recorded and 14 community types were classified. Among those 14 community types, our prioritization method identified only six community types (types 1, 2, 3, 4, 5, and 6) as prioritized for conservation, which covers 5.03% of the total study area. A total of 76 rare important species were identified as prioritized species for conservation. The ecologically important dry forest community types detected by our prioritization method were agreed upon by both foresters (P = 3.89E-10, chi-squared test) and local people (P = 1.57E-14). For ecologically important prioritized species, people do not believe that community specificity is important because the local people want to conserve useful abundant species for their livelihood. Conservation preference among the stakeholders is different for both community types and species. Foresters prefer to conserve species with fuel value, but local people prefer

to conserve species with various usages in addition to fuel, including food and aesthetics. For adequate conservation planning, we need to take into account not only ecological values but also social values. All of the stakeholders should meet to communicate their ideas regarding effective conservation.

Assessment of Mangrove Recovery in Cyclone-affected Areas in the Ayeyarwady Delta, Myanmar

*Thinn Thinn and Shinya TAKEDA

Graduate School of Asian and African Area Studies

Kyoto University

*Email: thinn@asafas.kyoto-u.ac.jp

Abstract

In this study, we investigate the recovery of the mangrove forests in the Ayeyarwady Delta that were degraded by cyclone Nargis in May 2008. Field data were collected in 2012/2013 through household surveys in a village that was affected by the cyclone. Changes in mangrove structure, especially regarding their height, were assessed in RS/GIS using IKONOS stereo pair images acquired in 2001 and with field measurements. The heights of a sample of 32 trees among the highest visible trees were derived from the stereo photogrammetry model and compared with the field heights of the same trees. *Avicennia officinalis* was the dominant species. The mean heights were 4.5±1.3 m in the model and 8.9±1.0 m in the field, respectively. The relative height of the trees in the model was observed with accuracy in the range of 0.2–1.4 m. The stereo model and the field survey showed an increase in the height and densities of the trees. After local people recognized that mangrove forests minimize loss of life and property damage during a cyclone, mangrove forests near the village were recovered as the human impact on these forests diminished.

Keywords: Mangrove, Recovery, Cyclone, Ayeyarwady Delta

Population Genetic Structure of Teak in Myanmar based on microsatellite analysis

*Thwe Thwe Win, Tomonori Hirao, Atsushi Watanabe,

Wataru Ishizuka, Susumu GOTO (The University of Tokyo)

Email: ttw74kk@gmail.com

Introduction

One of the most precious tropical timber tree species, teak is native to only four Asian countries: India, Myanmar, Thailand and Laos. Because of its unique qualities, including durability, workability, seasonability, resistance to termite, and its beautiful color and structure, it is recognized as the most valuable timber in the world. About 60% of total natural teak forests are in Myanmar. Out of four native regions of teak, logging from natural forests was banned in the late 1980s in India, Thailand and Laos but not in Myanmar. Although countries with native teak and introduced teak have conducted genetic studies, genetic information of Myanmar teak is very limited. We therefore study the genetic structure of teak to fill the gap in genetic information of Myanmar teak among native regions and to understand the genetic structure of natural populations and plantations of teak from Myanmar.

Materials and Methods

Fresh leaves were collected from two plantations and the provenance trial established using seeds from four natural populations and four plantations. Then, collected leaves were dried with silica gel prior to DNA extraction. Fifteen nuclear microsatellite markers for 256 individuals representing four natural populations and six plantations to compare genetic diversity of Myanmar teak with Indian, Thai, and Laos teak and to investigate genetic structure of Myanmar teak plantations. Genetic information of teak from other countries were obtained from Fofana et al. (2009) and used to compare genetic structure on teak from native regions. Total expected heterozygosity (H_E), allelic richness (R), the number of alleles (A), and genetic differentiation among populations (Fst) were calculated using FSTAT software. Rare faction allelic richness was calculated for comparison of the teak population with different sample sizes.

Results

The genetic diversity of Myanmar teak was significantly higher than that of Thai and Laos teak, but significantly lower than that of Indian teak. For genetic variation among populations of teak in its native countries, the highest genetic variation was observed in Thai teak followed by the Myanmar and Laos teak; the lowest variation was in Indian teak. We identified the high genetic diversity of Myanmar teak with the average number of alleles (A) 7.50, allelic richness (R) 7.05 and expected heterozygosity (H_E) 0.617. Among four natural populations, the Bago and Kanbalu populations harbored the highest genetic diversity and the Phyu population had the lowest. A moderate level of genetic differentiation was depicted in Myanmar teak. Although we predicted the genetic diversity of plantations would be low compared to that of natural

populations due to the founder effect, we observed that genetic diversity parameters of teak plantations in Myanmar were similar to those of natural populations.

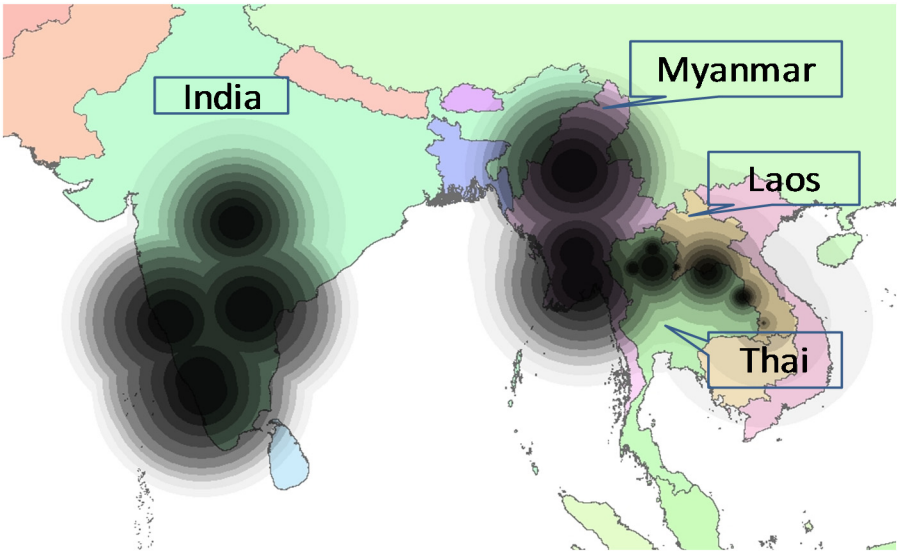

Fig. 1 Genetic diversity (H_E) of teak from each native country

Discussion

Both genetic diversity and genetic variation levels are important factors for the adaptability of the species to environmental and climatic changes. Therefore, Myanmar should be genetic center of teak due to its high genetic diversity and large genetic variation. A conservation program for teak should be urgently implemented in Myanmar to retain the genetic resource of teak and to sustain the valuable timber production. For the establishment of teak plantations, seeds are locally collected and mixed before producing the seedlings. This mechanism might have accounted for high comparable genetic diversity of plantations. However, seed transfer among geographic regions should be cared to avoid genetic erosion by mixing seeds from different regions. In Myanmar, teak plantations can be used as seed sources for the establishment of plantations and as genetic resources for conservation. Myanmar teak plays an important role not only for the production of the best timber quality, but also as a valuable genetic resource of teak in the world.

Can biological traits predict potential invasion risks of alien plant species in the central dry zone of Myanmar?

Thiri Aung, Fumito Koike*

Graduate School of Environment and Information Sciences

Yokohama National University

Email: thiriaungmyint@gmail.com

Background/Objective

The central dry zone of Myanmar once had substantial dry deciduous forest cover, but this has been largely degraded due to human impact, including agricultural conversion, overproduction, and heavy grazing by domestic cattle and goats. Restoration efforts have been done since 1950s through natural forest protection and reforestation activities. The restoration program occasionally uses alien species, and some of naturalized species caused hazards. This study aims to predict potential invasion risk of newly added alien species to woody communities in the human-dominated landscape of the tropical dry forest zone based on plant traits.

Methodology

A vegetation survey was done in 2011 and 2012 in the central dry zone. A total of 1399 sample plots of 15 m×15 m were randomly selected to record species presence/absence. To measure plant biological traits (maximum height, shade tolerance, animal palatability and specific leaf area), five individuals of each species were observed along a 1 km transect line. Relative light intensity was calculated from hemispherical photographs taken above seedlings/saplings of 15cm to 1 m high, and -log (geometric mean of three minimum light intensities) was taken as shade tolerance of species. Grazing traces were observed on seedlings/saplings and trees up to 1 m high and animal palatability values were calculated from the frequency of observed data using likelihood gradient analysis. Leaf samples were taken for each species and specific leaf area (Leaf area divided by leaf dry mass) was measured from the leaf samples. Plant community types were classified by TWINSPAN analysis. Species occurrence of each community type was predicted by logistic regression. The occurrence probability (number of present plots compared with the total number of plots in each community type) was used as a response variable, and four species traits were used as explanatory variables.

Results/discussion

A total of 360 species were recorded. Whole trait measurements were completed for 37 species. TWINSPAN classified six community types (three remnant forest communities: T1, T2 and T3; two woody communities in open lands: T4 and T5; and one residential community: T6). Prediction models by plant traits were significant for all community types. Maximum height was important key-trait in all community types. Animal palatability was the most important key-trait in tropical dry zone of Myanmar. Animal palatability was not significant in village

vegetation (T6) where people prevent animal grazing around their yards. Shade tolerance is usually key-trait for climax forest communities in humid regions; however, it was less important than animal palatability in tropical dry zone of Myanmar. Specific leaf area was the most important trait in climax semi-indaing forests with *Shorea* (T1), suggesting soil nutrient poverty to be key environment for the community. Predictability was generally low in open forests of tropical dry zone. Agricultural hedgerow with high human disturbance had lowest predictability.

Conclusion

Prediction of potential invasion risks of alien species was possible; however, predictability was lower than those in closed forests of temperate areas. Key traits in tropical dry zone of Myanmar were quite different from those of temperate moist regions. Animal palatability was quite important in Myanmar, instead of shade tolerance in humid area. Risk assessment system as WRA (weed risk assessment) in Myanmar needs to consider such difference. We need to continue to look for key-traits for Tropical Dry Zone to improve species risk assessment.

Feminization of Poverty in Myanmar:

A Case Study of Poor Single Elderly Women in Yangon City (Urban Area)

Khin Cho Win, D2 Student, Graduate School of Policy Science

Email: kcwin2007@gmail.com

Abstract

In this study, a life-course approach was used to examine the root causes of the emergence of poor single elderly women in Myanmar which is undergoing dramatic changes in economics and social structure. The feminization of poverty is a common issue in both developed and developing countries. However, poverty factors vary in different countries based on different economic, social and cultural backgrounds. Poverty factors in employment-based and welfare societies in developed countries are different from those in social-based and community-based societies in developing countries. In Myanmar, which is a developing country, ageing and industrialization have led an increase in poverty among single elderly women especially those in urban areas. Nevertheless, the only policy solution so far that supports vulnerable women is a non-profit organization in Yangon called "Twilight Villas." Because the number of single elderly women needing social support is increasing, the aim of this study is to uncover some of the complicated factors regarding poverty among single elderly women in Myanmar in the context of the nation's economic growth. Several inter-related economic, social and family factors are root causes of the emergence of poor single elderly women in Myanmar. Community factors also contribute to the increase in poverty. The weakening of the social solidarity including social relations, social networks and human relations between individuals, families, groups and communities is also a critical factor in the emergence of poor single elderly women in Myanmar**.**

Key words: Feminization of poverty, single elderly women, poverty, urban area, Yangon, Myanmar

Comparative Study of Environmental Impact Assessment

in Myanmar and Developing Countries

Nang Phyu Sin Than Myint, Graduate School of International Cooperation Studies

Kobe University

Email: phyusin82@googlemail.com

Abstract

Environmental impact assessment (EIA) is a system for identifying and introducing measures to prevent adverse environmental effects caused by development projects. EIA can be an effective instrument to achieve sustainable development. For this reason, EIA has become increasingly significant in recent years. EIA procedures require that a developer of a business submit a written document to a designated agency of a decision-making body, describing the probable or possible future environmental impact of the intended action. The U.S. National Environmental Policy Act (NEPA) of 1969 contained legislation to provide a framework for all recognized environmental concerns.

EIA in developing countries dates back to the mid-1970s, and although it varies significantly from country to country, its performance generally falls far behind that of EIA in developed countries. It is crucial that this performance be improved to help protect the environment of three-quarters of the world's land area. This paper reviews EIA in developing countries using a set of robust evaluation criteria to determine its strengths and weaknesses. These relate to legal basis, coverage, consideration of alternatives, screening, scoping, EIA report preparation, EIA report review, decision-making, impact monitoring, mitigation, consultation and participation, system monitoring, costs and benefits, and strategic environmental assessment.

Applying an EIA system throughout a nation will help to achieve the global goal of sustainable development and to reduce unfair costs and environmental impact (if any). Current international instruments commonly indicate that states should not undertake or authorize activities without prior consideration (at the early stage) of their environmental effects. In Myanmar, however, the EIA under Environmental Conservation law is still being drafted. This paper concludes with recommendations to strengthen the system, which encompasses improvements in capacity building, the creation of an effective EIA consultant accreditation system, assurance of effective public participation and access to EIA reports, application of a systematic environmental impact assessment process, review of the criteria, and enhancement of environmental awareness about the future of the EIA system in the Republic of the Union of Myanmar.

Edaphic and Microtopographic Effects on the Variation in Species Composition of a Dry Forest in Myanmar

Bo Sann, Mamoru Kanzaki and Seiichi Ohta*

Graduate School of Agriculture, Kyoto University

Email: bosan007@gmail.com

Introduction

In the present study, relationships between species composition and certain edaphic features are analyzed for a stretch of savannah woodland in the Central Dry Zone of Myanmar. The aim of this study is to acquire knowledge on species composition in relation to environmental conditions since such knowledge would be helpful in solving ecological problems and facilitate dry forest rehabilitation. The objectives are to examine how physio-chemical properties of the soil influence species assemblages, and to determine the microtopographic effects on the spatial variation of stand types in a dry forest.

Results

Thirty three species of 18 families were observed in the study area. Natural stand types (species composition or assemblages) were identified with a cluster analysis performed by the basal area of the species. Six types of natural stands, each of which was dominated by single species, were distributed in non-contiguous patches. This pattern of spatial variation in species composition was detected with a canonical correspondence analysis (CCA) driven by the physio-chemical properties of the soil. CCA axis 1 represents soil texture gradient and CCA axis 2 shows pH and soil hardness gradients, but gravel content, bulk density, organic matter, and soil depth did not account for the variation in species composition in the dry forest. The topography of the study area is of an undulating nature with various inclinations. Hence, in addition to the soil properties, we also analyzed microtopography to explain the variation in stand types. Four topographic variables, namely, degree of slope, slope aspect, elevation, and local landform, were considered in multinomial logistic regression. The only significant effect on the variation was due to degree of slope.

Discussions and Conclusions

Of 33 species observed, only few species (i.e., six to eight) were found dominant at forest level. Dominance of single species at stand level was a characteristic of the dry forest. It could be related with resprouting nature of the dominant species. Six types of natural stands distributed over the whole forest in a mosaic pattern. This kind of spatial variation in species composition was controlled by soil texture, soil pH, soil hardness and slope degree. Species composition could be mainly governed by soil moisture since soil texture and slope degree indirectly relates to soil water availability. Since the compositional variation of the dry forest could not be fully explained by the factors clarified in this study, other biotic and abiotic factors should be considered in further study.

Spatial and temporal variability of rainfall and its impact on vegetation phenology in the Central Dry Zone, Myanmar

Mya Thandar Toe and Mamoru Kanzaki*

Graduate School of Agriculture, Kyoto University

Email: myathandartoe@googlemail.com

Introduction

Rainfall is one of the important climatic parameters which is highly variable in space and time. Its distribution is particularly important in arid and semi-arid ecosystems, which are vulnerable to climate variability. In Myanmar, the Central Dry Zone (CDZ) which is identified as arid to dry sub-humid region receives mean annual rainfall of less than 1000 mm and the rain-fed croplands and the natural vegetation are strongly affected by the rainfall variability. In this study, (1) the spatial and temporal rainfall variability of the whole CDZ was analyzed and (2) the impact of rainfall variability on the vegetation phenology was examined.

Rainfall Variability

The annual rainfall data of 54 weather stations in the CDZ from 2001 to 2010 was subjected to Principal Component Analysis (PCA). The first principal components explained the spatial gradient from the driest centre to the moist periphery of the CDZ and this component explained 50% of the total variance. The second principal component is related to the annual variation of rainfall and its spatial pattern. In CDZ, the northern and southern part had opposite rainfall fluctuation pattern. For example, southern part received higher rainfall in 2005 but lower in 2006. On the contrary, northern part received lower in 2005 and higher in 2006. Such a reciprocal rainfall fluctuation pattern accounted for 17% of the total variance and was never documented before.

Impact on Phenology

The phenology of vegetation was examined using MODIS images. The 16-day composite normalized difference vegetation index (NDVI) images from 2001 to 2010 were used in this study. Fifteen study sites where the land-cover is stable during from 2001 to 2010 from six regions with different rainfall regime in CDZ were selected and ground truth survey was conducted in 2012. The points consist of six forest stands and five scrublands. The seasonal changes in NDVI were clearly different among the natural vegetation types. Dense forest (deciduous dipterocarp forest), sparse forest (*Tectona hamiltoniana* forest) and scrubland could be distinguished using two phenological metrics, the length of greenness (the period with NDVI ratio* 50% or more) and the amplitude (NDVImax - NDVImin). Clear phenological difference between forest and scrubland was also found in the NDVI increment in leaf flushing season. In the forest stands, NDVI rapidly increased and it attains the peak earlier than the sparse scrublands while NDVI linearly increased with increasing cumulative rainfall. This suggests that the timing of leaf flushing in the forest is highly depending on the soil water reserve. Interannual variation of the start of greenness (SOG, defined as the date that NDVI ratio attains 50%) in natural vegetation showed no significant dependence on

interannual rainfall variability, suggesting the importance of soil water or the factors other than rainfall.

Conclusions

Spatial and temporal variability of rainfall in CDZ was clearly demonstrated in this study and reciprocal rainfall fluctuation pattern between north and south CDZ must be considered for future forest and cropland management. Phenological pattern of NDVI were unique among the natural vegetation types and it is applicable to the reconstruction of the long-term deforestation process in CDZ. For the further understanding of interannual variation in phenology pattern, soil and ground regime should be integrated to the studies.

* NDVI ratio = 100 (NDVI - NDVImin)/(NDVImax - NDVImin)

Local Particularity of Taungya Participants' Livelihoods at the Teak Plantations in the Bago Mountains, Myanmar

**Ei and Shinya TAKEDA*

Graduate School of Asian and African Area Studies, Kyoto University

Email: ei@asafas.kyoto-u.ac.jp

Abstract

Since the 19th century in the Bago Mountains of Myanmar, teak (*Tectona grandis* L) plantation programs have been established using the *taungya* system, a type of dry agriculture that takes its name from the Burmese words *taung* (hill) and *ya* (cultivation) (Bryant, 1994); and used in many countries for reforestation of degraded areas (Tani, 2000). The program combines plantation operations with intercropping and is carried out by local swiddeners who practice hill cultivation. Nowadays, taungya participants still play an important role in teak plantation programs because of the cost-effectiveness of the taungya system that has been adopted in Myanmar forestry for centuries. However, taungya participants in the teak plantations have gradually formed communities that are engaged in various kinds of taungya practices for their livelihoods, especially after the recent expansion in private plantations. This study was conducted at three different sites in the Bago Mountains, Myanmar, where taungya teak plantations have been expanded by both the Forest Department and the private sector in recent years, to investigate particular livelihoods of taungya participants under location-specific conditions. The study site was given preference to both those areas which, historically, have had teak plantations and those which are currently most densely planted with teak. A household survey was conducted at each study site by using a semi-structured interview with the head of each household and field observation with the help of informants from the plantation programs. The household surveys sought information on household structure, crop production and consumption, subsistence satisfaction through cultivation, income generating sources and the experience of the taungya participants at each location. The different ways in which people participated in the taungya system were clearly observed at each site by concluding that each participant community depends on either labor wages or cash crops or subsistence crops respectively. These differences among the communities and their concerns with the teak plantations show diversifications of local livelihoods not only in crop production system but also in off-farm activities. Those particularities of taungya participants at each specific location should be considered in forest plantation management.

Comments by commentators

Dr. Ei Ei Swe Hlaing, Staff officer, Forest Research Institute, Yezin

There are 4 or 5 students conducting research in central dry zone of Myanmar where local community relies on different livelihood. Local forest management system is also not uniform. As such, different forest management strategies should be considered to achieve sustainable forest management. And, as Prof. Kobayashi pointed out that there should be trade-off between biodiversity conservation and utilization to achieve sustainable forest management. To ensure the co-benefits of local community and biodiversity, future studies should also assess dry land forest management from utilization point of view.

In addition, it is very important point that the social research should construct the theoretical framework based on previous studies. Also in conclusion, if we can show what the difference between the previous studies in developing countries and in our country is, it will be the research originality.

Another point about the conservation prioritization of dry forest communities and specie in Myanmar from ecological and social perspectives. It would be better if we could mention precise data of number of percentage of foresters and local people in the view point of conservation preference. Then, we need to be sure that all respondents (foresters) only prefer fuel. If the collected data are based on gender preference, it will be quite interesting.

The last one is on Environmental Impact Assessment (EIA). The last one is for Environmental Impact Assessment. This study will be very applicable in our country. Nowadays, EIA become the hot issue among the professionals, investors and higher level officials of Myanmar. We need to narrow down into specific case with clear objectives. If so, the relevant recommendations could easily be contributed to.

Tint Swe, Director, Forest Department, Myanmar

The whole day, I was observing all the participants. It made me alert all the time, because every presenters are very enthusiast. They have a lot of things done. I really appreciate all of your efforts. The way you do the research and the way you present them are quite impressive for us. But anyhow, the way you make a research is the research skill, academic research skill, which is quite naturally that confined the study area. But keep in mind that the reality is to tackle many issues not only at the national level but also we have to deal with the regional and global level. So all the experties and expert knowledge should be combined together in the reality. Otherwise it will be just like a ringed file. As we all know, we have many potentials, particularly, Myanmar people. Now we have a change, we open to the world. And before I left for Japan, I have a discussion with the retired persons from the Forest Department. And he said that Myanmar people are not inferior one. Once they have, they have the ability to show their competency. Now the time is coming. But being a forester, I would like to show the symbol of the teak. Teak is light demander. Although it could be suppressed under the shade/overhead cover, it grows, but not well. Once the overhead cover is opened, it takes the opportunity and advantages to establish into a fully grown stage. Remember it. Teak is famous. And Myanmar is famous for the teak. So, Myanmar foresters should be famous like teak. That's not the end. It's a long way to go. You need to endure of the hardship although we could say we have opportunities. But still we have a long way to go and many challenges. Not only the foresters but also other person who are doing on environmental consideration also, poverty issues. We are not still facing those issues. How to tackle those issues in a holistic manner is not only for the foresters but all the scholars here have responsibility. Thank you.

Vipak Jintana, Associate Professor, Faculty of Forestry, Kasetsart University, Thailand

First of all, I would like to thank all you very much for very informative presentations today. Maybe my favor, I would like to support some words given by Director Tint Swe yesterday. Congratulation for Myanmar people, because you all are coming here to study in Japan for your country. You may learn a lot technical knowhow from Japanese experts. I hope you all can bring it back to your home to develop your country. If Myanmar becomes a developed country, Thailand will be very happy too because we are neighbour.

Today, we have talked a lot about dry land forests. This is also my concern and interest. I am really impressive to know about it. Similar in Myanmar, we have forests in dry land and in village area in the northeast, and mangroves in the south. All forest areas are very useful for our people. We are very lucky, I think, having such a good opportunity to come here like this. But the most of the people are still living far away in the remote area. They have to work hard, and living in the rural area, in the difficult environment. They have to search for food and money. One thing I remember in Myanmar is *taungya* system which is rice cultivation on the hill. Maybe this is a kind of indigenous knowledge of people. Today, many people know agroforestry. *Taungya* is the way how to combine the trees in the cultivation areas. Prof. Kobayashi mentioned about the teak everywhere and also ideal trade-off curve. Maybe between forests or nature and cultivation, we cannot make 45 degree share curve, but it may depend on the site specific, depend on the people in the specific area. Sometimes, they need a lot of money in case of food and health. In Thailand, we tried to develop *taungya* system very long time ago. We called it the forest village, i.e., the people who live in the forests were allowed to grow the trees and to stay in the plantation area. Forest village are just left in the text book. Today, we can easily find para-rubber. They tried to use *taungya* system, but in low land. They asked Myanmar people to conduct all the works. The people can select the cash crops like cassava. Now we have a mechanism how much area to keep for the para-rubber. They do like it in the plantation. But they want to do like this everywhere to grow the para-rubber trees. Sometimes para-rubber trees destroyed the soil. It is very difficult for foresters to think about the combination between trees and crops. Also in dry zone, it is good to hear a lot of researches here. It is interesting that the people there uses the fodder for grazing. I am very much interesting in shifting cultivation in your country, because Prof. Takeda already informed me that it is very good. Shifting cultivation in Myanmar is very idealistic. As for Thinn Thinn-san, for your doctoral thesis, you established the database for Myanmar on how the land use change in the past century in order to see the forest cover in the past period of time. Now you set up a good research for your country. Sooner or later, you may see how the land use change in the future. In Thailand, a half century ago, forests were included in the first national economic development plan. It was started in 1961, since then, we lost our forests very quickly and sharply because of economic development. Our national development plan already changed from economic oriented to socio-economic emphasis. In the near future, socio-economic and environment plan will come into existence.

In Thailand, maybe also in Myanmar and Laos, we listen what is the sustainability? It means the learning process. How to make our people happy, healthy and wealthy? We have a nature in our home, or in our native country. As foresters we are nature lovers, we have to think about

the nature, nature for the people. People have to eat; there are so many things they collected from the forests. How can our nature be managed to benefit the people? That is a good way, everyone already told, as a source of income. I am surprising when you talked about the *taungya* system and you said that in most of the sites, they don't want to grow the rice, upland rice anymore, but cash crops, because they need money. They think money comes from cash crops, from labour. It is enough money from growing cash crops to buy rice. If somebody do not grow rice, they have enough money to buy rice. Why don't they keep money? Because, by the rest of the money, they can buy the television, they can buy motorcycle. In our country, plenty of rice can be produced because of good soil and good climate. We have sunlight twelve hours a day. In Japan, they have lesser in some period. In our country, we can grow plants in the whole year. So, the food in our country is, I think, secure. Our resources are suitable and sufficient. That's why, we just need to develop a proper learning process for sustainable development. In addition, it is an appropriate way to clarify how to select the site and species matching. They just think about the market, because they need money. Forests should, therefore, be managed in terms of natural conservation and socio-economic development aspects.

I have one more thing to response the talk of Nang Phyu Sin Than Myint on the environmental impact assessment issue. Actually, I don't know much about the details of EIA process when specific development projects were designed. But we, in Thailand, have a government office takes responsible for that. It's the Office of Natural Resources and Environmental Policy and Planning (ONEP). Once the project was initiated, they have to hire consulting agency to conduct EIA which should be private company. The company could have their own experts and/or hire some university professors to do scientific works for assessing the impacts. The assessments include mainly economic, social and natural aspects. At present, health impact is also included. We will focus on whether the project is feasible or not in term of ecosystem equilibrium such as forest restoration and so on. The assessment team will make an EIA report and submit to the ONEP for approval. They have to clarify the sources of effects and the intensity of impacts from the project. Finally, they have to propose proper measures to mitigate or to limit the impacts. After the ONEP approved, the project can start. To protect and restore the damage of natural resources from the project, various environmental agencies will take responsibility. They have to follow the measures of mitigation of the impacts mentioned in the report. I think in Myanmar, there will be a lot of oversea aids for development like from Japan.

To keep our nature sustainably is the most important. Okay, I think that is what I should talk today. Again, thank you very much for all of your valuable presentation. I hope that most of you presented today will complete your thesis and success in the near future. Please study hard in Japan and go back to your country for the better future. I think you are hardening off in Japan, and then feel happy for the people in your country. Thank you very much and see you again.

Lamphoune Xayvongsa, Associate Professor, Faculty of Forestry, National University of Laos

Dr. Lamphoune gave some comments on presentations. As Prof.Vipak mentioned about Environmental Impact Assessment (EIA), it is very important. Now, Myanmar just started to open to the world. Many foreign companies, from China and other countries, will come to Myanmar. He shared his experience and observation on EIA in Laos. In Laos, there are many land concession for plantation investment. The Laos government aims at creating job opportunity for the local people, but there was a missing point, that is, EIA. Therefore, for the future agreements, we realized the importance of EIA, but also social impact assessment (SIA).

It is very important to do research on forests in Myanmar. Also in Laos, the government is trying to improve the dry Dipterocarp forests, because the dry Dipterocarp forests are not diverse in species and not productive in term of timber production. However, there is still a need to improve, especially in research development. Researches on how to manage the local species and the alien species depending on the site condition are still necessary. Scientific papers are still limited in Myanmar and Laos. Here, all the presentation are very informative.

Closing remarks

by

Ei Ei Swe Hlaing,

Staff Officer, Forest Research Institute, Yezin, Myanmar

In the opening briefing, the program organizer said that this workshop is supported by Kyoto University. The objective is to enhance the skill of students. So, I would like to thank Kyoto University and Associate Professor Takeda Shinya. It is very important not only studying in classes, and also to enhance the capacity building. So, it is very appropriate to organize such occasion. It is also useful in our country. Today, among the presenters, the genetic, four studies on dry zone greening, environmental impact assessment, and gender issue. When we analyzed the research papers so far, the studies on genetic and studies on the rainfall and soil are very rare in our country. So, I would like to congratulate to all the presenters today. Also, gender issue and EIA are very important, especially in the development of our country. We have that millennium development goals. If you can get some good policy recommendations, it is useful for the future development of our country. So, as a conclusion, I would like to express my sincere thanks to Associate Professors Takeda Shinya, Suzuki Reiji and all participants, and also invited commentators from Thailand and Laos, and all students from Myanmar. Lastly, I would like to conclude this work by saying congratulation to all students.

Thank you.

List of published papers by participants

No.	Authors	Title	Journal	Year
1	Nyein Chan, Shinya Takeda, Reiji Suzuki, Sota Yamamoto	Establishment of allometric models and estimation of biomass recovery of swidden cultivation fallows in mixed deciduous forests of the Bago Mountains, Myanmar	Forest Ecology and Management 304: 427-436	2013
2	Yasuyuki Kosaka, Lamphoune Xayvongsa, Anoulom Vilayphone, Houngphet Chanthavong, Shinya Takeda, Makoto Kato	Wild edible herbs in paddy fields and their sale in a mixture in Houaphan Province, the Lao People's Democratic Republic	Economic Botany 67(4): 335-349	2013
3	Thinn Thinn and Shinya Takeda	A review of mangrove conservation and management in Myanmar	Journal of Forest Management 11: 34-42	2012
4	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Impacts of selective logging on the regeneration of two commercial tree species in the Kabaung Reserved Forest, Bago Mountains, Myanmar	Journal of Tropical Forest Science 24(3): 312-321	2012
5	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Remote sensing analysis of forest damage by selection logging in the Kabaung Reserved Forest, Bago Mountains, Myanmar	Journal of Forest Research 17: 121-128	2012
6	Shinya Takeda	Forest products of the trans-boundary Mekong River watershed: Lac and teak in the Lao forests	Journal of Forest Management 11: 90-107	2012
7	Shinya Takeda	Swidden farming and monsoon forests of mainland Southeast Asia: A patchwork of disturbance and succession	Journal of Agro-forestry and Environment 5 (special issue): 7-10	2011

No.	Authors	Title	Journal	Year
8	Sota Yamamoto and Tetsuo Matsumoto	Rice fermentation starters in Cambodia: cultural importance and traditional methods of produciton	Southeast Asian Studies 49(2): 192-213	2011
9	Yasuyuki Kosaka, Baikia, B., Mingki, T., Tag, H., Riba, T., Ando, K.	Roadside distribution patterns of invasive alien plants along an altitudinal gradient in Arunachal Himalaya, India	Mountain Research and Development 30(3): 252-259	2010
10	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Forest cover changes under selective logging in the Kabaung Reserved Forest, Bago Mountains, Myanmar	Mountain Research and Development 29(4): 328-338	2009
11	Reiji Suzuki, Shinya Takeda, Hla Maung Thein	Effect of slash-and-burn on nutrient dynamics during the intercropping period of taungya teak reforestation in the Bago Mountains, Myanmar	Tropical Agriculture and Development 53(3): 82-89	2009
12	Anoulom Vilayphone and Shinya Takeda	Mapping the changes of swidden cultivation area in a Khmu village of northern Laos	Proceedings of the International Agro-forestry Conference (IAC) 2006, Forest Research Institute, Malaysia, 61-71	2008
13	Kato, M., Kosaka, Y., Kawakita, A., Okuyama, Y., Kobayashi, C., Phimminith, T., Thongphan, D.	Plant-pollinator interactions in tropical monsoon forests in Southeast Asia	American Journal of Botany 95(11): 1375-1394	2008
14	Suphawat Laohachaiboon and Shinya Takeda	Teak logging in a trans-boundary watershed: an historical case study of the Ing River basin in Northern Thailand	The Journal of the Siam Society 95: 123-141	2007
15	Reiji Suzuki, Shinya Takeda, Hla Maung Thein	Chronosequence changes in soil properties of teak (*Tectona grandis*) plantations in the Bago	Journal of Tropical Forest Science 19(4):123-217	2007

No.	Authors	Title	Journal	Year
		Mountains, Myanmar		
16	Yasuyuki Kosaka, Shinya Takeda, Prixar, S., Saysana Sithirajvongsa and Khamleck Xaydala	Species composition, distribution and management of trees in rice paddy fields in central Laos PDR	Agroforestry Systems 67: 1-17	2006
17	Yasuyuki Kosaka, Shinya Takeda, Saysana Sithirajvongsa and Khamleck Xaydala	Plant diversity in paddy fields in relation to agricultural practices in Savannakhet Province, Laos	Economic Botany 60(1): 49-61	2006
18	Yasuyuki Kosaka, Shinya Takeda, Saysana Sithirajvongsa and Khamleck Xaydala	Land-use patterns and plant use in Lao villages, Savannakhet Province, Laos	Tropics 15(1): 51-63	2006
19	Reiji Suzuki, Shinya Takeda, Saw Kelvin Keh	The impact of forest fires on the long-term sustainability of taungya teak reforestation in Bago Yoma, Myanmar	Tropics 14(1): 87-102	2004
20	Susumu Nakatsuji	Differences in the importance of shifting cultivation among villages in northern Laos: A case study of 14 Villages in Xieng Ngeun District, Luang Prabang Province	Japanese Journal of Human Geography 65: 339-356	2013
21	Susumu Nakatsuji	Rural development, migrations and livelihood change in northern Laos: Comparing livelihood in a lowland village with that in a highland village in Xiangngeun District, Luang Phabang Province	Geographical Sciences 65: 26-49	2010
22	Shinya Takeda, Reiji Suzuki and Hla Maung Thein	Mapping shifting cultivation fields in a Karen area of the Bago mountains, Myanmar	Southeast Asian Studies 45(3): 334-342	2007

No.	Authors	Title	Journal	Year
23	Reiji Suzuki, Shinya Takeda and Hla Maung Thein	Analysis of land use history and fallow vegetation recovery: A case study of shifting cultivation by the Karen in the Bago Mountains, Myanmar	Southeast Asian Studies 45(3): 343-358	2007
24	Susumu Nakatsuji	Diversification of livelihood activities in the hills of northern Laos: A case study of an administrative village along a main road	Geographical Review of Japan 78: 688-709	2005
25	Susumu Nakatsuji	Changes in slash-and-burn agriculture after the introduction of cash crops in the hilly areas of Laos: A case study of Number 10 Village, Xiengngeun District, Luang Prabang Province	Japanese Journal of Human Geography 56: 449-469	2004
26	Nyein Chan, Sota Yamamoto, Reiji Suzuki, Shinya Takeda	Assessment of above-ground biomass and soil carbon in swidden cultivated fallows in the Bago Mountains, Myanmar: a chronosequence approach	Research for Tropical Agriculture 6(suppl.2): 69-70	2013
27	Ei and Shinya Takeda	Preliminary observations of interactions among local livelohoods and taungya teak plantations in the Bago Mountains, Myanmar	Research for Tropical Agriculture 6(suppl.2): 75-76	2013
28	Wei Phyo Oo and Fumito Koike	Conservation Prioritization of Forest Communities and Species in the Tropical Dry Forest Area of the Central Dry Zone, Myanmar	The 5th International Forum for Sustain-able Asia and the Pacific (ISAP) 2013	2013
29	Nyein Chan, Sota Yamamoto, Reiji Suzuki, Shinya Takeda	Role of bamboo in fallow management: a case study in the Bago Mountains, Myanmar	Proceedings of the 23rd Annual Meeting of the Japan Society of Tropical Ecology in Kyusyu 2013	2013

No.	Authors	Title	Journal	Year
30	Thiri Aung and Fumito Koike	Ecological risk assessment of alien plant species in Myanmar	The Third Green Economy Green Growth, GEGG Forum in Myanmar	2013
31	Thiri Aung and Fumito Koike	Predicting potential invasion risk of newly introduced alien plant species in central dry zone, Myanmar	INTECOL 2013, London	2013
32	Nyein Chan, Sota Yamamoto, Reiji Suzuki, Shinya Takeda	Biomass recovery of secondary teak-bearing forest after swidden cultivation: a case study in a Karen village, the Bago Mountains, Myanmar	Proceedings of the 22rd Annual Meeting of the Japan Society of Tropical Ecology in Yokohama 2012	2012
33	Nyein Chan, Sota Yamamoto, Reiji Suzuki, Shinya Takeda	Fallow vegetation recovery under different levels of disturbance: a case study in a Karen village, the Bago Mountains, Myanmar	Research for Tropical Agriculture 5(suppl.2): 71-72	2012
34	Nyein Chan, Sota Yamamoto, Reiji Suzuki, Shinya Takeda	Esimation of plant biomass in swidden fallows in a Karen village, the Bago Mountains, Myanmar	Research for Tropical Agriculture 5(suppl.1): 95-96	2012
35	Thiri Aung and Fumito Koike	Current status of *Prosopis* species invasion risk in Myanmar	Proceedings of the 22rd Annual Meeting of the Japan Society of Tropical Ecology in Yokohama 2012	2012
36	Thiri Aung	Tree planting activities and use of alien plant species in Myanmar: An experience from field survey	Yokohama National University Global COE News Letter, ecoRisk 11	2011
37	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Forest harvesting damages by selective logging in the Kabaung reserved forest, Bago Mountains, Myanmar	Proceedings of the 20rd Annual Meeting of the Japan Society of Tropical Ecology in Hiroshima 2010	2010

No.	Authors	Title	Journal	Year
38	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Stand damage and tree regeneration under the Myanmar Selection System in the Kabaung Reserved Forest, Bago Mountains, Myanmar	Research for Tropical Agriculture 3(Extra issue.2): 141-142	2010
39	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Canopy change under the Myanmar Selection System in the Kabaung Reserved Forest, Bago Mountains, Myanmar	Japanese journal of Tropical Agriculture 53(Extra issue.2): 133-134	2009
40	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Impacts of shifting cultivation on land cover changes in a Karen village in the Bago Mountains, Myanmar	Proceedings of the 119th Annual Meeting of the Japanese Forest Society	2008
41	Rosy Ne Win, Reiji Suzuki, Shinya Takeda	Logging impacts on land cover changes in the Kabaung reserved forest, the Bago Montains, Myanmar	Japanese journal of Tropical Agriculture 51(Extra issue.2): 33-34	2007

Cover photos by Shinya Takeda

Right – Water carrying in bamboo by Karen people

Left – Karen swiddener in upland rice field

Back cover photos

Upper – Dry forest ecosystem by Thiri Aung

Lower – A largest teak tree and teak plantation by Thwe Thwe Win

---

2013 Report of Research Collaboration & Management Support Course
for International Research Output Training

Environmental Issues and Livelihood Concern in Myanmar

Date of Issue: July 31, 2014
Publisher: Center for On-Site Education and Research, Integrated Area Studies Unit,
Center for the Promotion of Interdisciplinary Education and Research, Kyoto
University
Tel: +81 75-753-9636 / FAX: +81 75-753-9655
E-mail: shien@asafas.kyoto-u.ac.jp
Printer: 中西印刷　Nakanishi Printing Company
ISBN: 978-4-905518-13-6