

Opportunities and Challenges for Rebuilding and Effective Use of *Satoyama* Resources

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Abstract

Major characteristics, functions and recent changes in *satoyama* and *satoumi* landscapes are analyzed, in addition to the needs and conditions for enhancing the values added to the ecosystem services, focusing on *satoyama* resources. Since the 1960s, many rural communities have been faced with the difficult situation of losing their resource base and social community ties, due mainly to the problems of depopulation and aging of society confronting contemporary Japanese society. This study demonstrates that ecosystem services may be regarded as scarce resources having quantifiable economic values, and since traditional markets do not capture these values, subsequent market failures are caused by inefficient allocation of the scarce resources. The Sub-global Assessment of *Satoyama* and *Satoumi* in Japan (Japan SGA) has shown that in the process of urbanization and globalization of economies, many of the social relationships in metropolitan areas have changed dramatically, too. Japanese people today do not recognize or even know the origins of ecosystem services they utilize. This itself indicates changes in and weakened social relationships of Japanese society today. During the process of the *Satoyama* and *Satoumi* SGA, the necessity of a new form of resource management unit (a “new commons”) was pointed out, as people expect new roles to be fulfilled by the *satoyama* and *satoumi* under the strong pressures of resource loss or quality degradation. A new market-based form of economic mechanism, such as payment for ecosystem services, should be adopted.

Key words: direct payment, ecosystem services, new commons, resource management, *satoyama* and *satoumi*

1. Introduction: What are the Basic Issues?

The main objective of this chapter is to examine major characteristics, functions and recent changes in *satoyama* (and *satoumi*) landscapes and analyze the needs and conditions for enhancing the values added to the ecosystem services, focusing on *satoyama* resources. I will then discuss future directions for sustainable use and conservation of the *satoyama* resources attached to them, based upon detailed empirical case studies conducted in the Noto region of Ishikawa Prefecture, and the City of Yokohama in Kanagawa Prefecture, Japan. My focus is to explore the potentials and opportunities to re-build or create alternative mechanisms for management and effective use of *satoyama* resources.

Why do we need to seek revitalization of the *satoyama*? In the long history of Japan the *satoyama*, which is composed of various types of ecosystems (such as forests, grasslands, paddy fields, irrigation ponds and canals) along with human settlements, was widely found in rural areas and was created and maintained over a long time through interactions between humans and ecosys-

tems. In addition, the *satoyama* is considered to provide various significant values (including non-monetary values) to society, including material and non-material ecosystem services which eventually contribute to human well-being.

In the last several decades, however, a variety of factors such as increased rural-urban migration, land-use conversion, abandonment of cultivation activities and advancement of agricultural technology (e.g., increased chemical inputs) have been causing extensive degradation and loss of *satoyama* and *satoumi* values, while depopulation and the aging of society have resulted in poor resource management in such rural or coastal communities. Especially since the 1960s, many rural communities have been faced with the difficult situation of losing their resource base and social community ties, due mainly to depopulation and aging of society. The following are the major issues confronting contemporary Japanese society in relation to changes to the *satoyama* and *satoumi*.

First, people in Japan are gradually becoming concerned about the loss of agriculture, forestry and fisheries,

which not only reduces the country's rate of self-sufficiency in food production but also results in the loss of the *satoyama* and *satoumi* culture and society, which are connected with farming or fishery activities. The *satoyama* culture has been the basis of the aesthetic, spiritual and cultural values of the Japanese people.

Second, it is considered if this trend of farmland abandonment and resource degradation continues, many marginal villages in the uppermost watershed zone might disappear or be lost, which would be a heavy burden on regional economies and local governments. The implication of this deterioration process is that the rural landscape does not automatically exist, but it has been maintained and sustained by rural residents in accordance with farming activities and their daily life. In fact, many conservation efforts have been conducted by the collective actions of village people. Now the situation has changed, and changed for the worse.

Third, the environmental and ecological impacts are becoming greater, more directly affecting society than before. Ecological risks are expanding which are considered to be associated with the deterioration of resource management in the *satoyama*. That is why I emphasize the importance of ecosystems and biodiversity as the key elements for the sustainability and functioning of *satoyama* and *satoumi* landscapes.

Since around the 1960s, however, many rural and suburban communities in Japan in the process of rapid economic development and globalization have faced challenges to sustaining their functions by losing their natural resource base and social community ties, due mainly to depopulation and the aging of the structure of those societies. Continuous rural-urban migration among young people, land-use conversion and abandonment of farming activities are among the major drivers for such extensive degradation and loss of *satoyama* resources.

In the 10th Conference of the Parties to the CBD, held in Nagoya in October 2010, the Sub-global Assessment of *Satoyama* and *Satoumi* of Japan (Japan SGA) was discussed widely to assess the ecosystem services derived from the *satoyama* and *satoumi* and to provide a scientific base for actions to be taken towards the conservation and sustainable management of such services. The present chapter is the outcome of such an evaluation done for Ishikawa Prefecture and Kanagawa Prefecture as site reports for the Japan SGA. The basic conceptual framework adopted in this process is same as the one developed by the Millennium Ecosystem Assessment (MA) of the Japan *Satoyama* and *Satoumi* Assessment.

2. Need for Valuation of Non-Marketed Ecosystem Services

People have conventionally thought that ecosystem services, which are benefits from nature, are unlimited and, thus, that those services have no economic value. This study demonstrates that ecosystem services may be scarce resources and have quantifiable economic values in many cases, and since traditional markets do not cap-

ture these values, significant economic externalities and ecological risks, such as degradation of water quality, GHG emissions and subsequent market failures are caused by inefficient allocation of these scarce resources. It also explains why beneficiaries of ecosystem services may be required to make payment for the services when providers create them for beneficiaries, and explores potentials and challenges that are involved in creating a mechanism of payment for ecosystem services (FAO, 2008).

Ecosystem services, which are defined as the benefits provided from nature to humans, include supporting services such as primary production and soil formation, provisioning services such as food and water, regulating services such as flood and disease control, and cultural services such as recreational benefits (Daily, 1997; MEA, 2005). Supporting services maintain the other three services.

Human actions, market externalities, ecological risks and human well-being are well interlinked. This means when human actions reduce the level of ecosystem services, ecological risks emerge as a distribution of potential negative externalities. An externality is generally defined as an action of an individual or a group of individuals that inflicts a cost on or provides a benefit to others. A human action can have both negative and positive impacts on others.

Goda *et al.* (2006) have listed a number of negative externalities that basically result from human activities such as degradation, livestock production and use of pesticides in agriculture. Due to population growth and rapid economic development, many Asian countries have increased agricultural food production. However, these human activities have resulted in extensive degradation of natural resources and reduction of ecosystem services. In particular, the adoption of modern technology including intensive use of fertilizers and monoculture has caused serious soil and water degradation. For example, substantial soil degradation has resulted from deforestation (30%), overcultivation (32%) and overgrazing (26%) occurring due to population growth and economic development in the Asian region (Agus *et al.*, 2006).

In Japan, the decreased area of farmland has caused various social problems as well. Due to both rapid urbanization and abandonment of farmlands, ecosystem services from farmlands are estimated to have decreased, resulting in more frequent occurrences of flooding in the surrounding and downstream city areas. Although chemical fertilizer input is an essential element for enhancing productivity, excessive use of chemical inputs has resulted in negative externalities such as water pollution and biodiversity loss.

On the other hand, groundwater contamination due to crop and livestock production activities has become an important public issue in some areas of Japan. Nitrates are a major source of water contamination, introduced not only through the use of chemical fertilizers, but also associated with the amalgamation of animal manure.

Similarly, pesticide residues are potentially toxic to

humans and animals in food, feed or drinking water. They may also be hazardous to farm workers during application and have undesirable side effects on non-targeted living organisms in the natural ecosystem.

Developing a mechanism for payment for ecosystem services involving the beneficiaries and producers of ecosystem services that emerge from agriculture is substantially important, as this can address the externality and market failure issues in agriculture and consequently, increase food production in a sustainable way.

Kada (2006) has illustrated the potentials and challenges towards developing a payment system for ecosystem services (PES) in Japan. Table 1 shows the necessary conditions for higher value-added activities (or products) that will enable the support of rural communities for sustainable use of *satoyama* resources. The following list gives some typical examples of such activities taking place in rural Japan recently:

- An increasing number of city people or groups are willingly assisting farmers and rural communities with their tasks and at the same time enjoying rural amenities.
- Consumers are affiliating with producers to support regional agriculture through contracts between the two parties for fresh and safe farm products. Direct marketing systems such as farmers' markets and producer-consumer affiliated marketing have become very popular in Japan today.
- Groundwork activities and trusts for preservation of genetic resources (e.g., insects, fish, birds and flora) and landscape conservation have been attempted so as to construct ecologically-friendly wetlands, parks and ponds in harmony with agricultural activities, on both a public and voluntary basis.
- Green tourism has been expanded in which city people are invited to spend their leisure time visiting rural landscapes, enjoy farming experiences, farm for their own consumption, and voluntarily work in forestry and paddy management in remote rural areas.
- The Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) has introduced a direct payment scheme for farmers and rural communities to maintain the existence of paddy fields.
- Direct support is being provided by local governments for environmentally-friendly farming through direct subsidies to farmers who keep paddy fields for their flood mitigation function. To be eligible for this subsidy, the local governments require that the owners of the paddy fields sign a contract for maintaining paddy land or farmland.

What all these imply is that estimating the economic value of non-marketed ecosystem services is possible, if not precisely. Furthermore, estimating the economic value is crucial to creating a market for ecosystem services (payment for ecosystem services) (King, 2007; Wills, 2006). Both non-coercive government intervention and cooperation from the natural resource users seem essential to establishing this market. In this line of thought, in order to maintain the level of non-marketed

Table 1 Necessary conditions for higher value-added activities.

① To measure Environmental Values & Ecosystem Services numerically (Raise the Visibility of Potential Values)
② Grading, Certifying and Labeling of <i>Satoyama-Satoumi</i> Products
③ Effective Supply of Information to the Targeted People/Markets

ecosystem services provided by agriculture, it is important to assist farmers with new technology that requires a reduced amount of chemical fertilizers and insecticides, reduces the conversion of agricultural land use into non-agricultural, and compensates farmers for conserving agricultural land.

3. Why is a “New Commons” Expected in Contemporary Rural Japan?

The Sub-global Assessment of *Satoyama* and *Satoumi* in Japan (Japan SGA) was launched in 2007 to assess the ecosystem services derived from the *satoyama* and *satoumi* and to provide a scientific base for actions to be taken towards their conservation and sustainable management. It applies the conceptual framework developed by the Millennium Ecosystem Assessment (MA) (Duraiappah *et al.*, 2012; MEA, 2005).

A review of the economic valuation of ecosystem services provided by the *satoyama* and *satoumi* in Japan confirms that the key ecosystem services for the Japan SGA include flood regulation (regulating service), food safety (provisioning service), and cultural services. As the decline in the *satoyama* has resulted in more frequent occurrences of flooding in recent years, a well-maintained *satoyama* has been noted to provide the service of flood control. Also, as people are concerned about the quality of food in Japan and the risk has expanded under large-scale production and international marketing systems, it can be said that food safety is another critical ecosystem service that the *satoyama* and *satoumi* have been providing.

Furthermore, as many festivals and cultural activities are attached to the management of the *satoyama* and *satoumi*, it can be seen that cultural services provided by the *satoyama* and *satoumi* are significant, which is particularly evident in the Noto region where traditional festivals still continue with the help of local people who once outmigrated to cities.

In general, however, many social relationships have changed dramatically, too. Japanese people today do not recognize or even know the origins of ecosystem services they utilize. This itself constitutes a change in and weakening of social relationships. During the process of the *Satoyama* and *Satoumi* SGA, a new form of resource management unit (“New Commons”) was indicated, while people expect new roles to be fulfilled by the *satoyama* and *satoumi* under the strong pressures of re-

source losses or quality degradation. A new market-based form of economic mechanism, such as payment for ecosystem services, should be adopted. As an example, ecotourism (green tourism) could be expanded, drawing on the better quality ecosystem services in the *satoyama* and *satoumi*.

One might observe that many aspects of the *satoyama* landscape and its resource management system can be found in many other countries in Asia, such as the *muyong* and *uma* in the Philippines, *mauel* in South Korea, or community forests in Thailand. It should also be noted that the same so-called *satoyama* issues, mainly caused by depopulation and poor resource management, are taking place in many parts of Asia.

Accordingly, a scientific evaluation of *satoyama-satoumi* landscapes should be undertaken in an international framework, and sustainable use and management of common pool resources should be developed based upon such scientific knowledge. It is hoped that our small challenge in the Noto region might be a milestone for such international efforts.

4. Challenges for Revitalizing the *Satoyama* with Sustainable Resource Use

4.1 The case of the Noto Region, Ishikawa Prefecture

Let us take an example of the case of *satoyama* and *satoumi* empirical challenges in the Noto Region, Ishikawa Prefecture. This has been conducted and managed by Kanazawa University, which has long endeavored to conserve *satoyama-satoumi* resources and revitalize the socio-economic conditions of the Noto Region. We would like to illustrate this case as an alternative development model in terms of wise resource use and conservation.

The Noto Region has passed through serious socio-economic conditions, just like all other remote rural areas in Japan. It has experienced poor resource management and degradation of resource conditions due to depopulation and the aging of communities. Furthermore, the Noto region was seriously damaged by the Noto Peninsula Earthquake, which took place in March 2007, with the damage extending to hundreds of houses, roads and other social infrastructure in the region.

Under these adverse conditions, Kanazawa University started to construct a new approach for rural development by utilizing local resources existing in *satoyama* and *satoumi* landscapes. In order to revitalize local communities, environmental and biodiversity conservation are taken into consideration with the support and collaboration of four local municipal governments.

In 2006, the "Noto *Satoyama-Satoumi* Nature School" was established as a local branch of Kanazawa University, fully reviving and utilizing an old, closed primary school building in Suzu City. A variety of new educational, environmental and exchange activities have been attempted at this school, where several resident-type staff in addition to several professional coordinators dispatched from Kanazawa University, have worked with

local people to tackle and try to solve local issues.

In October 2007, a totally new educational program, named "the Noto *Satoyama* Meister Program," was started at the above mentioned Nature School and has continued since. The main objective of this program is to educate those who are willing to revitalize Noto region in the field of *satoyama-satoumi* related businesses. Many of them are relatively young, city-oriented students who are attending practical courses and seminars during weekends for the two-year program. After graduating from this pragmatic program, many of the graduates are expected to continue to live in the Noto region and engage in new businesses related to the local economies. Environment-concerned agriculture or fisheries, related processing businesses and eco-tourism are typical examples of such businesses. The key concept here is the wise and sustainable use of *satoyama-satoumi* resources, and thus the businesses should be in harmony with the ecological and environmental conditions of each locality.

4.2 An Alternative Approach by Yokohama City and Kanagawa Prefecture

Nearly one and a half centuries have passed since Japan opened its society to foreign intercourse after the Meiji Restoration of 1868. Yokohama City and the Kanagawa Prefectural area have undergone rapid urbanization, industrialization and land use changes, in a continuous process of *satoyama* resource loss and the deterioration of remote areas as more and more human and capital resources are concentrated into metropolitan centers. *Satoyama* resources have been divided, isolated and ultimately abandoned. In that process, ecological conditions in rural and remote areas have been disturbed and often degraded, with occasional intrusion of exotic species brought by human activities (Sadohara *et al.*, 2011).

It is widely acknowledged that biodiversity resources are being lost at an increasing speed worldwide in recent years. If *satoyama* resources are totally divided or abandoned and resource degradation continues, a substantial social loss will take place in ecosystem services, since the existence of diversified biological resources is the basis of the various ecosystem services they provide to the society such as food and energy supplies or rural amenities.

As more and more green resources are degraded or lost, as typically shown in the cases of Yokohama City and Kanagawa Prefecture, urban dwellers also gradually become worried about the loss of green resources, including agriculture, forestry and fisheries in the nearby areas. The very low rate of self-sufficiency in food is often associated with the loss of the *satoyama* culture, which is deeply associated with farming or fishery activities. In fact, the *satoyama* culture is the basis of aesthetic, spiritual and cultural values of the Japanese people. Figure 1 illustrates the structure of factors involved in rebuilding local communities by utilizing nature-based activities, which provide new value-added returns to the people and products produced in such areas.

As such, the environmental and ecological impacts are becoming more and more significant for present day society. Ecological risks are expanding which are considered to be associated with the deterioration of resource management in the *satoyama*. That is why I emphasize the importance of ecosystems and biodiversity as the key elements for the sustainability and functioning of *satoyama* landscapes. Table 2 presents key functions which are generated by suburban *satoyama* resources, as explicitly expressed by city people.

Niche space is expanding as depopulation continues and the number of farmers decreases. Meanwhile, metropolitan areas also face issues of how to manage

land resources properly in and near urban areas. With shrinking economies in addition to budget constraints, local government units have been forced to alter their management of space, including parks and green zones, which are indispensable elements in present urban planning. Rather than well-managed parks or green zones, they would prefer a proper but easy form of management that can be obtained by adopting ecological systems which require less management input. In other words, the new social system should incorporate natural ecosystems similar to the *satoyama* in order to reduce management costs.

In order to protect *satoyama* resources, a variety of

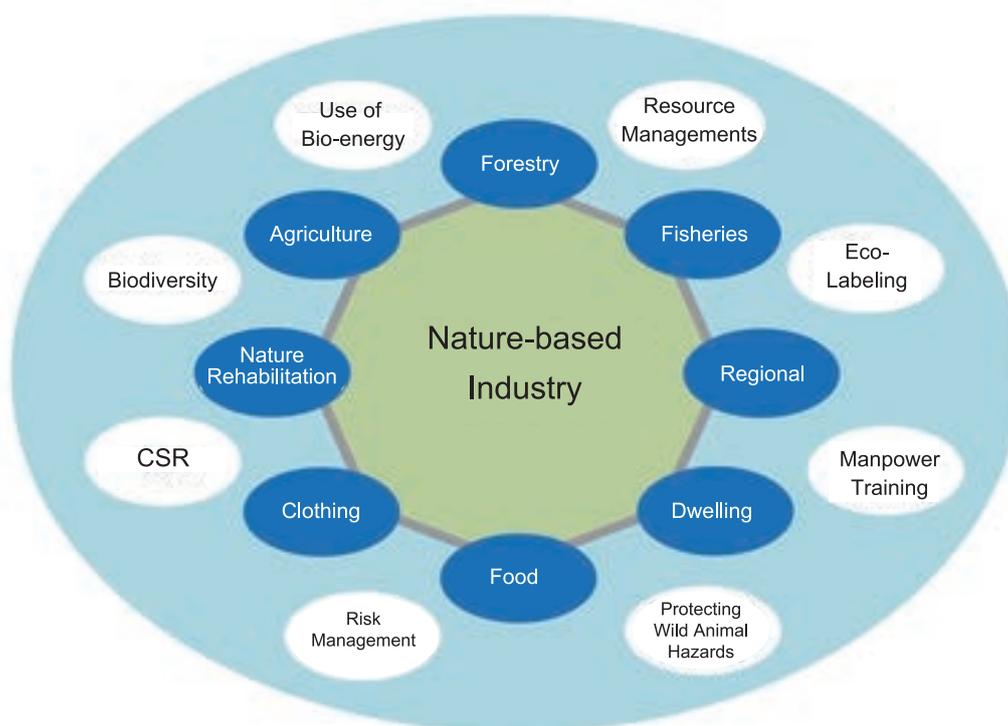


Fig. 1 Rebuilding of nature-based industry.

Table 2 Key functions generated by suburban *satoyama* resources.

< Food Security-Safety Function >

Farmland in suburban areas is an important resource for supplying fresh, safe agricultural products and performs multiple ecosystem services. In particular, in unexpected situations such as catastrophic disasters or food shortages, the existence of nearby farmland will enhance the feeling of safety and security among the people.

<Disaster & Flood Prevention Function >

In times of disaster, suburban *satoyama* resources play an important role in the prevention of fire propagation, or as safe refuges, evacuation routes, etc. They also protect the lives and assets of local residents. Paddy fields have the function of rainwater harvesting, flood control and groundwater recharge.

<Environment-Ecological Conservation Function >

The *satoyama* has the effect of reducing the heat-island phenomenon, purifying the atmosphere, preventing noise pollution, and controlling dust. Green resources including farmlands not only improve the city’s harsh environment but also create a comfortable urban landscape, while contributing to biodiversity conservation.

<Educational and Recreational Function >

The *satoyama* in suburban areas possesses the function of environmental education and nature experience for school children, who are expected to take responsibility for resource conservation for future generations. Recreational and other amenity values are also attached to suburban *satoyama* resources.

Table 3 Allocation of the forest conservation tax, Kanagawa prefecture.

Expenditure	Unit: million yen		
	FY2008	FY2009	FY2010
1. Headwater Forest Conservation	1,725	1,588	1,380
2. Use of Timber from Forest Thinning	74	98	152
3. Subsidies for Reforestation	766	737	700
4. River Water Purification	378	257	188
5. Conservation of Groundwater	113	111	98
6. Installation of Public Sewers	475	566	541
7. Installation of Septic Tanks	219	256	349
8. Monitoring of Aquatic Environments	177	231	178
9. Others	233	271	243
Total	4,160	4,115	3,829

Source: Data from *Forest Conservation Tax System: 2008-2010*, Kanagawa Prefectural Government, 2011.

activities have been attempted by Yokohama City and Kanagawa Prefecture. As early as one century ago, Yokohama City secured and protected the Dohshi forest in Yamanashi Prefecture, upstream from the city. A landscape preservation act was stipulated in Kamakura City before World War II. More recently, the “Nature Conservation and Rehabilitation Plan” was materialized and upstream forest resources came under the protection and subsidization of Kanagawa Prefecture. In addition, Yokohama City has adopted the “Green Taxation” system to promote greener metropolitan areas since 2010.

As shown in Table 3, the Kanagawa Prefectural Government has introduced the “Forest Conservation Tax” system since FY2007, marking the first time in Japan in which tax money is collected from all city people as a part of their water service fees. That tax money is utilized for various purposes: headwater forest conservation, subsidies for reforestation, installation of public sewers, etc. This system is, therefore, considered to be direct payment for environmental conservation (Sadohara *et al.*, 2011).

5. Conclusion

The Sub-global Assessment of *Satoyama* and *Satoumi* in Japan (Japan SGA) has shown that in the process of urbanization and globalization of economies, many social relationships in metropolitan areas have changed dramatically, too. Japanese people today do not recognize or even know the origins of ecosystem services they utilize. This in itself indicates changed and weakened social relationships in Japanese society today.

During the process of the *Satoyama* and *Satoumi* SGA, the necessity of a new form of resource management unit (“New Commons”) was indicated, as people expect new roles to be filled by the *satoyama* and *satoumi* under the strong pressures of resource losses or quality degradation. A new market-based form of economic mechanism, such as payment for ecosystem services, should be adopted. As an example, ecotourism (green tourism) could be expanded by drawing on the better quality of ecosystem

services in the *satoyama* and *satoumi*.

Let me finally emphasize that the *satoyama* landscape itself does not exist automatically, but it has been maintained and sustained by rural or local residents in accordance with farming activities and their daily life, by the collective actions of village people. Now is the time to seek a “new commons,” which should be created and coordinated by a variety of new entities, including various NPOs, the CSR of private companies and many types of volunteers, who are interested in using or conserving once depleted *satoyama* resources.

Estimating the value of non-marketed ecosystem services and creating markets for ecosystem services, *i.e.*, mechanisms for the payment for ecosystem services, will be a great task as a next step, since this will both keep up the level of ecosystem services and enhance human well-being.

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