Satoyama
The Traditional Rural Landscape of Japan
With 85 Figures
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Preface

The traditional term satoyama has recently come back into common usage in Japan. Environmentally conscious individuals use satoyamas to symbolize nature that requires management. The term satoyama, however, does not have a specific definition and this has sometimes caused confusion when scientific discussions are attempted. In this book, satoyamas are defined as secondary woodlands and grasslands adjacent to human settlements. The more general term satoyama landscape describes the broader area of secondary nature, including satoyamas, as well as cultivated lands, human settlements, and wetlands.

This book aims to describe satoyama landscapes from the scientific perspective, as well as discuss directions for conservation from three different points of view: scientific, citizen participation, and political.

The main focus of this book is on the nature of satoyama landscapes. The assertion of this book is that the secondary nature in satoyama landscapes is a consequence of a coexistence between nature and humans. In order to conserve satoyama environments, adequate land management is as essential as physical land protection.

Satoyama landscapes are suffering from pressures associated with development and, to make matters worse, the few remaining satoyamas are being neglected. It is essential in satoyama conservation to determine how to continue with human intervention and, at the same time, to act so as to protect the remaining physical land area. Attempts are made in this book to reveal biodiversity transformation through human intervention in order to propose a direction for satoyama management.

However, sustainability of satoyamas cannot be discussed without consideration of the integrity of the broader satoyama landscape. The fuel revolution has deprived satoyama landscapes of one of their most important functions. Cultivated lands, human settlements, and wetlands are also suffering from land abandonment and the destruction of secondary nature due to urban development. In this book, the condition of satoyama landscapes is reviewed through a chronology of land use. The importance of nature conservation is evaluated and a systems approach to conserving nature is discussed. One of the conclusions resulting from this review is that there is a need to redevelop sustainable societies based on bioresources.

Concerned citizens play a major role in satoyama landscape conservation. Satoyama landscapes are considered not only as a surviving natural environment, but also as the nature of the good old days, the Japanese idyllic landscape. The recognition of the need for adequate management can motivate citizen participation. When one considers that, in the past, only farmers conducted satoyama landscape management, the situation has changed quite dramatically. Both the participants and the techniques have changed. This book argues for the need to support citizen movements, separate from bureaucracy, but with appropriate cooperation and recognition of their roles and abilities.

The 21st century is said to be the century of the environment. We need to change our relationship with nature, which has seen a sad segregation develop through modernization, and seek coexistence. People need to coordinate with global per-
spectives and work within their own region to create living environments that are in harmony with nature. This way of thinking could be a touchstone to fuse global and local cultures together. I expect that this book will be a step toward those attempts for the future.

This book was edited based on the results of a research group on the establishment of a strategy for the conservation of satoyama landscapes, aiming to achieve integrated and planning-oriented conservation of satoyama landscapes, which was supported by the Nippon Life Insurance Foundation for 2 years in 2000 and 2001. The Japanese edition of this book was published by the University of Tokyo Press in November 2001.

The international edition of the book was edited based on the Japanese edition and necessary modifications were made. Particularly, for international readers, a new chapter describing the global view of the satoyama landscape was added in order to clarify the uniqueness and similarity of satoyama landscapes to coppice woodland utilization throughout the world. I believe that this book will contribute to the promotion of worldwide comparative studies on this topic by the expected readers, such as researchers, citizens, and administrative officers, as well as non-governmental organizations (NGOs) that are actively involved in conservation activities.

I am deeply grateful to Dr. Amal Kar, Dr. Satoru Okubo, Ms. Rui Seguchi, Mr. Marco Amati, Ms. Yuki Sampei, and Ms. Kaoru Ichikawa who helped the editing works. I would like to express sincere thanks to the Nippon Life Insurance Foundation, The University of Tokyo Press, and Springer-Verlag Tokyo, who helped us publish this book. I also would like to express our gratitude to the Japan Society for the Promotion of Science for providing us with a Grant-in-Aid for Publication of Scientific Results (No. 145337) for the fiscal year 2002.

Kazuhiko Takeuchi
Editor-in-Chief
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1 Ideological Contribution of Satoyamas

R. D. Brown and M. Yokohari

1.1 Introduction

The 20th century has seen dramatic changes in the way that humans use the landscapes of the world. People are now living in and affecting virtually every environment on earth. There will soon be few truly natural areas left. While it is crucial that we preserve the natural areas, an even more important issue for the 21st century will be to determine how people can live in harmony with the natural environment.

This book considers solutions for the future by looking back. Over the centuries, a pattern of land use emerged in rural Japan that was sustainable over a long period of time. The satoyama landscape system was a harmonious relationship between humans and nature. The nature of the satoyama landscape was managed, and both humans and nature benefited from this management. As human populations continue to grow, and people move into previously unsettled areas, we need successful prototypes like satoyamas as patterns for the development of settlements that will allow both people and nature to survive.

Habitat modification is not a uniquely human trait; in fact, it is quite common in nature. Virtually every organism modifies its environment to its advantage. Examples of natural landscape modifications include everything from African termites building impenetrable mounds, to black walnut trees (Juglans nigra) warding off competition by exuding juglone, which is poisonous to other plants, to the beaver (Castor canadensis) of North America, which cuts down forests of trees and builds dams that flood large tracts of land. Managed landscapes can have a great deal of biodiversity and add an important dimension to the landscape mosaic. In contrast, many human-dominated environments are almost devoid of nature. This is not a prototype for sustainability. Rather, we should be seeking to integrate humans and nature in a manner that is beneficial to both.

The traditional satoyama landscape of Japan did exactly that. The system was devised, through trial and error, as a means of surviving on small mountainous islands in a monsoon climate. Japan is a land of natural disasters. Earthquakes, volcanic eruptions, torrential rains, and typhoons are all normal occurrences. The natural environment of Japan developed under these conditions. As a conse-
The heavy rains of Japan collect quickly in steep mountain streams and make a short, violent dash to the sea. Flooding and property damage are inevitable without careful planning and management. The water management system that was devised and used successfully throughout Japan to mitigate the effects of storms was the basis for a prototypical settlement pattern. The system was simple but very effective (see Figure 2.1). The hillsides were covered with managed woodlands and carefully terraced paddy fields. Human settlements were arranged linearly along the base of the hills. Immediately in front of the settlements were the vegetable gardens, and beyond that were the lowland paddy fields. Rainfall was buffered by the trees, so caused little erosion. The water was slowly but methodically passed from the woodlands and terraced paddies, through the villages to the vegetable gardens, then through paddy after paddy until it gently entered the local stream or river. All along the way, water provided an abundant habitat for wildlife and slowly percolated into the groundwater.

Materials were also cycled within the system. Leaves from the trees were composted and added to vegetable plots and paddy fields. Branches were used for fuel either directly or as charcoal. After trees reached a desired size they were harvested and the stumps were left to sprout. This coppice woodland was managed carefully so there was a constant supply of wood and the woodland always had an open canopy, allowing sunlight to penetrate and maximize the biomass production. Inputs to the system were limited to those provided by nature: precipitation and solar radiation. Outputs included sales of agricultural products and fuel to downstream urban settlements. It was a simple but very effective system that persisted for many generations.

The urban residents of Japan were also deriving a tremendous benefit from the satoyama landscape, perhaps without even realizing it. The most important of these benefits was flood protection. Massive flooding was the norm when heavy monsoon rains would fall on the steep mountains of Japan. Enormous volumes of water would have to traverse short, steep rivers that inevitably ran through urban areas located on the plains below. The water management system of the satoyama landscape mitigated this effect. Another major benefit was slope stabilization. Landslides and soil erosion could make travel and trade treacherous, but the managed satoyama woodlands stabilized the rural environment.

In the middle of the 20th century, however, several events served to disrupt the system. Fossil fuels become more readily available, easier to use, and less expensive than charcoal or wood. Chemical fertilizers became easier to acquire and more effective than composted leaves. Rural residents joined in the worldwide trend of moving into urban areas. Suddenly, the satoyama landscapes that had been central to Japanese life for so long were abandoned and nearly forgotten. Coppice woodlands became dense and overgrown. Understory plants disappeared in the heavy shade and the woodland floor started to erode. Carefully tended paddy field dikes crumbled, allowing water to move more quickly through the landscape, creating more soil erosion. Satoyamas were the forgotten landscape of Japan.
After several decades of decline, the satoyama landscape has only recently begun to be rediscovered. Scientists have begun to measure land use change over time and to determine the effect on everything from biodiversity to landscape stability. Local residents are beginning to realize the natural and cultural value of the satoyama landscapes. Grass-roots community groups are forming to manage the landscapes in traditional ways and give them new life. This resurgence in interest has led to the production of this book. It was originally produced only in Japanese, but we soon realized that there are lessons here that can benefit others outside Japan. Concepts from satoyama landscapes are applicable more broadly. Perhaps we can learn from systems of the past and apply them to the future. This book is intended to document and share information about coppice woodlands and their associated landscape systems in Japan so that others might learn from it.

1.2 International Perspective on Coppice Woodlands

1.2.1 Experiences in Other Countries

The satoyama landscape system revolves around the coppice woodland. There is evidence that woodlands have been managed this way since ancient times, not only in Japan, but also in many other parts of the world. Coppices continue to be areas of considerable interest internationally, with recent studies investigating aspects of coppices in the United Kingdom (e.g. Buckley 1992), Sweden (e.g. Rydberg 2000), France (e.g. Logli and Joffe 2001), the Czech Republic (Konvicka and Kuras 1999), Italy (e.g. Amorini et al. 2001; Cutini 2001), USA (Anderson 1999), Malawi (Abbot and Lowore 1999), Kenya (Kennedy 1998), Korea (Hong et al. 1993), and New Zealand (Sims et al. 2001), to name but a few. The concept has currency in both developed and developing countries, as well as in both traditional and contemporary applications.

The UK has a long history of coppice woodlands that has been going on for hundreds, and in some cases thousands, of years (Buckley 1992). The practice of coppicing trees has created unique ecosystems that, where there is less dead wood, results in a more open canopy, allowing in more solar radiation and, in many cases, a higher diversity of plants and animal species than unmanaged woods. As in Japan, the coppices of the UK are no longer commercially viable and are currently of interest primarily for aesthetic and scientific reasons. Many are being destroyed either through neglect, clearing, or replanting to other species (Buckley 1992). The problems facing UK coppices are similar to the Japanese situation: little or no cutting has taken place in half a century; there is a lack of skilled labor; and management by volunteers does not provide a long-term solution.

Since 1945, the removal of a management regimen in coppices in the UK has altered their ecology (Peterken 1992). Many coppices have been cleared, mostly for agricultural activities, so that distances between remaining coppices have increased. Many of the ancient hedges that connected so many coppice woodlots...
have been removed to enlarge agricultural fields, so connectivity between woodlots has generally decreased. Streams have been altered to improve drainage, meadows and pastures have been reduced or removed, large amounts of agricultural chemicals have been introduced into the environment, and coppices that have survived destruction have been abandoned without management (Peterken 1992).

As in Japan, people in other countries are seeking answers to the coppice question: what should be done with woodlands that were managed for a long time and have now been abandoned? Some efforts have focused on reviving traditional methods of management, whereas others have sought new uses for coppices that lead to economic reasons for their survival.

1.2.2 Use of Coppice Wood for Fuel

In many parts of the developing world, wood is still the main source of domestic energy. One of the key problems in sustainable land use in Africa, for example, is the on-going need for fuel wood and the consequent destruction of native forests. The use of coppices for producing a continuous and renewable source of energy shows considerable promise in countries such as Malawi (Abbot and Lowore 1999) and Kenya (Kennedy 1998).

Other recent investigations have focused on the selection of species of trees for coppicing that will provide the best source of fuel (Senelwa and Sims 1999; Sims et al. 2001), and on energy and carbon budgets from coppices (e.g. Matthews 2001).

1.2.3 Biodiversity

There is currently interest in the UK in the effects of coppicing on the biodiversity in the coppice woodland. There seems to be a growing consensus on how coppices should be managed to provide maximum biodiversity with the increased understanding of how coppices affect plants, birds, mammals, and insects (Buckley 1992). Studies have been done comparing coppice management with natural disturbances (Evans and Barkham 1992), the effects of coppice activities on perennial ground flora (Barkham 1992), woodland breeding birds (Fuller 1992), small mammals (Gurnell at al. 1992), and butterflies (Warren and Thomas 1992). A recent study in the Czech Republic suggested that an endangered butterfly is threatened with extinction due to loss of coppice habitat. These butterflies require the sunny, open environment of the coppice and are disappearing as abandoned coppices become closed-canopy, even-aged woodlands (Konvicka and Kuras 1999). Coppices have been found to provide functions such as pest control and wildlife habitat (Sage 1998). Production is not compromised and few pesticides were required, and, if appropriately located, coppices have the potential to increase biodiversity in many farmland situations.
1.2.4 Contemporary Applications

Coppices are being actively investigated as possible tools for the ecological restoration and recovery of contaminated lands. Recent studies have investigated the use of coppice woodlots for extracting contaminants such as landfill leachate in the USA (Stephens et al. 2000) and radiocesium in Belarus and Western European sites (Vandenhove et al. 2001). Studies in Sweden have investigated coppice treatment of wastewater (Rosenqvist et al. 1997) and investigations have considered the use of coppices as carbon dioxide mitigation measures in the UK (Scholes 1998) and Belgium (Dubuission and Sintzoff 1998).

1.2.5 Developing Versus Developed Countries

There is limited scholarly literature currently available in either Japanese or English that describes the historical and contemporary status of traditional coppice landscapes in other Asian countries. Hong et al. (1993) suggest that the situation in Korea is very similar to that of Japan. Rural landscape patterns in China, as described by Forman (1995), are also similar to the satoyama landscapes of Japan. They are described as a relationship between humans and their natural environment, where woodlands are maintained on potentially erodible slopes and water is carefully managed as it flows slowly through the settlement.

However, the situation in other Asian countries seems to be very different. In developed countries, such as Japan, Korea, and, indeed, almost all the countries described so far in this chapter, the traditional managed landscapes are faced with the problem of abandonment and overgrowth, while in developing countries the situation appears to be the exact opposite, one of overutilization (e.g. Brookfield and Byron 1993). Both situations have occurred because of changes in economic and political contexts, and both lead to degradation of the environment. However, the overutilization of wooded landscapes is outside the scope of this book.

Studies of the satoyama landscapes of Japan must be considered in this broader context. The sections of this book cover many of the same topics that are of interest in other regions of the world, and hopefully the Japanese experience will provide an interesting and valuable dimension.

1.3 Contributions to the Book

The chapters and sections of this book have been written by many different individuals. The authors are a diverse group, with a wide range of expertise, but they have one thing in common: they study the landscape. Satoyama landscapes have been considered from the biological, physical, social, cultural, political, and economic perspectives.

Chapter 2 introduces the nature of satoyama landscapes and defines the concepts of satoyama and satoyama landscape. Chapter 2 also provides a prehistoric
and historic context by discussing the factors that affected satoyama development over time. The discussion of the nature of satoyama landscapes considers not only renewable resource extraction and species diversity, but also grass-roots conservation efforts and government policies. This section sets the context for the discussions in the rest of the book.

Satoyama landscapes are then discussed at various temporal and spatial scales in Chapter 3. The changes in the landscape over time are illustrated, starting at the national scale, moving to a regional level, and, finally, discussing specific areas. Two important case studies are considered: the Kanto Plain and the Kyoto Basin in Kansai. The mechanisms behind the change in landscape over time are discussed in detail.

The details of the biodiversity of satoyama landscapes are considered in Chapter 4. Plants, birds, and insects, as well as ecological mechanisms that have affected ecosystem relationships over time, are discussed within the context of a coppice landscape. The effects of vegetation management on the diversity of plant and bird species are discussed, with a special emphasis on rare and endangered species.

Chapter 5 outlines in detail current approaches to the conservation of satoyama landscapes. Citizen movements are analyzed to explain how and why they emerged, and how they can be supported in the future. Approaches to the regeneration of satoyama landscapes are introduced.

The vast biological resources of satoyama landscapes are investigated in Chapter 6 for their possible use in contemporary Japanese society. Wood harvested from satoyamas is investigated as a potential building material, both as lumber and as processed wood products. The history of the use of satoyamas as an energy resource is discussed and future scenarios are considered. Finally, the potential of satoyamas for use in nature studies is investigated and the value of participatory involvement in active management is discussed.

The final chapter (Chapter 7) discusses the history of conservation strategies in Japan and reviews current approaches to management. Future scenarios are considered, including the use of satoyama landscapes for energy, raw materials, mitigation against global warming, and legal regulations. A proposal is put forward for a national policy for landscape planning and a long-term national policy for xxx.

### 1.4 Contributions of the Book

The Japanese have long been known as a culture willing to import ideas and incorporate them into their lifestyle and culture. However, Japan is also a land with much to share with the rest of the world. Unfortunately, the Japanese language provides a challenging barrier. Few non-natives can read Japanese easily and share Japan's valuable contributions with the scientific community. In addition, translation of text from Japanese to English is not easy. Not only are the written characters different, but the manner in which the concepts are presented is sometimes almost incomprehensible when direct translations are made.
However, in this case the translation was worth the effort. Information about a traditional system for a sustainable coexistence with the natural environment must be shared. Through countless generations of trial and error, the Japanese have learned how to live in harmony with their environment, and not just in the short term. The satoyama landscapes of Japan were a wonderful, sustainable land-use system that thrived for centuries, probably millennia.

The attraction of city life has drawn most Japanese people from the countryside, leaving a dwindling number of mostly elderly people to live on the land. These elderly people are increasingly unable to manage the rural landscape as it falls further and further into disrepair. The management of the satoyama landscapes is a critical link in a complex system of sustainable land use and without it the whole system will collapse. The challenge is to determine what components of this system need to survive and how to make their management relevant and applicable in today’s world.

This book introduces many concepts, some very old, some very new. The authors and editors hope that the information will contribute to the establishment of sustainable landscapes, where human and non-human organisms can live together for the benefit of all.
2 The Nature of Satoyama Landscapes

2.1 Satoyama Landscapes as Managed Nature

K. Takeuchi

2.1.1 What is Satoyama?

To Japanese people, the term *satoyama* conjures up images of the idyllic rural landscape of fields and woodlands. However, it is surprising that this term only became popular within the past 40 years. The term *satoyama* was used as long ago as 1759 by a Kiso area assistant wood manager by the name of Hyouemon Teramachi, who described satoyamas in a book entitled *Miscellaneous Stories of Kiso Mountain*. He described satoyama as mountainous landscapes close to rural villages (Tokoro 1980). The person who revived the term in modern times was Tsunahide Shidei, a forest ecologist, who proposed the idea of satoyamas in the early 1960s. He later explained that this term is just a modification of *yamasato* (village in the mountains) to satoyama (mountains near the village) so that everybody can understand the meaning. Based on this idea came the concept of the satoyama as an agricultural woodland (Shidei 2000).

The term *coppice woodland* expresses the role of woodlands in traditional rural life. A coppice woodland is used to produce wood or charcoal through a management system that involves cutting every 10 years or so. Although the trees are cut, the roots and stumps are left intact. Sprouts emerge from the stump and create a new woodland. This woodland reproduction system is called coppice regeneration. These woodlands are also used every year to provide dead branches, leaves, and herbaceous plants to create compost for traditional agriculture. Most of these woodlands are composed of pines or mixed deciduous species, and are called secondary woodlands because they were formed artificially. However, after World War II, when chemical fertilizers and fossil fuels came into common use, the economic importance of coppice woodlands diminished.

Today, nature-loving citizens often use satoyama to symbolize remnant natural environments in Japan. Citizens have become more aware of the conservation of the natural environment because of the loss of nature due to rapid urbanization and environmental destruction in suburban areas. In the late 1960s, there was a surge of suburban development along with rapid economic growth in Japan. In particular, coppice woodlands on hillslopes and dissected uplands were cleared for large-scale residential development sites. The sites for such large-scale housing development in
the suburbs, such as Senri New Town and Senboku New Town in Osaka, Kouzouji New Town in Nagoya, and Tama New Town in Tokyo, were all once satoyama landscapes (Tamura et al. 1983). To develop extensive housing sites in satoyama landscape areas, the hill ridges were cut and used to fill the valley bottom to create a flatland. As a consequence, the natural environment of the satoyama landscape was completely destroyed.

Subsequently, people developed an increasing awareness of nature conservation in their neighborhood, and housing construction methods have been changed to partly maintain slopes covered with woodlands and to make the best use of natural landscapes. Conservation of satoyama landscapes came to be undertaken at development sites. Moreover, the citizens who moved to these new towns started voluntarily managing the surrounding woodlands and rice paddies. These citizens were getting more and more interested in satoyama landscapes and the concept of conservation rapidly started to influence all of Japan. In the process, satoyama has become a popular word for describing the traditional Japanese rural landscape.

Today, the word satoyama is used in various contexts, but it generally indicates a natural environment that is being managed and, therefore, its basic element can be represented as secondary nature. Secondary nature is easily lost in the process of large-scale urban development but, on the other hand, if it remains untouched it will be thoroughly transformed by natural vegetation succession. In order to conserve satoyama landscapes, adequate management is essential, as has been observed in traditional agricultural activities. In other words, we can see the richness of the natural environment of satoyama landscapes not only as an original natural diversity, but also as a natural diversity enriched by human intervention.

There are, however, different interpretations as to what elements can be included in the category of secondary nature. There is no doubt about including coppice and pine woodlands in this category because they are seen as typical plant communities. Also, in the traditional Japanese agricultural system, areas for thatch grass collection were regarded as very important and, therefore, these areas, too, can be included in satoyama landscapes. The problem is whether we should also include farmland and settlements in the satoyama landscape category. Considering that the traditional rural landscape is formed with coppice, grasslands, farmlands, and settlements, these elements must all be included as a set of landscape elements.

2.1.2 Satoyama Versus Satoyama Landscape

Moriyama (1997) mentioned that the typical land use arrangement of woodlands (yama), farmlands (nora), and settlements (mura) could be observed in upland rural communities in the Kanto Plains. Here, the word yama is used to indicate woodlands and, therefore, this yama can be regarded as similar to satoyama. It might be inappropriate, however, to use the word satoyama for farmlands and settlements. In this book, we propose to follow the lead of Fukamachi et al. (2001) and Yokohari et al. (2001) and call the entire area satoyama landscape.

Figure 2.1 shows the concepts of satoyama and satoyama landscape used in this book and classifies these concepts by relating them to the landform and land use.
2.1 Satoyama Landscapes as Managed Nature

(Yamamoto 2001). As shown in the figure, *satoyama landscape* indicates the rural landscape that is comprised of satoyama, farmlands, settlements, and reservoirs, because these elements were once strongly connected to each other through the agricultural land use system.

In December, 1994, the Japanese Basic Environment Plan was implemented and it fully recognized the importance of satoyama landscapes. In this plan, the coexistence between nature and humans was regarded to be one of the most important long-term goals. Also, in order to achieve the goal, the coexistence of nature and humans with high natural and social quality in national lands was proposed, and policy implementation corresponding to each natural area with different natural environments was required. This *natural area* includes mountainous areas, satoyama landscapes, flatlands, and seashore areas. *Satoyama landscape* was defined as the middle part between mountainous areas and flatlands.

The Basic Environment Plan (Environment Agency 1994) describes the satoyama landscape as an area that has considerable secondary nature and an area that allows wild animals and humans to live together. The natural environment of this area is created through human interventions such as farming and forestry, and it is what Japanese people have long imagined as their idyllic landscape. In order to conserve the coppices, rice paddies, and irrigation ponds of satoyama landscapes, some action by citizens and public support are necessary.

Here, *satoyama landscapes* include not only the mixed woodlands, but also the *yatsuda* (special type of paddies, see below) and the small rivers and artificial ponds used for irrigation. Mixed woodlands of satoyama that are very near rural settlements and distributed on mountains, hills, and uplands as major geomorphic sites are very important in the rural villages to be used for coppice woodlands or agri-

![Fig. 2.1. Schematic representation of satoyama and satoyama landscapes (After Yamamoto 2001)](image-url)