

Fellowship Summary Report

Dr. Yayoi Takeuchi

Title: Sustaining biodiversity and ecosystem services in rural agricultural landscapes in a tropical region

THEME 1: MANAGING NATURAL CAPITAL FOR THE FUTURE

Host Institution: Stanford University

Host collaborator: Prof. Gretchen C. Daily

Period: 9 May 2018-19 Sept 2018

I consent to this report being posted in the Co-operative Research Program's website

1 What were the objectives of the research project? Why is the research project important?

Biodiversity is a key component of natural capital, and it allows or limits ecosystem service and human well-being. However, biodiversity has been still declining due to forest loss and degradation by human developments and activities, particularly in the tropical regions. There is a need for the implementation of biodiversity conservation strategy, although there is still a lack of knowledge of conservation targets and a discrepancy between local demand and political strategy.

This study focuses on the biodiversity-rich tropical area, Malaysian Borneo, and aims to investigate 1) the status of biodiversity and ecosystem services in rural landscapes, 2) the threats to those, and 3) local use and demand for those by a multidisciplinary approach. This study also 4) generalizes the findings by comparing the results with those for other areas.

Through those points, we show how biodiversity and ecosystem services are embedded in the rural landscape in the past, how the current landscape impacts on biodiversity and ecosystem services, and then how landscape management can create options for biodiversity conservation while securing ecosystem services for local people. These outcomes will provide a basis for conservation and development planning in rural tropical landscapes for both scientists and policy makers deciding on land use.

2 Were the objectives of the fellowship achieved?

The first two objectives have been almost achieved and the third and fourth objectives are on the way to being achieved. During the fellowship, I attended an academic meeting, the annual meeting of Ecological Society of America, which was held in USA, and presented the part of the research outcome (3-(1)).

3 What were the major achievements of the fellowship? (up to three)

(1) Scientific outcome

Forest fragmentation is a major threat that triggers declines in biodiversity at regional and global scales. Importantly, forest fragmentation affects tree species diversity and composition by limiting seed dispersal. For investigating historical transitions of forest cover in the area, we analysed Landsat satellite images from five time periods between 1972 and 2015 and found that forest cover of natural forest decreased over time in the two target areas. Then, we quantified the effects of past forest cover on contemporary species diversity and species abundances. As a result, forest fragmentation reduces species diversity with time delays, and the effects of fragmentation vary according to functional traits of species. For the prevention of future biodiversity losses in fragmented forest landscapes, conservation strategies should

account for the diverse functional groups occurring in biological communities. This research revealed how biodiversity can be maintained in the interaction between environment and land use pattern, which is the main issue of ecology. This multi-scale analysis of biodiversity gives an analytical example for biodiversity science and keen insight into the mechanisms for maintaining biodiversity on local to regional scales.

(2) Deepening the knowledge and techniques on evaluation of biodiversity and ecosystem services.

During the fellowship in Stanford University, I learned the cutting-edge frameworks, techniques, and tools for the assessment of biodiversity and ecosystem services from local to global scale. I also learned the cons and pros of the collaboration between scientific groups and stakeholders. As such, I could widen and deepen my background knowledge and techniques for evaluation of biodiversity and ecosystem services. It will undoubtedly expand my research target and skill to contribute to a sustainable society and human wellbeing.

(3) Expanding of networking

I could build a network of not only the host group at Stanford University, but that of other scientific and policy-relevant communities in USA and other countries. Those networks will help me to extend out targets and opportunities to deal with local to global-scale biodiversity issues.

4 Will there be any follow-up work?

4.1 Is a publication envisaged? Will this be in a journal or a publication? When will it appear?

We will prepare the several publications that biodiversity and ecosystem services in fragmented landscape in Borneo, which will be prepared and submitted to journals within the next year to two years.

4.2 Is your fellowship likely to be the start of collaboration between your home institution and your host?

This fellowship will be the start of collaboration between myself and the host group in Stanford University.

4.3 Is your research likely to result in protected intellectual property, novel products or processes?

None.

5 How might the results of your research project be important for helping develop regional, national or international agro-food, fisheries or forestry policies and, or practices, or be beneficial for society?

International policy: Global society is paying attention to biodiversity conservation and is seeking ways to do effective conservation planning. This study is relevant to global conservation goals, such as conservation strategies that integrate traditional indigenous practice (Article 8(j) of the CBD), “Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss” (Goal 15 of UN SDGs), “Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society” (Goal A: Aichi target of the CBD) and “Reduce the direct pressures on biodiversity and promote sustainable use” (Goal B: Aichi target of the CBD).

National and local policy: The government of Japan has been taking the lead in solving global environmental problems including the loss of biodiversity. Currently, the governmental environmental strategic plan focuses on enhancing international cooperation, especially in the Asia-Pacific region, by support for scientific knowledge, skill, and infrastructures to solve global and local environmental issues. This study will contribute to the strategic targets of the Japanese government.

Sarawak government, Malaysia, currently promotes sustainable forest management to reduce illegal logging because timber industry is the second most valuable agricultural renewable resource in Sarawak. Sustainable forestry management is supposed to secure biodiversity and ecosystem services for local communities; thus, this research outcome will provide suggestions to the local government and timber companies to secure a “sustainable landscape” biologically and sociologically.

6 How was this research relevant to:

6.1 The objectives of the CRP?

The CRP aims to strengthen scientific knowledge and provide relevant scientific information and advice that will reveal future policy decisions related to the sustainable use of natural resources. This study aims to elucidate the factors that influence biodiversity and ecosystem services in fragmented forest areas by employing a multidisciplinary approach. The research outcome provides science-based evidence for a landscape-planning tool that guides tropical forest conservation and sustainable development management while securing ecosystem services.

6.2 The CRP research theme?

The CRP research theme 1 is about how to manage natural capital by securing the availability and managing the quality of natural resources. The main goal of the research is to

sustain natural resources in rural agricultural landscapes in tropical regions in terms of biodiversity and ecosystem services. For this purpose, I evaluate the current status of biodiversity and ecosystem services, and elucidate key factors for biodiversity and ecosystem service conservation planning.

7 Satisfaction

7.1 Did your fellowship conform to your expectations?

Yes, it did.

7.2 Will the OECD Co-operative Research Programme fellowship increase directly or indirectly your career opportunities? Please specify.

Yes, this programme increased my career opportunities in both academy and policy-relevant science. Through my research experience at Stanford University, I could improve my research capacity and develop a coordinated and strategic approach to ecosystem services research. I also could build a network with the group and people in Stanford University. This experience will extend out my research targets to deal with local to global-scale issues, contributing to support a sustainable society and wellbeing.

7.3 Did you encounter any practical problems?

None.

7.4 Please suggest any improvements in the Fellowship Programme.

None.

8 Advertising the Co-operative Research Programme

8.1 How did you learn about the Co-operative Research Programme?

Through a colleague

8.2 What would you suggest to make it more “visible”?

I think it is visible enough at least in Japan.

8.3 Are there any issues you would like to record?

None