Kazuhiko Takeuchi

Rebuilding the relationship between people and nature: the Satoyama Initiative

Received: 28 December 2009 / Accepted: 14 June 2010 / Published online: 14 August 2010
© The Author(s) 2010. This article is published with open access at Springerlink.com

Abstract The *satoyama* landscape is a traditional Japanese rural land-use system that represents a balanced relationship between human beings and nature, thereby sustaining a variety of ecosystem services, including the diversity of secondary natural environments. Overuse of the *satoyama*, as occurred during the Edo and early Meiji periods, as well as underuse as seen in the wake of the fuel and fertilizer revolutions of the 1960s, destroy this balance and hence the sustainability of this system. The Satoyama Initiative is an effort to rebuild a healthy relationship between nature and people who respect the traditional knowledge embodied in the *satoyama* system, and to explore new shared management systems (“new” commons) in which various actors, including corporations, participate in working toward the combined goals of a low-carbon, resource-circulating, nature-harmonious society. In the interests of furthering cooperation with developing nations, it is important that this initiative pay heed to the need for improved agricultural, forestry, and livestock industry productivity that harmonizes with the natural environment, and to the improvement of human well-being and the reduction of poverty.

Keywords Satoyama landscape · Biodiversity · Ecosystem services · Sustainable society · Nature-harmonious society · Satoyama Initiative · New commons

Introduction

Efforts to build a sustainable society are underway in various parts of the world. In Japan, the government made a cabinet-level decision promulgating “Becoming a Leading Environmental Nation Strategy in the 21st Century—Japan’s Strategy for a Sustainable Society” on 21 June 2007. As a member of a special committee of the Central Environmental Council on Environmental Nation Strategy in the 21st Century at which this strategy was debated, I argued that it was crucial that we seek to achieve a sustainable society by integrating our respective efforts to create a low-carbon society, a resource-circulating society, and a nature-harmonious society. This approach was incorporated into the strategy. The integration of these three images of a future society consists, in essence, of formulating a vision of a society that is sustainable from the three aspects of energy, resources, and ecosystems, as well as formulating an integrated policy that takes into account the interrelationships among these three aspects (Komiyama and Takeuchi 2010).

Of these three societal visions, a low-carbon society and a resource-circulating society are subjects of active discussion in such contexts as the United Nations Framework Convention on Climate Change (UNFCCC) and the 3R Initiative. Japan in particular has made great strides toward achieving a resource-circulating society. However, efforts to create a nature-harmonious society—i.e., one in which human activities and the natural environment coexist in harmony—have been far from adequate, despite the work in certain regions of a number of nature conservation and revitalization programs, national park and nature preserve administrations, and the like. Moreover, the vision of a nature-harmonious society that incorporates the goals of a low-carbon society and a resource-circulating society has yet to be articulated.

The Conference of the Parties (COP 10) to the Convention on Biological Diversity (CBD) that will convene in October 2010 in Nagoya, Japan, offers an ideal

K. Takeuchi (✉)
Integrated Research System for Sustainability Science,
The University of Tokyo, Tokyo 113-8654, Japan
E-mail: takeuchi@ir3s.u-tokyo.ac.jp; takeuchi@unu.edu
Tel.: +81-3-58411552; +81-3-54671237
Fax: +81-3-58411553; +81-3-34067347

K. Takeuchi
Institute for Sustainability and Peace,
United Nations University, Tokyo 150-8925, Japan

opportunity to promote the building of a nature-harmonious society in Japan. The Japanese public exhibits a high interest in climate change and the 3Rs (reduce, reuse, recycle), but awareness of the importance of ecosystems and biodiversity is limited to a few specialists and concerned citizens. In response to a question about the meaning of “biodiversity” in a public opinion survey on environmental problems conducted by the Cabinet Office of the Government of Japan, only 12.8% of respondents said that they knew what the word meant; 23.6% replied that they did not know the meaning but had heard of it; and 61.5% said they had never heard of it (Cabinet Office Minister’s Secretariat Government Public Relations Department 2009).

Becoming a Leading Environmental Nation Strategy in the twenty-first century includes a proposal to develop a global strategy for pursuing a healthy relationship between people and nature as represented by the traditional Japanese rural land-use system of the satoyama landscape, utilizing that system as a model for a nature-harmonious society, and working in concert with other regions of Asia and the rest of the world to conserve and revitalize similar systems. The Satoyama Initiative is the embodiment of that proposal. In this paper I will review the dynamic, ever-changing relationship between humans and nature reflected in the satoyama landscape, propose an approach toward its revitalization, and describe the efforts undertaken by the Satoyama Initiative toward this end.

Changes in the satoyama landscape

Narrowly defined, *satoyama* (literally, “uplands near villages”) refers to secondary woodlands and grasslands near human settlements that have traditionally used these lands as coppices and meadows for fuel, fertilizer, and fodder. In the broader sense, however, *satoyama* also encompasses farm fields, rice paddies, irrigation canals and ponds, and the settlements themselves. We have used the term *satoyama landscape* to distinguish this broader meaning from the narrower one (Takeuchi et al. 2002). The satoyama landscape is, in other words, a heterogeneous landscape, a land-use mosaic. The different land-use elements that make up this mosaic are interrelated to one another, and together form a cohesive system.

The satoyama landscape is highly valued because it provides a diversity of ecosystem services. According to the Millennium Ecosystem Assessment (2003, 2005) conducted by the United Nations from 2001 to 2005, biodiversity provides many such ecosystem services. These are categorized into provisioning services (e.g., provision of food and fuel), regulating services (e.g., regulation of climate and water), cultural services (e.g., spiritual and aesthetic values), and supporting services (e.g., water cycling and soil formation). All of these services, it is asserted, are indispensable to human well-being. The Sub-Global Assessment of Satoyama and Satoumi in Japan (Japan SGA), conducted under

the auspices of the United Nations University (UNU) Institute of Advanced Studies, is currently evaluating the ecosystem services provided by the satoyama landscape, and plans to publish a report in the near future. The Japan SGA (Morimoto and Kondo 2009) highlighted the importance of cultural services among the various ecosystem services provided by satoyama landscapes, since they have historically been formed as traditional cultural landscapes, ensured by traditional knowledge (Cetinkaya 2009).

The satoyama landscape serves as a valuable model of a nature-harmonious society because it fosters the biodiversity of a secondary natural environment created through interaction between human activities and nature. It is the periodic disturbance of the ecosystem by agricultural and forestry activities (Buckley 1992) that has maintained the diversity of this “secondary nature”. The flora and fauna that have inhabited this environment of cold-temperate grasslands and deciduous woodlands, including relict species that have survived since the last ice age, faces extinction if the deciduous woods give way to evergreen species, or if the meadows turn to forest (Moriyama 1988). For example, spring ephemeral plant species such as *Erythronium japonicum* can survive only when intolerant tree woodlands are maintained. The current wildlife inhabitants have survived in this environment precisely because these grasslands and deciduous woodlands have been maintained by periodic human disturbance. Moreover, this land-use mosaic has provided a diversity of wildlife habitats by permitting the establishment of vegetation in varying stages of succession.

Since the 1960s, however, this close relationship between human beings and nature has become frayed, and today the relationship threatens to disintegrate altogether. The primary reason for this is the increasing use of fossil fuels and chemical fertilizers, which has led to a precipitous decline in the use of coppices for firewood and charcoal as well as for compost. The massive importation of livestock feed has caused grasslands maintained for that purpose to fall into disuse as well. Meanwhile, the aging and diminishing population of rural areas has made it increasingly difficult to cultivate and maintain rice paddies, whether in terraces or on the valley floors. Cultivation of dry fields and paddies in hilly or mountainous areas in particular is being abandoned. The satoyama landscape itself faces extinction.

Another factor in the loss of the satoyama landscape is the breakdown of the functional relationships among the elements of the land-use mosaic. The satoyama landscape once provided a system for the cyclical use of bioresources: villages and cities used the firewood and charcoal from the coppices; compost, as well as waste from the villages and cities, was applied to the fields and paddies; and vegetation provided fodder for livestock. In view of the circulation of bioresources described here, the satoyama landscape thus serves as a model not only for a nature-harmonious society, but for a resource-circulating society as well. Today, however, this process

of circulation, too, has collapsed with the advent of an economic system that seeks to improve productivity through greater efficiency in the form of monocultural land-use, and hence threatens to eliminate the small-acreage land-use pattern of the satoyama landscape.

Reassessing the satoyama landscape

Meanwhile, the collapse of the satoyama landscape has also triggered a reassessment of its value, a trend that ironically began in the 1960s, just as disintegration of the nature–human relationship was starting to accelerate. It was during this period that massive housing developments were planned to accommodate the burgeoning populations of Japan's major urban areas, particularly Tokyo, Osaka and Nagoya. These developments were built in satoyama areas on the outskirts of the cities. Having lost their traditional functions as sources of fuel, fertilizer and fodder, the satoyama woodlands were considered prime locations for large-scale housing construction. Although these satoyama lay in hilly areas on the periphery of the plains on which the cities were built, the development of large-scale earthmoving equipment in the 1960s made it feasible to flatten this rolling terrain, and the construction of vast stretches of suburban housing proceeded apace.

The massive land-clearing operations that accompanied these housing projects transformed the natural environment that had been maintained until then as part of the satoyama landscape. One consequence was that people became aware of the loss of the many ecosystem services that the satoyama had provided, and of the importance of preserving the landscapes that remained. In fact, the term satoyama did not enter common parlance until the 1960s, when it was first popularized by forest ecologist Shidei (2000). The loss of large swathes of a natural environment for which people felt a close affinity—the satoyama landscape—proved to be the catalyst for a reappraisal of that landscape not only by city-dwellers but by citizens all over Japan.

If, however, our goal is to revive this newly appreciated satoyama landscape so that it can once again provide the ecosystem services it traditionally has, mere protection of satoyama areas is not enough. A process of periodic disturbance is needed to replace the traditional disturbance process effected by agriculture and forestry. Unlike with croplands and paddies, it has been difficult to make a case for the economic value of conserving satoyama woodlands previously used as coppices for firewood, charcoal and so on. Near the largest cities, however, these woodlands have been the beneficiaries of management by citizen volunteers. Such management has provided a tremendous opportunity for urbanites to gain a renewed appreciation of the importance of rebuilding the relationship between people and nature in preserving the biodiversity, and the aesthetic and recre-

ational value, of secondary natural environments like the satoyama. These managed satoyama areas also play an important role as part of urban greenbelts.

Even so, volunteer-based satoyama management cannot possibly provide for maintenance of the satoyama landscapes that make up an estimated 40% of all land in Japan. Particularly in hilly and mountainous areas, the entire satoyama landscape is on the verge of disappearing. To revitalize it will require the development of a strategy utterly unlike those implemented to revive satoyama to date. Revitalization of these landscapes on such a broad scale will require not only the development of approaches to a resource-circulating society based on traditional bioresources, but also the reinforcement of aspects that address the goals of a low-carbon society and a nature-harmonious society. In sum, what is needed is a proposal to treat the satoyama landscape as a new model for a sustainable society addressing all these goals.

Proposals of the Satoyama Initiative

What did the satoyama landscape of nineteenth-century Japan (during the late Edo and early Meiji eras) look like? This was a period when, unlike today, people did not rely on fossil fuels or chemical fertilizers at all. Instead, society was dependent almost entirely on bioresources, particularly plant resources. Consequently, the satoyama areas of Japan, serving primarily as coppice woodland for fuel and compost, or as a source of other forest products, were subjected to overuse (Ichikawa et al. 2006). Many such areas became denuded of vegetation and suffered from soil erosion. These aspects of the landscape of this period are clearly visible in Edo-era illustrations and Meiji-era photographs.

Such evidence demonstrates that we cannot simply say that the satoyama landscape enjoyed a stable nature–human relationship for hundreds of years, or that this relationship began to fray only in the past 50 years or so. Essentially, we must view the satoyama landscape as representative of a dynamic nature–human relationship in which human dependence on bioresources varies from era to era. Our objective in launching the Satoyama Initiative is to revitalize the satoyama landscape, not in order to restore it to some nostalgically envisioned state, but to rectify the imbalance that has occurred as a result of successive periods of overuse and underuse.

A similar emphasis can be seen in the Globally Important Agricultural Heritage System (GIAHS) designation promoted by the UN Food and Agricultural Organization (FAO 2003, 2008). A GIAHS is defined as a land-use system or landscape deserving of recognition on a global level for its application of traditional knowledge that contributes to sustainability and biodiversity. The GIAHS initiative particularly highlights the use of dynamic conservation and adaptive management. In its emphasis on the future rather than the past, it

shares the same orientation as the Satoyama Initiative. Enhanced cooperation between these initiatives and the active exchange and presentation of information at events like CBD/COP10 should lead to more global recognition of the merits of revitalizing traditional, agriculture- and forestry-based land-use systems.

Fundamental to revitalization of the satoyama landscape is the development of solutions that provide for both the effective use of natural resources and the conservation of the ecosystem. Regarding natural resources utilization, we must underscore not only the cyclical use of bioresources effected by satoyama in the past, but also their potential contribution to the achievement of a low-carbon society through the use of biomass energy. The traditional satoyama landscape is, basically, an example of both a resource-circulating society and a low-carbon society since the landscape is managed mainly through the cyclical use of bioresources, which is essentially carbon-neutral (Komiya and Takeuchi 2010). How to revitalize such landscapes amid today's globalized society is a challenge with immense relevance to the broader question of how to create a sustainable society in the twenty-first century.

Traditional landscapes and land-use systems

This issue is especially relevant to efforts to expand the Satoyama Initiative to other regions of the world. In developing nations, traditional land-use systems are being neglected, and in many regions dismantled, in the wake of urbanization and agricultural modernization. Meanwhile, large-scale urban and rural development has exacerbated such environmental problems as deforestation, soil erosion, and water pollution, threatening the sustainability of local environments. If sustainable societies are to be revived on the local level in these regions, a renewed recognition of the critical role performed by traditional land-use systems in maintaining ecosystem services is imperative.

We must pay particular attention to traditional agroforestry (Kumar and Nair 2006; Kumar and Takeuchi 2009), as typified by the *pekarangan* and *kebun-tahun* agroforestry methods practiced in West Java, Indonesia (Christanty et al. 1986; Abdoellah et al. 2006). The *pekarangan* is a home garden, planted on the land surrounding a dwelling, that combines timber, fruit trees, crops and medicinal plants (Table 1). Also found there are poultry and other livestock, as well as fish ponds. The *pekarangan* can thus be viewed as a reconstruction of a complex tropical forest ecosystem consisting of useful flora and fauna, which also has the attribute of doing minimal harm to the environment. The *kebun-tahun* is a system that alternates a rotating garden (*kebun*) with a tree plantation (*tahun*) in a 6-year cycle. Two years of crop cultivation are followed by 4 fallow years while trees are allowed to grow on the land. During the fallow period, the trees provide resources like fruit, timber and fuel. The *kebun-tahun* thus deserves note as a sustainable land-use system well suited to tropical environments where soil fertility quickly deteriorates.

In our effort to rebuild sustainable local societies, we must address the current circumstances in which traditional land-use systems are disappearing in the face of massive urban and rural development. Fukamachi et al. (2001) examined the change of a satoyama landscape in Kamiseya, Kyoto Prefecture, Japan, and concluded that “societal, economic and technological changes, especially those that occurred after 1970, were considered the focal points from which major landscape changes developed”. In order to re-evaluate such a traditional land-use system, it is important to understand the socio-economic conditions which have brought major changes in landscapes. To revitalize traditional land-use systems we must not only undertake a proper assessment of the role played by these land-use systems in maintaining local sustainability, but also devise new approaches to developing land-use systems that can survive in today's globalized economy. Precisely because such a process dovetails with the process of revitalizing the satoyama

Table 1 Examples of traditional landscape/land-use systems in the world

Country	Local terms	Characteristics
Korea	Maeul (village) Maeulsoop (village forest)	Maeul: landscape composed of mountain in the back, residential area, streets, croplands, streams, and ponds
China	Rice-fish agriculture	Fish farming in rice paddies
Indonesia	Kebun-Talun Pekarangan (homegarden)	Shifting cultivation system A mixture of agricultural crops, tree crops, and animals on the land surrounding a house
Spain	Dehesa	Agrosilvopastoral system (sparse wood pasture grazed by livestock)
Zambia, Malawi, Mozambique	Chitemene	Slash-and-burn system (branches of trees on an area several times the size of the cultivated field are cut and piled on the central field where they are burnt to fertilize acidic, nutrient-poor soils)

landscape I have described above, it behooves the Satoyama Initiative to contemplate how to re-evaluate traditional land-use systems in developing countries as well.

We must bear in mind that traditional, locality-specific land-use systems or landscapes of this sort exist all over the world, in developed and developing countries alike (Table 1). Some other examples are the *maeul* (village) land-use system of Korea, which resembles the satoyama landscape, consisting as it does of a village located at the foot of forested mountains, with croplands, streams and ponds. The Korean equivalent of the Japanese *satoyama* is the *maeulsoop* (village groves; Kwon et al. 2006). In Spain, the *dehesa* are pasturelands interspersed among sparse woods, where pigs and other livestock are raised (Gómez-Limón and Fernández 1999)—in other words, an agroforestry land-use system that can be classified as agrosilvopastoral.

Another land-use system registered as a GIAHS is the traditional combined system of rice–fish agriculture employed in China’s Zhejiang Province, which utilizes integrated management to reduce pressure on the environment even as it maximizes earnings (Min et al. 2009). In the Miombo woodlands of Zambia, Malawi and Zimbabwe in southern Africa, the *chitemene* system of slash-and-burn agriculture does not clear-cut entire areas of trees, but rather prunes only the branches, which are gathered and burned in a specific area where crops are to be grown (Takeuchi 1988). By thus ensuring the conservation and rapid regrowth of trees, this system is admirably suited to a region with relatively low rainfall.

In re-evaluating these traditional landscapes and land-use systems, and attempting to apply the lessons they offer in the establishment of sustainable societies by somehow integrating them with our modern socioeconomic system, we must not lose sight of the fact that these traditional systems are the product of many years of human coexistence with nature and that, consequently, the forms they take vary dramatically with the environmental and cultural characteristics of each locality. We therefore need to respect this diversity, determine how to construct or reconstruct systems that are appropriate for the locality in question, and formulate specific measures for applying the use of these systems in the establishment of sustainable societies that embrace the three globally shared imperatives of a low-carbon society, a resource-circulating society, and a nature-harmonious society.

The vision of the Satoyama Initiative

We have had occasion to conduct trial calculations in the Saku district of Nagano Prefecture, Japan to determine the extent to which the recovery of satoyama landscape resources would contribute to resource and energy self-sufficiency in the area (Harashina and Takeuchi 2004). Our study showed that the district could become 100% self-sufficient in timber, which is

currently imported from overseas, if sustainable forestry management practices and a 50-year rebuilding cycle were put into effect. The district could also provide about 60% of its heating needs from a combination of wood biomass energy and biogas generated from methane fermentation of raw garbage and animal and human waste. After methane fermentation, this garbage and waste could also provide fertilizer in excess of the amount required for all farmland in the district. Finally, cultivation of feed rice in currently abandoned paddies could feed 1.4 times as many cattle as are currently raised in the district. The Saku study is just one example, but it suggests that a sustainable society is feasible in most rural areas of Japan.

Rebuilding a resource-circulating society using the satoyama landscape in this manner also promotes the use of bioresource energy. For example, Kuzumaki Town in Iwate Prefecture, has developed a renewable energy source by using wooden pellets for fuel (Nakagawa 2002). Such bioresources are essentially carbon-neutral and therefore contribute significantly to the achievement of a low-carbon society as well. Moreover, as a locality grows more self-sufficient in wood, food, and feed, it reduces the energy consumed for transport, which further enhances efforts to achieve a low-carbon society. As long as resource and energy use remains within the limits of the area’s environmental capacity and natural resilience, the satoyama landscape will continue to provide its ecosystem services indefinitely. A similar idea was proposed by Fischer et al. (2009), who insisted on the integration of research into land management, and in particular “resilience thinking” and “optimization of conservation”. Furthermore, for the satoyama landscape, management that maintains the appropriate level of human disturbance of the landscape will increase the diversity of this secondary natural environment, enabling flora and fauna that have survived since the last ice age to flourish (Moriyama 1988).

Similarly, the expansion in developing countries of agroforestry utilizing multilayered ecosystems through the revitalization of local traditional land-use practices in place of plantations and other large-scale agricultural developments can contribute to the establishment of a sustainable society that combines the features of resource-circulating, low-carbon, and nature-harmonious societies. To achieve this, however, requires efforts to improve agrosilvopastoral productivity while reducing the burden on the natural environment. In Tome-Acu, a settlement in the Amazon region of Brazil, Japanese–Brazilians have successfully engaged in agroforestry, marketing cacao, acai and other products in collaboration with Japanese companies (Yamada and Osaqui 2006). With slash-and-burn farming practices in the Amazon destroying the rain forest and exerting a significant impact on the global environment, the expansion of agroforestry practices that utilize the forests without destroying them will contribute to a sustainable society that effectively balances economic and environmental needs in rain forest regions.

An important point to be learned from the Brazil project is that agroforestry is predicated on the small-scale production of a large number of products, and hence differs drastically from the prevailing economic mode of profiting from the mass production and mass marketing of a few products. Agroforestry therefore requires the enhancement of earnings through production and marketing of products with high added value and the development of a system of partnerships with multiple companies to share the handling of these various products. Corporate participation of this sort can and should be applied to satoyama landscapes as well. The Amita Corporation, which began as a recycler of discarded goods, now engages in woodland grazing of dairy cattle in satoyama areas in Kyotango, Kyoto Prefecture, and Nasu, Tochigi Prefecture. The project has successfully generated profits from the marketing of high added-value products—milk and ice cream—while the grazing of cattle aids in satoyama management. The Satoyama Initiative should highlight the importance of efforts by companies like Amita.

The Satoyama Initiative recognizes the need for a major reassessment of the system of management of satoyama landscapes, which in the past were maintained exclusively by households engaged in farming and forestry. The satoyama consisted primarily of co-owned woodland that was managed jointly by local residents. But this system, too, has collapsed in recent decades—yet another cause of the deterioration of the satoyama. If we wish to revitalize the satoyama landscape, we also need to re-establish a system of joint satoyama management. The importance of “commons” has been revisited by many sociologists and political economists, as represented by Ostrom (1990, 2005) who clarified the possibility of self-governance of common-pool resources. Murota (2009) summarized recent debates in Japan concerning local commons in the era of globalization. He pointed out that the current dichotomy of “public” and “private” is not appropriate, and that an intermediate category of “common” must be established. Matsuura et al. (2009) examined the effectiveness of stakeholder analysis for diversified stakeholders and different environmental factors, and suggested that a new forum was necessary, with a different agenda and set of participants. The Satoyama Initiative uses the term “new” commons to describe such co-management system, which would involve the participation not only of farming and forestry households, but also local governments, businesses, NGOs/NPOs, and urban residents, in the formulation of a new framework for natural resources management. One requirement of the “new” commons is, of course, that it be economically sustainable.

Conclusion

In order to discuss the concept and activities to be included in the Satoyama Initiative, a Global Workshop was held at UNESCO Headquarters in Paris in January

2010, resulting in the Paris Declaration (<http://www.satoyama-initiative.org>). I attended the Workshop as one of the four Co-Chairs. The Declaration clarified the target of the Initiative as “socio-ecological production landscapes” which is defined as “dynamic mosaics of habitats and land uses that have been shaped over the years by the interactions between people and nature in ways that maintain biodiversity and provide humans with goods and services needed for their well-being”. It also highlighted the aims of the Initiative as: (1) to enhance understanding and raise awareness of the importance of socio-ecological production landscapes for livelihood; (2) to enhance capacities for maintaining, rebuilding and revitalizing socio-ecological production landscapes; and (3) to collaborate with and/or strengthen synergies with local community organizations, national governments, donor agencies, and NGOs, other UN agencies and organizations in the implementation of their respective activities.

When CBD/COP 10 convenes in October 2010 in Nagoya, it will serve as a forum for debate on short-term and long-term strategies for preserving and revitalizing the ecosystems and biodiversity of the planet. Post-2010 targets will also be set. The Paris Declaration suggested that:

“The Satoyama Initiative can be used as an instrument for the implementation of the proposed 2020 targets relating to (1) the sustainable management of all areas under agriculture, aquaculture, (2) the reduction below critical ecosystem loads of pollution from excess nutrients and other sources; the management of the multiple pressures on vulnerable ecosystems impacted by climate change and ocean acidification, (3) the improvement of the status of crop and livestock genetic diversity in agricultural ecosystems and of wild relatives, (4) the raising of awareness of the role of biodiversity, (5) the safeguarding or restoration of terrestrial, freshwater and marine ecosystems that provide critical services, and contribute to local livelihoods, (6) the guarantee for all of adequate and equitable access to essential ecosystem services, (7) the protection of traditional knowledge, innovations and practices, as well as the rights of indigenous and local communities, and (8) the increase of capacity for implementing the Convention on Biological Diversity”.

I strongly believe that a long-term target of achieving a balance between the deterioration and restoration of the world’s ecosystems by 2050, thereby effecting “no net loss” on a global scale, is a goal in accord with the ambitious UNFCCC target of reducing global-warming gases by half by 2050. As a vehicle for fundamentally reassessing the agricultural, forestry and livestock industry practices that have so far resulted in the sacrifice of our ecosystems and biodiversity, and for devising modes of production that can better coexist with

ecosystems and biodiversity, the Satoyama Initiative can be an effective part of this effort to achieve “no net loss.”

Acknowledgements This study was supported by the Environment Research and Technology Development Fund (ERTDF), Ministry of the Environment, Japan, entitled “Ecosystem Services Assessment of Satoyama, Satochi and Satoumi to Identify New Commons for Nature-Harmonious Society (E-0902)”.

Open Access This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

References

- Abdoellah OS, Hadikusumah HY, Takeuchi K, Okubo S, Parikesit (2006) Commercialization of homegarden in an Indonesian village: vegetation composition and functional changes. *Agrofor Syst* 68:1–13
- Buckley GP (ed) (1992) Ecology and management of coppice woodlands. Chapman & Hall, London
- Cabinet Office Minister's Secretariat Government Public Relations Department (2009) A public opinion poll about the environmental problem (Attachment: a special public opinion poll about the local reproduction) (in Japanese). Cabinet Office Minister's Secretariat Government Public Relations Department
- Cetinkaya G (2009) Challenges for the maintenance of traditional knowledge in the satoyama and satoumi ecosystems, Noto Peninsula, Japan. *Hum Ecol Rev* 16:27–40
- Christanty L, Abdoellah OS, Marten GG, Iskandar J (1986) Traditional agroforestry in West Java: the pekarangan (homegarden) and kebun talun (annual-perennial rotation) cropping systems. In: Marten GG (ed) Traditional agriculture in Southeast Asia. Westview, Boulder, pp 132–158
- Fischer J, Peterson GD, Toby A, Gardner TA, Gordon LJ, Fazey I, Elmqvist T, Felton A, Folke C, Dovers S (2009) Integrating resilience thinking and optimisation for conservation. *Trends Ecol Evol* 24:549–554
- Food and Agriculture Organization (FAO) (2003) Terminal report: Globally Important Ingenious Agricultural Heritage System (GIAHS), FAO, Rome
- Food and Agriculture Organization (FAO) (2008) Terminal report: Globally Important Ingenious Agricultural Heritage System (GIAHS) PIMS 2050, FAO, Rome
- Fukamachi K, Oku H, Nakashizuka T (2001) The change of a satoyama landscapes and its causality in Kamiseya, Kyoto Prefecture, Japan between 1970 and 1995. *Landsc Ecol* 16:703–717
- Gómez-Limón J, Fernández JVL (1999) Change in use and landscape preferences on the agricultural-livestock landscapes of the central Iberian Peninsula (Madrid, Spain). *Landsc Urban Plan* 44:165–175
- Harashina K, Takeuchi K (2004) Study on regional bioresource utilization and recycling system in a case of Saku City, Nagano Prefecture, Central Japan (in Japanese with English abstract). *J Jpn Inst Landsc Archit* 67:741–744
- Ichikawa K, Okubo N, Okubo S, Takeuchi K (2006) Transition of the satoyama landscape in the urban fringe of the Tokyo metropolitan area from 1880 to 2001. *Landsc Urban Plan* 78:398–410
- Komiyama H, Takeuchi K (2010) Sustainability science: building a new academic discipline. In: Komiyama H, Takeuchi K, Shiroshima H, Mino T (eds) Sustainability science—a multidisciplinary approach. UNU Press (in press)
- Kumar BM, Nair PKR (eds) (2006) Tropical homegardens. Springer, Dordrecht
- Kumar BM, Takeuchi K (2009) Agroforestry in the Western Ghats of peninsular India and the satoyama landscapes of Japan: a comparison of two sustainable land use systems. *Sustain Sci* 4:215–232
- Kwon J, Shin JH, Kim YK, Choi MS, Oh JH (2006) Geographical characteristics of the MAEULSOOP (Korean village groves) between southwestern flat region and eastern hilly region. Nippon Seitai Gakkai Taikai Koen Yoshishu, 53rd edn
- Matsuura M, Suzuki T, Shiroshima H (2009) Stakeholder assessment for the introduction of sustainable energy and environmental technologies in Japan. In: ISTAS, Proceedings of the 2009 IEEE international symposium on technology and society, IEEE Computer Society, Washington, pp 1–9
- Millennium Ecosystem Assessment (2003) Ecosystem and human well-being—a framework for assessment. Island, Washington, pp 54–60
- Millennium Ecosystem Assessment (2005) Ecosystem and human well-being—general Synthesis. Island, Washington, pp 39–40
- Min Q, Sun Y, van Schoorbroeck F, Liang L, Dela Cruz MJ (2009) The GIAHS-rice-fish culture: China project framework. *Resour Sci* 31(1):10–20
- Morimoto J, Kondo T (2009) Satoyama-satoumi sub-global assessment in Japan and involvement of the Hokkaido Cluster. *Landsc Ecol Eng* 5:91–96
- Moriyama H (1988) Shizen wo mamoru toha douiu kotoka (On nature conservation) (in Japanese). Nonsangyoson-bunka-kyoukai, Tokyo
- Murota T (ed) (2009) Gurobaru-jidai-no-local-commons (Local commons in the era of globalization) (in Japanese). Minerva-shobo, Tokyo
- Nakagawa S (2002) Coppice wood as an energy source. In: Takeuchi K, Brown RD, Washitani I, Tsunekawa A, Yokohari M (eds) Satoyama: the traditional rural landscape of Japan. Springer, Tokyo, pp 158–171
- Ostrom E (1990) Governing the commons: the evolution of institutions for collective action. Cambridge University Press, Cambridge
- Ostrom E (2005) Understanding institutional diversity. Princeton University Press, Princeton
- Shidei T (2000) Miscellaneous notes of farm forest. *Bull Kansai Organ Nat Conserv* 22(1):71–77 (in Japanese)
- Takeuchi K (1988) “Chitemene” a type of shifting cultivation in Zambia (in Japanese). *Tropical For* 13:2–7
- Takeuchi K, Brown RD, Washitani I, Tsunekawa A, Yokohari M (eds) (2002) Satoyama: the traditional rural landscape of Japan. Springer, Tokyo
- Yamada M, Osaqui HML (2006) The role of homegardens in agroforestry development: lessons from Tome-Acu, a Japanese–Brazilian settlement in the Amazon. In: Nair PKR, Kumar BM (eds) Tropical homegardens. Springer, The Netherlands, pp 299–316