

**Proceedings of the AFSA Conference 2016
on**

FOOD SAFETY AND FOOD SECURITY

**held at KIIT UNIVERSITY, BHUBANESWAR, INDIA
ON SEPTEMBER 15-17, 2016**



**Prof. Mrutyunjay Suar
Dr. Gargi Dey
Dr. Ramesh Chandra Ray
Takashi UEMURA**

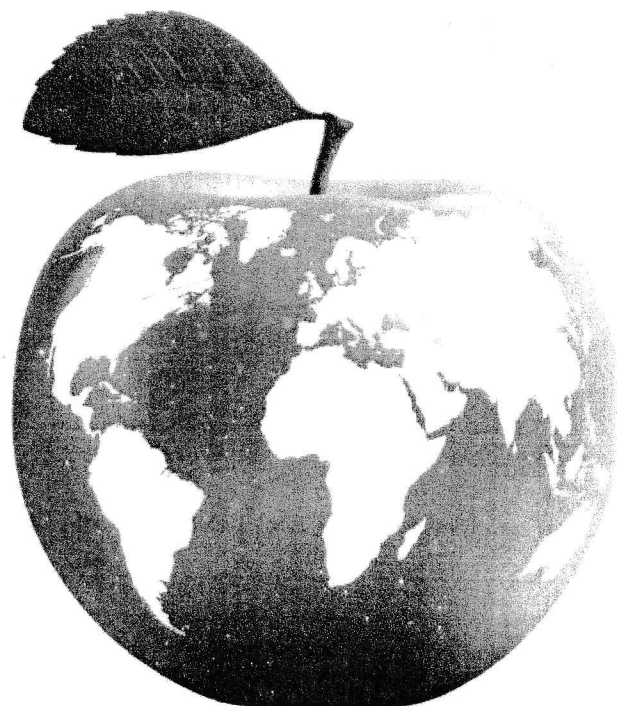


ASIAN FOOD SAFETY AND SECURITY ASSOCIATION

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FROM AGROFORESTRY TO COFFEE ECO-CERTIFICATION: AN EXAMINATION OF SUSTAINABILITY OF SMALLHOLDER FARMERS IN SEKAMPUNG WATERSHEDS, SUMATRA-INDONESIA

Ryohei Kada¹, Bustanul Arifin², Hanung Ismono², and Katsuya Tanaka³, (Corresponding author: Ryohei Kada; email: kada0113@gmail.com)

Keywords: Ecosystem services, Land and soil degradation, Agroforestry, Coffee eco- certification, Sumatra-Indonesia

1. Background and Research Objectives

Food security, closely linked with environmental problems, has become one of the most important contemporary issues in Asia. Especially in recent decades, ecological degradation such as sedimentation, water quality degradation and frequent flood occurrence, many of which are enhanced by climate change impacts, is expanding in Indonesia and many other Southeast Asian countries. Such degradation of natural resources is affecting negatively food supply and food safety conditions. The basic issue here is whether and how Asian agriculture and fisheries can supply sufficient amount and quality of food to meet with the rapidly growing population, without jeopardizing natural and environmental resources.

While agriculture supplies wide-ranged ecosystem services including marketed goods such as food and fiber, it also provides non-marketed services to the society such as flood regulation, disease control, water purification and scenic view. People generally.

Assume that such non-marketed ecosystem services have no economic significance (Daily, et.al 2002). In recent years, however, as modern agriculture has been causing significant land and soil degradation due to urbanization, deforestation and overexploitation of natural resources, we are learning that the four major categories of ecosystem services have been drastically reduced by human activities, causing higher ecological risks in Indonesia and other Asian countries (see Tab. 1).

Based on an international collaborative research by RIHN (Research Institute for Humanity and Nature, Kyoto), Shiga University and University of Lampung (UNILA), we try to examined the recent changes of such environmental degradation in Indonesia. Based on this empirical research, the present paper has two major objectives: (1) one is to clarify and assess the roles of eco-certification, by examining small-holder coffee farmers in Sumatra; and (2) to estimate farmers' preferences on sustainable coffee certification by use of best-worst scaling methods (BWS) and examine

necessary conditions for the potential expansion of such eco-certification scheme.

Our study has demonstrated that non-marketed ecosystem services from sustainable land use in agriculture would provide significant economic and ecological values, and developing mechanism for the payment for ecosystem services is crucial in enhancing sustainable agricultural development. It is also demonstrated that developing.

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Mechanism for the payment for ecosystem services is crucially important for enhancing sustainable agricultural development.

2. Characteristics of Research Site and Methodology

As a typical example of this natural resource degradation, we have conducted an empirical research on smallholder coffee farmers in the Upper Sekampung watershed, in Lampung, Indonesia. For this, we conducted a thorough household survey, by interviewing 408 coffee farmers in the above-stated watershed in 2016. Many of those farmers have been adopting agroforestry system since the 1980s, especially in the degraded-prone watershed in coffee production centers, by planting shade trees, fruit trees, timber and other multi-purpose tree species. Smallholder farmers are the majority (over 90 percent) in coffee production system in Indonesia, controlling land area of 1-2 hectares, with limited access to technology, market information and financial schemes. At the same time, the coffee economy is also a sector with several competing global eco-certifying entities, some of which have a partnership structure of smallholder farmers, coffee traders, roasters, exporters, and coffee industry in the global value chain system.

Although Sekampung is the main watershed in Lampung Province, serving as major food baskets, such as rice, maize and other crops, it also produces major export

The present study is considered as an appropriate and typical case for such certification with respect to agroforestry system.

As a next step, we have analyzed to estimate coffee farmers' preferences on sustainable certification (K. Tanaka, 2016). As already stated, the best-worst scaling (BWS) method is adopted, which is a choice-based conjoint analysis for valuing environmental amenities. By this method, we will be able to find the motivations of farmers as to the willingness to participate in the scheme, and clarify the necessary conditions for the certification system to be expanded more in the region

The questionnaire-based farm survey was conducted to 408 local coffee farmers in the Upper Sekampung Watershed, in July 2016. In the questionnaire, we asked in-depth questions of current production practices, input-output patterns, preference on agroforestry and participation into various eco-certification, etc.

Out of 408 samples, about 10% of farmers ($n = 41$) have adopted eco-certification, of which 4C is the majority (63%), Organic (17%) as second and Rainforest Alliance (7%). The following eight (8) factors have been selected carefully for BWS questions, after literature search and intensive interviews with farmers. They are: ① price level in international market; ② environmental benefits; ③ price premium (price difference with non-certified coffee); ④ social cohesiveness with group members; ⑤ technical assistance to improve yield and quality; ⑥ price difference by size of production; ⑦ expanding market access; and ⑧ improving access to credits and other inputs. In the questionnaire interview, each respondent was asked to choose "best" and "worst" among 4 factors which were randomly selected from the above 8 factors. This process was repeated for 4 times for each responded.

With the use of mixed (random parameter) logit model, we have been able to estimate the following results with respect to each factor above listed (see Tab. 3). As shown in Table 3, 7 out of 8 factors are found to be statistically significant. In particular,

⑤ Technical assistance to improve coffee yield and quality (coefficient as 2.098) and ③ price premium (1.054) are considered relatively more important than others. On the other hand, farmers do not consider those factors of ⑧, ②, ④, and ⑦ as important. It should be noted that all the values of SD (standard deviation) are found to be statistically significant, which may indicate that farmers' preferences on coffee certification are relatively heterogeneous.

As one important policy implications of this analysis is that market price and price premium are certainly important for farmers' decisions, but technical assistance (to enable agroforestry management more sustainable) appears to be more important for the coffee farmers. To provide better access to technical assistance would be a key to the success of wider expansion of coffee eco-certification schemes in the region.

5. Summary and Policy Implications

In summary, the present study calls for more empowerment programs for coffee farmers to improve coffee yield and coffee quality, by encouraging better farming practices at the farm level. Structural problems facing the smallholder coffee farmers need to be solved by providing technical assistance, extension services and empowerment actions at the field level. Here, some concluding remarks should be addressed with respect to interdisciplinary approach in managing environmental risks, as shown in the case of Sekampung Watershed of Sumatra, Indonesia. The issues of environmental quality need to be addressed properly as it would have consequences on endangering food security and health security. Environmental risks could constitute huge social cost in the long run if not managed and solved properly.

In economic theory, the so-called polluters pay principle (PPP) should be adopted in environmental incidences, although in practice no one would dare to pay, because there is no market existing to take care of environmental quality and social cost.

Strategies to tackle environmental deterioration include developing alternative or eco-friendly technology, institutional arrangement or social-economic setting, and trans-disciplinary approach with economic incentives, community-based and participatory decision making. Schemes of payment for environmental services (PES) and eco-certification schemes where coffee farmers can voluntarily choose to comply with eco-friendly practices. However, since most certifications are originally from North America and European countries, more research has to be conducted to measure the social-economic benefits to local farmers, especially smallholders.

An important key for policy advocacy in the future is by building up partnership the above-mentioned tasks with locally organized leaders and major stakeholders.

Involved in land use changes affecting ecological risks at the landscape and regional level. It should include (1) awareness on ecological degradation, complex, diverse and specific local conditions, (2) observation based on scientific data collection and reporting system partly collected by local people, (3) identification of potential risks, analysis and evaluation, and (4) action by governments, legislative actions, and science for community.

Finally, whether to expand the implementation of PES mechanisms in Southeast Asian countries, it should be noted that PES are mostly local specific and not necessarily applicable to the whole nation, since there is no legal foundation to execute such mechanisms. Some initiatives on characteristics between farming practices in private land and state-owned land might differ in terms practicing agroforestry system and adopting eco-certification. More detailed and rigorous analysis is required to reveal strong and solid conclusion based on field data and observation.

Table 2. Economic and Ecological Impacts of Eco-certification by Conversion from Coffee Plantation to Agroforestry

(1) Economic Impacts (Change of Income per ha. of land)

Comparison	Mean difference	t-value
Control - RA	-6,318,305	*** -6.747
Control - 4C	1,514,419	1.904
RA - 4C	7,832,723	*** 8.715

(2) Ecological Impacts(Nitrogen Input per ha. of land)

Comparison	Mean difference	t-value
Control - RA	0.645	*** 4.667
Control - 4C	-0.348	-1.661
RA - 4C	-0.992	*** -6.295

1.1 Source: Hanung et. al. (2016)

Table 3: Estimated Results of Farmers' Preferences on Eco-certification

Variables	Coefficient	Std. Error
Price level in international market	0.138	0.164
Environmental benefits	-0.780 ***	0.132
Price premium	1.054 ***	0.117
Social cohesiveness with group members	-1.892 ***	0.175
Technical assistance to improve coffee yield and quality	2.098 ***	0.131
Expanding market access	-2.056 ***	0.177
Improving access on credits and other inputs	-0.376 ***	0.129
SD(Price level in international market)	2.365 ***	0.182
SD(Environmental benefits)	1.457 ***	0.158
SD(Price premium)	1.108 ***	0.150
SD(Social cohesiveness with group members)	2.504 ***	0.183
SD(Technical assistance to improve coffee yield and quality)	0.925 ***	0.184
SD(Expanding market access)	2.203 ***	0.162
SD(Improving access on credits and other inputs)	1.488 ***	0.158
<i>n</i>	11067.000	
Log likelihood	-2983.730	

Source: Tanaka K (2016)

