

# A Pathway for a Nature-Harmonious Society

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## Abstract

An assessment of ecosystem services provided by the *satoyama* and *satoumi* has revealed that the value of regulating services has been enhanced more sharply than that of provisioning services. This study has analyzed the possibility and effectiveness of restoring provisioning and regulating services provided by the *satoyama* and *satoumi* based on the following four policy options for their regeneration: (1) environmental stewardship, (2) branding, (3) double habitation and (4) enhancement of knowledge and awareness, as well as nurturing of new bearers. This is the first attempt to integrate a natural scientific assessment of benefits brought to human society by the *satoyama* and *satoumi* with a socioeconomic assessment of the same in order to demonstrate specific policy options and their effectiveness with regard to a pathway to reconstruction of a nature-harmonious society.

An environmental stewardship policy would be effective in the conservation and utilization of the *satoyama* and *satoumi* and would additionally generate a high return on investment, therefore payment for ecosystem services would be effective in the restoration of the *satoyama* and *satoumi*. Increased brand value of domestic agricultural products has changed consumers' preference from imported agricultural products to domestic agricultural products, thus indicating that this would also be effective in the conservation and utilization of the *satoyama* and *satoumi*. It has been revealed that a double habitation policy would be likely to increase the interchange population on the condition that employment, shopping areas, improved medical systems, inexpensive housing and minimum income were ensured and that the region were located near an urban area within an hour by car. This study has also clarified the effectiveness of a policy of utilizing and maintaining ecosystem services as a new type of commons shared by community members rather than through legally reinforced protection of the *satoyama* and *satoumi*. To assess the value of the *satoyama* and *satoumi*, all capital elements (produced capital, human capital, natural capital and social capital) must be taken into account. This study has concluded that the incorporation of such a comprehensive value into a development and educational system would allow urban inhabitants with no direct connection to the *satoyama* and *satoumi* to become more aware of the social value of these ecosystems, exerting effectiveness in their restoration.

**Key words:** *satoumi*, *satoyama*, nature-harmonious society, new commons ecosystem service

## 1. Introduction

The world population reached 7 billion people in 2011. How to ensure and distribute water, food and energy to support this population has posed a more and more critical global challenge. On the other hand, in Japan, a low birth rate combined with an increase in life expectancy has accelerated the decrease in population and the aging of the society. The Japanese agricultural, forestry and fisheries industries are important in generating ecosystem services. However, they are likely to be exposed to fiercer international competition due to the constantly decreasing domestic workforce and other factors such as trade liberalization in the future. Furthermore, the Great East Japan Earthquake on March 11, 2011 had a devastating impact on ecosystem services in the Tohoku region, which was one of the important food centers (agricultural and marine resource supplying

areas) for Japan. Under these conditions, a scientific method is urgently required for making effective use of natural resources without impairing the value of the biodiversity or the ecosystems.

In Japan, the *satoyama* and *satoumi* have maintained a certain level of sustainable use of biological resources through community-based management and maintenance rooted in local culture, including traditional knowledge and conventions. Currently, in Japan, *satoyama* ecosystems have suffered from an accelerating degradation of the quality of their ecosystem services attributed to lack of maintenance. Not only has this resulted from direct factors regarding the decline in *satoyama* provisioning services, but it has also been significantly influenced by the collapse of village communities in mountainous areas due to depopulation and an aging society as well as the weakening of village communities near urban areas, such as that caused by the extinction of traditional culture. In

order to reconstruct a mechanism for maintaining and restoring the public functions of the *satoyama* and *satoumi*, it is necessary to make natural scientific assessment of these ecosystems. In addition, there is a need for an appropriate evaluation of the cultural value of the *satoyama* and *satoumi* as well as the social value for local communities in designing a system as a new commons. In other words, it is imperative to integrate a natural scientific assessment of benefits brought to human society by the traditional *satoyama* and *satoumi* with a cultural and social assessment, including economic and cultural values, to present a pathway to the reconstruction of a nature-harmonious society.

## 2. *Satoyama*, *Satoumi*, and a New Commons

The research project “Ecosystem Services Assessment of *Satoyama*, *Satochi*, and *Satoumi* to Identify a New Commons for a Nature-Harmonious Society,” supported by the Environment Research and Technology Development Fund of the Ministry of the Environment, was carried out jointly by the United Nations University Institute of Advanced Studies, the National Institute for Environmental Studies, Yokohama National University, the University of Tokyo, and the Research Institute for Humanity and Nature. This paper reviews the concept of “*satoyama*” and “*satoumi*” discussed in various research activities in the project and summarizes current issues that underscore the necessity for redesign of the system as a new commons, then it discusses the possibility of applying major policy options derived from a comprehensive assessment of *satoyama* and *satoumi* ecosystem services. This paper also explores what the ideal new commons for a nature-harmonious society should be.

### 2.1 Definition of “*satoyama*” and “*satoumi*”

The definitions of “*satoyama*” and “*satoumi*” vary greatly depending on the social background at each point in time being considered. On the other hand, the Japan *Satoyama Satoumi* Assessment (JSSA) has discussed existing definitions to arrive at a uniform definition. Based on this examination, the JSSA defines *satoyama* and *satoumi* landscapes as “dynamic mosaics of managed socio-ecological systems producing a bundle of ecosystem services for human well-being” (Duraiappah, *et al.*, 2012a). Particularly, through this assessment, the JSSA has focused on the *satoyama* and *satoumi* as long-lasting traditions associated with land (*satoyama*) and more recently coastal (*satoumi*) management practices, and concluded that these traditions used to enable the sustainable management of *satoyama* and *satoumi* resources, thus representing a historical model for environmental stewardship and resource management that has contributed to human well-being (Japan *Satoyama Satoumi* Assessment, 2010). The JSSA’s definition can be considered useful in discussing policies regarding land use and environmental management in the *satoyama* and *satoumi* based on an assessment of ecosystem services. Therefore, this paper discusses the

*satoyama* and *satoumi* in accordance with the definition suggested by the JSSA.

### 2.2 The *Satoyama* and *Satoumi* as a commons, and their history

The *satoyama* and *satoumi* are considered to be traditional commons that were formed historically in local communities in a way that ensured a certain degree of sustainable relationship between humans and nature. The concept of “commons” is ambiguous. The commons originated in pre-modern ownership of local resources. Currently, a commons includes the use and management of local resources linked to local communities such as the sea, forests and rivers as well as the local resources included therein, the inhabitants primarily using and managing those resources, and the normative social systems underlying the use and management of the resources (Uegaki, 2006). Japanese traditional management methods such as common ownership and water usage rights in *satoyama* areas as well as fishing rights in *satoumi* areas were maintained in the local commons (Japan *Satoyama Satoumi* Assessment – Kanto-Chubu Cluster, 2010). The *satoyama* represents a typical model in which continuous human activities in Japanese traditional “common areas” have nurtured unique ecosystems. It is also referred to as “ecosystems formed through human activities” (Tabeta, 1990).

In the system of traditional commons, natural resources of the *satoyama* were managed in a sustainable manner by communities and through restrictions on use enforced by those communities. This system continued from the middle ages to the modern age, although collapse has occurred in some regions due to the emergence of bare hills resulting from the exploitive use of natural resources since the Edo era. Since the Meiji era, the increase in purchased fertilizer and chemical fertilizer has led to a decline in the use of grassy and wooded hills where green manure was produced. Grassy and wooded hills have been replaced with artificial conifer forests. Economic growth brought demand for building materials, and additionally, the Tohoku region contributed to an increase in demand for railroad ties during construction of the nationwide rail network. In many mountainous areas, development projects were promoted and mountains were rapidly replaced with artificial forests (Japan *Satoyama Satoumi* Assessment – Tohoku Cluster, 2010). Moreover, due to supply shortages during the war in the early 1900s and the post-war restoration construction rush, the Hokushinetsu region also experienced destructive forest logging. For example, in Ishikawa Prefecture immediately after the war bare hills comprised an area of 15,000 ha (Ishikawa Prefecture Forestry History Compilation Committee, 1997). However, during the Meiji era, in the Tohoku region, there was great demand for charcoal as a fuel source indispensable for people’s daily life. For this reason, charcoal burning spread as an important income source over *satoyama* areas across the Tohoku region. In addition, hunting and wild vegetable collection were conducted for livelihood. Thus, people constantly

went to the *satoyama* and *okuyama* (wilderness mountains) to utilize mountain and forest resources (Japan *Satoyama Satoumi* Assessment – Tohoku Cluster, 2010). In Suzu, located on the Noto peninsula, salt production, diatomite processing, Japanese roof tile manufacturing, and coal mining industries were inherited. To provide fuel for these industries, low broadleaf trees were logged and used from red pine forests in *satoyama* areas. This helped in cyclical management of red pine forests, consequently forming a secondary natural environment (Japan *Satoyama Satoumi* Assessment – Hokushinetsu Cluster, 2010).

Since the post-war 1950s and 1960s, drastic *satoyama* degradation has accelerated. For example, in order to address lumber demand due to industrialization, a large number of cedar and Japanese cypress trees were planted temporarily. Subsequently, however, this forestry business was overwhelmed by lumber imports. A similar tendency was observed in regard to agricultural products, particularly those of lakes. As a result, many artificial forests were abandoned. It is not too much to say that such a large amount of imported agricultural and marine products and the increase in urban population have driven the deterioration of the agricultural and forestry industries. In addition, the increase in imports has unexpectedly introduced intrusive alien species into Japan through trade activities, resulting in changes to ecosystems. Furthermore, post-war economic growth has significantly changed the Japanese lifestyle. Westernized food culture has decreased the consumption of rice, which is essential for Japanese food. Adjustment of rice production has reduced the utilization of rice paddies. Looking at products other than food, firewood charcoal has been replaced with oil and natural gas (the energy revolution). This impact was so enormous that firewood forests have declined in the *satoyama*. Moreover, economic growth and a decline in the agricultural, forestry and fisheries industries have forced inhabitants in agricultural villages to engage in other forms of commerce and industry. This has led to a localized decrease in population and the aging of society in agricultural villages, making the management of mountains, forests, rice paddies and fields difficult. This phenomenon has rapidly expanded, particularly in inconvenient locations.

For the *satoumi*, conventional rules and practices conducted until the Edo era were inherited under the Fisheries Act enacted in 1901, in the Meiji era. After that, organizations such as fisheries cooperative associations managed exclusive rights to fish and fishing grounds. Analysis of a list of maps of exclusive rights to fish and fishing ground archived in the Fisheries Research Agency has revealed that at that time, a total of 5,489 rights were registered and that there were a number of fisheries cooperative associations. However, as of 2011, the number had drastically decreased to 24% of the number in the Meiji era due to the consolidation and abolishment of fisheries cooperative associations. In addition, this analysis has also indicated that various types of resources were collected and utilized, including

marine products such as dugongs, green turtles and sandworms in the Meiji era. Fishing for agricultural fertilizer production was also widely carried out (Akimichi, 2012). In particular, focusing on changes in the *satoumi* after the post-war 1950s or 1960s, economic growth combined with technological advancement led to an increase in marine production initially. However, in the longer term, a decrease in marine resources due to overfishing, combined with stagnation of the Japanese fishing industry, has resulted in a decline in marine production. Moreover, rapid industrialization has resulted in a loss of beaches that were once used for recreation and traditional fishing activities. Although there has been a gradual improvement in recent years, contamination has expanded in coastal sea areas (Japan *Satoyama Satoumi* Assessment, 2010). The increase in product imports has helped a larger number of ships enter Japanese sea areas. Ballast water discharged from these ships has induced alien species harmful to ecosystems.

Since the 1970s, in response to the environmental destruction and pollution that have been observed in surrounding areas, the general citizenry have become more aware of the importance of conserving the natural environment. In recent years, therapeutic and spiritual characteristics of the *satoyama* and *satoumi* have been reevaluated. Through ecotourism and social initiatives for appreciating these values, a focus has been placed on the cultural and social aspects of the *satoyama*. According to an opinion poll conducted by the Cabinet Office, Government of Japan (2008), since the 1980s, there has been a steady and prominent increase in people who pursue “spiritual fulfillment” rather than “material fulfillment.” Since the late 1980s, the conservation and protection of the *satoyama* has drawn increasing attention. According to the Nature Conservation Society of Japan (2002), more than 1,000 *satoyama* interactive projects have been carried out across Japan (e.g., nature observation sessions by inhabitants, as well as maintenance, management and investigation of secondary forests). In reality, since the year 2000, many laws related to the *satoyama* and *satoumi* have stipulated the participation of public citizenry (Japan *Satoyama Satoumi* Assessment, 2010). Thus, in the years following the Meiji era, the *satoyama* and *satoumi* were overused to satisfy demand for materials deriving from a population increase, construction and development, including the wartime goods shortage and the post-war intensive restoration. Nevertheless, until the 1960s, when use of fossil fuels and chemical fertilizers started to spread, in many regions, people maintained their livelihood by using *satoyama* and *satoumi* resources according to the cycles of nature. Since the 1960s, however, the usage of domestic natural resources has decreased, particularly due to scientific and technological advancements, such as the energy and fertilizer revolutions, as well as economic globalization, significantly changing the quantity and quality of the *satoyama* and *satoumi*.

Since the 1960s, the *satoyama* and *satoumi* in Japan have failed to maintain traditional commons, resulting

in drastic changes to them. The primary factors and characteristics of the issue are as follows:

- a) Decline in the use of the *satoyama* due to the energy revolution and fertilizer revolutions in the 1960s;
- b) Impairment of the market value of domestic agricultural and marine products due to imports of low-priced agricultural and marine products through trade;
- c) Loss of motivation and economic incentives for management of the *satoyama* and *satoumi* as the result of a decline in the economic value of the *satoyama* and *satoumi*;
- d) Population outflow from rural areas to urban areas for new jobs and lives due to sluggish local economies in agricultural and fishing villages;
- e) On the other hand, since the year 2000, in parallel with a slowdown in the Japanese economy, the general citizenry including urban inhabitants have developed stronger aspirations for nature. NGO initiatives have been actively carried out and awareness of the non-economic value of the *satoyama* and *satoumi* has risen with increased attention.

### 3. Policy Options for the Restoration of the *Satoyama* and *Satoumi* as New Commons

In order to restore *satoyama* and *satoumi* which can no longer be maintained as traditional commons, it is necessary to resolve the issues discussed in the previous section: a decline in the market value of the *satoyama* and *satoumi*, a decline in incentives for management of the *satoyama* and *satoumi*, and population outflow from rural areas to urban areas. There is a need to establish a common management mechanism (new commons) in which new stakeholders participate proactively. Currently, there is a social trend toward recognizing the non-use value of ecosystem services and incurring conservation costs in a form such as a direct guarantee. The future restoration of the *satoyama* and *satoumi* in Japan cannot be separated from “revitalization of livelihood.” Therefore, one important strategy will be to reinforce an economic basis by raising the willingness to pay for the enhancement of the value of ecosystem services that underlie livelihoods and the innovation of attractive products. Furthermore, based on social needs emerging among certain people such as those returning to rural areas or aspiring to interaction with nature, it is important to provide better knowledge and information necessary for the future management of the *satoyama* and *satoumi* so as to develop a new workforce. For this reason, this paper examines the efficacy of the following policy options with regard to the restoration of the *satoyama* and *satoumi*: (1) environmental stewardship, (2) branding, (3) double habitation, and (4) enhancement of knowledge and awareness, as well as nurturing of the new bearers.

### 3.1 Environmental Stewardship

“Stewardship” means taking responsibility for managing entrusted properties. It is also referred to as “trustee liability.” Originally, Environmental Stewardship was a basic core policy for agricultural promotion in England. This agricultural and environmental policy program continues to provide financial aid to farmers and landowners who implement effective environmental management in their lands (Department for Environment, Food and Rural Affairs, 2005). In order to address environmental issues, Environmental Stewardship grants rewards for effective land management. Financial resources are appropriated from tax income. In broad terms, this concept is regarded as payment for ecosystem services, such as a direct payment scheme and a forest environmental tax. However, Environmental Stewardship imposes more requirements than Cross Compliance (which specifies minimum obligations of farmers to receive direct payments), which is part of the EU Single Payment Scheme (SPS). Thus, the Environmental Stewardship scheme distinguishes more effective land and environmental management in regions and situations with higher priority to provide rewards (Department for Environment, Food and Rural Affairs, 2005; Hinsley *et al.*, 2010).

Water by itself represents an indicator for all ecosystem services: provisioning services (freshwater resources), regulating services (flood control, temperature control), cultural services (recreation), and supporting services (water cycle). Moreover, water has been considered to be a resource that should be managed in the *satoyama* as an important public good (commons). For this reason, this study quantified the value of ecosystem services provided by the *satoyama* and *satoumi* (particularly focusing on ecosystem services provided by water) using the environmental accounting system and direct market valuation (Okadera & Watanabe, 2012). It turned out that the economic value of ecosystem services was 18 trillion yen in 1985, 24 trillion yen in 1995, and 31 trillion yen in 2005, indicating an increase by 1.7 times in the 20 years from 1985. In contrast, although the percentage of the value actually paid for ecosystem services was 14% in 1985 and 1995, it decreased to 11% in 2005, indicating an accelerating trend toward externalizing the economic value of ecosystem services. Since 1995, provisioning services have not changed significantly. Therefore, the enhancement in the economic value of ecosystem services is greatly attributed to an increase in the value of regulating services (flood control and temperature control). Thus, there has been an increase in the ratio of the economic value of regulating services to ecosystem services overall. Incorporating the importance of regulating services is necessary when making political decisions and establishing new commons across the country and region in the future.

This study also discusses a policy option that would fund activities for enhancing the *satoyama* (*Satoyama Stewardship*) with lump-sum tax payments collected from households in each region (Watanabe, *et al.*, 2012).

With this option, the entire society would share the costs of environmental preservation. A model has been established based on the hypothesis that *Satoyama* Stewardship is driven by inputting labor and capital at a fixed ratio and that the costs of activities are collected from households in each region as a lump-sum tax. Further, this study examines the following three scenarios of *satoyama* services: (1) only flood control services increase by 30%, (2) only temperature control services increase by 30%, and (3) both services increase by 30%. As a result, if an increase in *satoyama* ecosystem services exerts a cost effectiveness of 1:4 or more, a GDP increase and positive equivalent variation will be achieved at the same time. This provides an optimal solution for the effectiveness of *Satoyama* Stewardship to the conservation and utilization of the *satoyama* and *satoumi* as well as for the return on investment. To sum up, the study found that a *Satoyama* Stewardship policy would be highly effective in the conservation and utilization of the *satoyama* and *satoumi* if the cost effectiveness in enhancing *satoyama* ecosystem services is 1:4 or more.

In order to explore an optimal land use option while maintaining biodiversity and regulating services, this study has applied the following three scenarios to a regional-scale assessment model to compare changes in biodiversity and ecosystem services among scenarios (Okuro, *et al.*, 2012): (1) scenario for reclaiming rice paddies and forest areas by introducing farm animals, (2) scenario for leaving disadvantageous farmland less intensively managed, and (3) scenario for increasing abandoned farmland. Scenario 1 attempts proactively to utilize unused resources such as rice paddies and eliminate abandoned farmland by introducing year-round Japanese cattle grazing as well as by using abandoned rice paddies and forest areas as cattle feedstuff cultivation sites, including pasture grass and rice plants. Scenario 2 attempts to maintain and manage farmland resources by applying a method for continuously maintaining farmland through annual minor work (extensive management) to abandoned farmland at an early stage of abandonment. Scenario 3 allows the current land use change trend, and particularly accelerating abandoned cultivation, to continue. As a result, an example of Town M has suggested that with Scenario 1, which attempts to reclaim rice paddies and forests to maintain a mosaic structure by introducing livestock, each element (provisioning services, regulating services, and biodiversity) is maintained in the best equilibrium. Therefore, in Environmental Stewardship as well, by providing incentives for management practices that proactively encourage this type of land use, political effectiveness is anticipated.

When adding climate conditions and obtaining the ratio of RDB vascular plant intensive grids per land management type, it has been revealed that the RDB intensive grid ratio is higher in areas with less snowfall and that the ratio is extremely high for the “devastated land + forest” type in these areas (Hori, *et al.*, 2012). Particularly, there are many marginal village grids of the “devastated land + forest” type (in areas with less snow-

fall). If there is a possibility of the land management type changing to another type due to the abandonment of management, ecosystem services can degrade, causing a negative impact on the entire country including downstream. It would be necessary to implement reinforced incentives for the management of critical areas from the standpoint of conservation of biodiversity and national land.

### 3.2 Branding

The agricultural, forestry and fisheries industries have faced difficult situations such as sluggish local economies, a decreased workforce, the aging of society, increasing abandoned farmland, and difficult business operations due to the impact of import liberalization. In order to improve these issues, there have been attempts to revitalize regions and promote industries by producing new local specialties through “high-value added agriculture,” shipping these products to external regions and promoting sales. These initiatives aim to sell local products by distinguishing products that take advantage of natural and cultural features in the region from mass-produced standardized goods. Across Japan, the agriculture, industry and commerce sectors have collaborated in enthusiastically producing and developing “local brands” or “agricultural and fisheries product brands.” Particularly, since the 1990s, in the midst of the liberalization of agricultural and fisheries products imports as well as price decline, consumers have strengthened their preference for “safety of food” and “high quality.” Combined with this, producers have implemented many projects to establish local brands with the objective of increasing revenues and expanding sales channels through various branding strategies for adding value such as high quality, local features and special processes (*e.g.*, black pigs, local chickens and organic agricultural products) (Sato, *et al.*, 2011). Moreover, in April 2006, the “Local Organization Trademark Program” was launched to encourage initiatives for revitalizing local economies as well as promoting and restoring local industries through various measures. For example, this program relaxes the standards for registering products or services bearing regional names as trademarks. Local governments have also proactively supported local branding initiatives (Japan Center for Regional Development, 2006).

In order to discuss a branding policy for enhancing the value and recognition of domestic agricultural products by emphasizing the location of the *satoyama* and *satoumi* in each region, this study has focused on the distribution of rice taste quality in Japan (Rice Taste Analysis and Appraisal Association, 2010). While taking into account factors determining taste quality (*e.g.*, water quality, climate including temperature gaps, soil resources and agricultural production technology), this study has examined the relationship between rice productivity and ecosystem services as well as the relationship between the taste quality value and the JOIN value, which is considered to represent biodiversity

(Watanabe, *et al.*, 2012). Through this analysis, direct correlations between the taste quality value and the JOIN value associated with biodiversity have not been clarified. However, this study has quantitatively reproduced a case in which rice with a higher taste quality value is densely distributed in areas where there is a temperature gap between day and night according to a tradition among rice producers. In addition, this study has simulated a rise in the brand value of domestic agricultural products based on a change in consumers' preferences from imported agricultural products to domestic agricultural products to assess the economic effect of a scenario related to imports of agricultural products. This simulation has clarified that a rise in the brand value of domestic agricultural products among consumers (change of preference to domestic agricultural products) would bring significant benefits, particularly to Hokkaido, Tohoku, Kyushu and Okinawa. Thus, it has been suggested that a domestic agricultural branding policy would be highly effective in the conservation and utilization of the *satoyama* and *satoumi*.

Furthermore, this study conducted a questionnaire survey to gain insight into the public visibility of biological (environmental) branded agricultural products and to obtain quantitative data regarding additional willingness to pay for branded agricultural products (Yumoto, *et al.*, 2012). The results of this survey indicated that brand awareness of biological (environmental) agricultural products depended on environmental knowledge and that most people would accept an additional charge for a brand by up to 20% of the market price, although approximately 30% of people would refuse such an additional payment.

In contrast with product brands developed for general goods that aim to increase corporate revenues, the purposes of a local brand include the revitalization of a local economy and improvement of inhabitants' satisfaction with their lifestyle. This point sheds light on the importance of focusing on social capital, natural capital and economy in generating a value (adding a high value) for maintaining and restoring the multifaceted functions of the *satoyama* and *satoumi* in order to ensure that an appropriate price is paid to the party who generates the value. Thus, it is important to ensure the following basic conditions: (1) visualization (quantification) of the environmental value, (2) certification aid labeling based on an objective and professional third party, and (3) provision of effective information regarding methods with which to make environmental payments (*e.g.*, farm stands, rice terrace ownership programs, ecotourism) (Kada, 2012).

### 3.3 Double habitation

Diversification of values and lifestyles has emphasized spiritual fulfillment, increased the number of voluntary activities and raised people's interest in living a slow life in regions outside metropolitan areas. On the other hand, it is projected that agricultural and fishing villages will experience a drastic decrease in residential population, serious population decrease, and expansion

of sparse and empty areas due to factors such as the rapidly aging society. To coordinate the needs of agricultural and fishing villages with the needs of urban residents and create diverse lifestyles, various projects have been carried out. Particularly, in agricultural and fishing villages, in addition to the "residential population" and "non-residential population" made up of temporary short-term visitors such as tourists, attention is being paid to "double habitation" and the roles played by this population. Through "double habitation," urban residents live in the same agricultural and fishing village for a medium or longer period of one month or more during the year, or visit the same village regularly and repetitively. Generally, "double habitation" refers to a form of lifestyle in which urban residents spend the weekend or a certain period of time in a year living in an agricultural or fishing village. According to the definition of the Ministry of Land, Infrastructure, Transport and Tourism, "double habitation" refers to the establishment of a life base by urban residents in addition to their house in an urban area as a method for achieving a diverse lifestyle depending on the person's or family's needs. Urban residents stay in a single area of agricultural and fishing villages for a medium or longer period (approximately one to three months) on a regular and repetitive basis in order to maintain a certain level of relationship with the regional community (National and Regional Planning Bureau, Ministry of Land, Infrastructure, Transport and Tourism, 2005).

In reality, according to the "Public research on co-existence and exchange between urban areas and rural areas" (Public Relations Office, Cabinet Office, Government of Japan, 2005) conducted for 3,000 people in Japan, 0.8% of the respondents indicated that they had already started double habitation.

Additionally, mainly focusing on Ishikawa Prefecture, this study has identified *satoyama* and *satoumi* areas in danger of extinction based on population density and organized land-use and population data to validate the impact of geographical conditions on population and the effectiveness of multi-habitation (Hori, *et al.*, 2012). This study has established the following hypotheses regarding double habitation: (1) double habitation is not conducted in two different prefectures, (2) urban residents go to the *satoyama* and *satochi*, (3) people do not concentrate on a specific grid (population is uniformly distributed), and (4) the ratio of population increase in the *satoyama* and *satochi* is determined by the total population of the urban area. Assuming that the population in the *satoyama* and *satochi* increases by 1% (1% scenario) or 5% (5% scenario) of the total population of the urban area through double habitation, this study calculated the double habitation population and then conducted an analysis on the land area of rice paddies and forest areas in *satoyama* and *satochi* areas in danger of extinction. For rice paddies, the areas were 24.6 km<sup>2</sup> without double habitation, 21.1 km<sup>2</sup> with the 1% scenario, and 1.6 km<sup>2</sup> with the 5% scenario. For forest areas, the areas were 213.3 km<sup>2</sup>, 195.8 km<sup>2</sup>, and 15.3 km<sup>2</sup>, respectively. Thus, this study

has confirmed that there would be a significant decrease in the land area of *satoyama* and *satochi* rice paddy and forest areas in danger of extinction if double habitation were steadily promoted as assumed.

In February 2012, a questionnaire survey was conducted with 8,200 participants in Japan to investigate economic incentives for immigration and willingness to pay. Many expressed opinions indicating interest in interaction with the *satoyama* and *satochi* as leisure activities while continuing urban life. The reasons for their reluctance to live in rural areas included insecurity regarding continuous employment and insufficient development of commercial and medical facilities (Yumoto, *et al.*, 2012). However, approximately 25% of the total respondents indicated a desire to have a second house in a rural area. The following points would create significant immigration incentives for those who are interested in rural areas: (1) employment (for men), shopping areas (for women), and improved medical systems (for the elderly) must be ensured in order for urban people to live in rural areas, (2) the non-residential population could be increased through double habitation if the rural area was located within an hour by car from suburban areas, and (3) inexpensive housing and income guarantees must be provided for those who want to immigrate. In addition, this survey has indicated that in many cases, an income guarantee of 50,000 yen or less per month would be sufficient. A certain degree of effectiveness could be anticipated even with 20,000 yen per month.

### 3.4 Enhancement of knowledge and awareness as well as nurturing of new bearers

The value of the *satoyama* and *satoumi* cannot be measured by economic growth alone. It is imperative to incorporate all capital elements such as produced capital, human capital, natural capital and social capital (Duraiappah *et al.*, 2012b). It is important to encourage urban residents who do not have a direct connection with the *satoyama* and *satoumi* to become more aware of the social value of the *satoumi* and *satochi* by integrating this comprehensive value into economic calculations and development/educational systems.

Data such as a summary of marine production and MTI have indicated the sustainability of initiatives carried out in the Shiretoko World Heritage area. Subsequent to that, this study has examined the conditions for successful voluntary management by fishermen in the area and found the following important points: (1) a drastic decrease in resources has been experienced, (2) long-term benefits are anticipated from fishing industries, (3) local researchers can provide advice to fishermen, (4) voluntary management policies can be revised if necessary, and (5) discussion can be repeated over and over until agreement is reached (Matsuda, 2012). Upon World Heritage registration, the Shiretoko area was required to reinforce the conservation of its sea areas. In response, fishermen voluntarily strengthened protection by expanding the seasonal marine preserve for walleye pollack. This initiative was evaluated and the Shiretoko area was

approved as a World Heritage site in 2005. Through the opportunity to be approved under the global standards known as World Heritage, the fishermen in Shiretoko have maintained cooperative management as a commons and introduced their management method to the world. This story was certified as one of six world impact stories by the International Association for the Study of the Commons in 2010. On the other hand, some issues were identified such as a failure of resource management due to a constantly high level of the true sardine total allowable catch for offshore fisheries.

It is worth examining a policy for allowing companies to enter into agricultural industries to engage in large-scale agricultural business through the revision of the Agricultural Land Act. However, it is highly likely that such companies will withdraw from the business as soon as it becomes unprofitable. For this reason, some doubt if this policy can be a long-term and stable agricultural policy in consideration of global economies and international situations. Particularly, in regions where companies are reluctant to launch businesses, in order to maintain ecosystem services provided by farmland and the *satoyama* as a new commons, it would be possible to explore a scheme for increasing the urban non-residential population, providing economic incentives to induce urban people to immigrate, and funding this policy through payments made by urban residents who benefit from farmland and *satoyama* ecosystem services as an “ecosystem service payment” (Yumoto, *et al.*, 2012).

Ritual events conducted in the coastal areas of the East China Sea in Kyushu and those conducted on islands in Okinawa represent examples of cultural value of ecosystem services in the *satoumi* that have been actively recognized. Through these events, people have mutually confirmed that they are members of the community. These events are also significant in allowing people to review the detailed rules for resource utilization. In regard to these biological resources, resource use and management are ensured through clear membership, not limited to dedicated fishermen. Thus, in order to use *satoumi* resources as a local commons by restricting the rights to use these resources, it is critical to implement measures for developmentally adopting cultural practices without legal regulations (Akimichi, 2012).

In some cases, expert knowledge and technology related to ecosystems and individual biological organisms help enable resource use without depleting biological resources. In other cases, this might lead to an exploitive use of resources which depletes the target biological organisms. It is important to implement governance which controls how to use knowledge and technology, or to have “human willingness” to sustain biological resources. Once the maturity of knowledge and technology has made it possible to deplete biological resources, consciousness and practices referred to as management are essential for sustainability. If local ecosystems are used by local inhabitants, motivation for voluntary management is enhanced, making management through mutual monitoring effective. On the other hand, external

users are less motivated to use ecosystems in a sustainable manner, because their life is distanced from those local ecosystems. In order to achieve the “wily use of the outsiders, by the outsiders, for the outsiders,” the best option is to exploit the resources in a minimum time and then move on to another area with abundant resources. Therefore, the importance of the role of the “local inhabitant” is emphasized. “Local inhabitants” are those who are passively destined to accept the results of their behavior without having the option to escape from this destiny, or those who have positively chosen the destiny of the area where they live and are resolved to accepting the results of their behavior. In other words, it is the “local inhabitants” that are suitable for taking land stewardship (trustee liability). As a result, environmental governance can be more effective if it is implemented with a method closely connected to nature and life in a layered bottom-up manner rather than carried out by broadly impacted external people in a top-down manner. Even technological innovation based on scientific knowledge is likely to contribute to the complete exploitation of nature unless “local inhabitants” are willing to use resources in a sustainable manner. Forestry logging technology such as chainsaws, forest road construction, and wiring technology as well as fishing technology such as fish-finders and high-speed ships have obviously amplified the negative impact imposed on the natural environment, leading people to exploit resources. However, environmental governance helps to control resource exploitation. For example, in the case of the *satoumi*, the Akita Fisheries Cooperative Association has achieved a drastic recovery of resources through voluntary banning of sandfish fishing activities for three years. In the case of the *satoyama*, although external political or economic pressure has intended to exploit forestry resources, forest areas have still been maintained where there has been the will to cherish and use local resources wisely.

#### 4. Conclusion

Since the energy and fertilizer revolutions in the 1960s, traditional fuel and fertilizer provisioning functions performed by the *satoyama* have declined. In addition, imports of inexpensive agricultural and marine products through trade have deprived *satoyama* food provisioning functions of market value. A decrease in the economic value of these *satoyama* provisioning services has resulted in stagnation of local economies and has forced people to immigrate to urban areas for jobs and livelihoods. As a result, the workforce for maintaining and managing the *satoyama* and *satoumi* has been lost, devastating these regions. This study has suggested an increase in the value of regulating services among ecosystem services provided by the *satoyama* and *satoumi* as well as an externalization trend of this phenomenon. This study has examined the effectiveness of the following four policy options with regard to the restoration of the *satoyama* and *satoumi*: (1) environmental stewardship, (2) branding, (3) double habitation, and (4) enhancement

of knowledge and awareness, as well as nurturing of the new bearers. For these policy options, this study has focused on and analyzed the effectiveness of provisioning services and regulating services. This is the first attempt to integrate a natural scientific assessment of benefits brought to human society by the *satoyama* and *satoumi* with a socioeconomic assessment of the same in order to demonstrate specific policy options and their effectiveness regarding a pathway to reconstruction of a nature-harmonious society. The policy options proposed in this paper are related to typical themes to be discussed, making it possible to examine more diverse options. In addition, the economic effects of these policy options have been quantified based on limited data. Therefore, further improvement is needed in regard to quantitative accuracy. Particularly, in relation to regulating services, the value is underestimated and hence the evaluation method must be improved. Moreover, in the future, it will also be necessary to develop quantitative assessment of important cultural services that are difficult to evaluate in the value of the *satoyama* and *satoumi*. The value of the *satoyama* and *satoumi* cannot be measured only by GDP, which is an indicator for economic growth. It is imperative to incorporate all capital elements such as produced capital, human capital, natural capital and social capital. In particular, in order to create a pathway toward the restoration of the *satoyama* and *satoumi* and reconstruction of a nature-harmonious society, it is important to encourage urban residents who do not have a direct connection with the *satoyama* and *satoumi* to become more aware of the social value of these ecosystems by integrating this comprehensive value into economic calculation and development/educational systems.

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