In Japan No. 7	**Reintroduction of traditional agriculture toward the conservation of the natural environment and the historic and cultural environment in the Zushi-Onoji region, Machida City, Tokyo Metropolitan Prefecture, Japan**

1. Regional Profile

Geographical Location	Country and Region	Machida City, Tokyo Metropolitan Prefecture, Japan, East Asia
	Longitude and Latitude	North Latitude 35° 32’ 43”, East Longitude 139° 26’ 59” (Machida City Hall)
	Geographical Conditions	• Suburban Tokyo, the capital of Japan • Approximately 20 km from the nearest ocean • Approximately 30 km from central Tokyo (the Imperial Palace)
Natural Environment	Topography and Altitude	• The major part of the administrative territory of Machida City is the hill area ranging from the lowest altitude of 27 m to the highest altitude of 363 m. • The northern part of the city is characterized by complex topography with up-and-down. Much valley-shaped topography formed through the erosion of a hill (locally called yato) is distributed.
	Climate	• There is no weather observation facility in the city, however, the annual average temperature is about 14°C and the annual precipitation is about 1,600 mm in its neighboring city (normal value at Hachioji). • Categorized as Cfa (humid subtropical climate) in accordance with the Koeppen climate classification.
	Vegetation and Soil	• The vegetation of the northern part of Machida City is a mixture of secondary forests of sawtooth oak (Quercus acutissima) and konara oak (Quercus serrata), agricultural areas, and residential areas. In contrast, the southern part of the city is significantly developed with few forests and agricultural lands. • The soil type is brown forest soil.
	Biodiversity and Ecosystem	• In the northern part of Machida City, yato topography and traditional land uses such as secondary forests, rice paddies, and other types of socio-ecological production landscape still remain. The plants and animals that have become rare in urban and suburban areas today can still be seen here. • The animals and plants characteristic to the yato area include raptors which are the umbrella species of the region (eg. northern goshawk), insects inhabiting secondary forests (eg. the great purple emperor (Sasakia charonda)), and plants that grow in rice paddies and canals (eg. grasses and algae). • The socio-ecological production landscape has been quantitatively decreasing due to the development of the target region in recent years. In addition, lack of adequate management has resulted in an uncontrolled vegetation succession and the deteriorated quality of the remaining natural environment. • As a result, plants and animals that used to be typically seen in the yato area have decreased significantly to the extent that many species are now listed on the Red Lists of threatened species at the national level or Tokyo level.
Social Background	Population and Changes in Population	• The population of Machida City was 57,977 people in 1955. Due to rapid residential development after the 1960s, the population increased to 405,534 people in 2005 (a 7-fold increase in 50 years).
	History and Culture	• The oldest signs of human activity found in Machida City include stone tools from the Japanese Paleolithic era (approximately 23,000 years ago), indicating that this region had been inhabited by people since ancient times. • Machida City was an agricultural area until the mid-20th century; rapid residential development started after the 1960s and today it has become a bedroom town in Tokyo.
	Regional Economy (Major Industries, Livelihood (including data and forecasts))	• The major industry of the city is commercial and service business. The table below shows the number of employees by industry types in 2005.

Primary Industry (agriculture, forestry and fishery)	1,638	0.9%
Secondary Industry (mining, manufacturing and construction)	38,150	21.3%
Tertiary Industry (commerce, tourism and others)	139,655	77.8%
Total*	179,443	100.0%

**Note: As the percentages of workers in Primary Industry, Secondary Industry, and Tertiary Industry are rounded off to one decimal place, they may not add up to 100.0%.*

2. Use and Management of Natural Resources in the Region

(1) Use and Management of Natural Resources in the Past and Present

1) Land Use Related to the Use and Management of Natural Resources in the Past and Present

- The total area of Machida City, including the target site, is 7,162 ha, of which the mountainous and/or forest-covered area occupies 1,042 m2 (14.5% of the total area) and the agricultural land 844 ha (11.8% of the total area).
- Traditional land uses that suit the complex topography has generally been inherited in the areas of Machida City where the topography has not been altered by development. Agricultural lands and human settlements are located on the narrow flatlands along rivers. Forests are distributed on hills that surround such areas.
- Particularly in the yato area, the valley-shaped landform created as a result of the erosion of hills, there are examples of living traditional land uses characterized by the mixture of rice paddies that use natural spring water taken from the river source, secondary forests on slopes, farmlands, and human settlements in a mosaic pattern.

2) Objectives and Details of the Current Use and Management of Natural Resources

- In agricultural lands, rice, vegetables, and fruits are produced for human consumption as well as livestock husbandry. However, due to the impact of urbanization, agricultural areas and agricultural production are decreasing.
- In forests, the production of timber, charcoal, and compost used to be made; however, in the recent years, the amount of their production is very low.

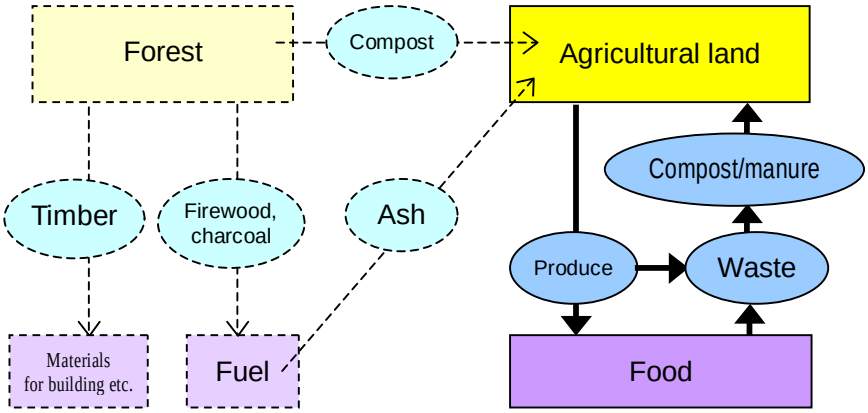

Figure Schematic overview of natural resource uses
(Light colors and broken lines represent that the uses concerned are significantly lower today than before.)

(2) Problems Associated with the Use and Management of Natural Resources and their Impact on Biodiversity

- Topography and land uses have changed as a result of the development of hill areas into the residential areas since the 1960s in Machida City. Forests and agricultural lands, which are important habitats for wild organisms, have been significantly reduced.
- In the meantime, (1) the decreased demand for firewood and charcoal due to the increased use of fossil fuels and (2) the decreased demand for the forest-based compost due to the increased use of chemical fertilizers have significantly lowered the forest use. Under such circumstances, the utilization of forests has dramatically decreased and the secondary forests, which had been maintained with human interventions over a long period of time, have changed in accordance with succession, resulting in the deterioration of the quality of the habitats for wild organisms.
- Due to the increased use of cheap fossil fuels and chemical fertilizers, the advantage of being able to collect fuels and compost from the nearby secondary forests has been lost especially in the yato area, where the cyclic utilization of natural resources was practiced in the past. Meanwhile, one of the disadvantages of the yato area, the difficulty of improving agricultural efficiency because of the narrow land and slopes, has become apparent. Therefore, the area is regarded as low-valued for land use, and development and abandoned management have been increasing.

(3) Regional Plans and Other Measures toward a Resolution of the Above Problems

- As one of the policies of the "Machida City Environmental Master Plan" prepared in 2002, it was set to conserve and restore the natural environment as well as the historical and cultural environment. The City is working on the conservation and restoration of the secondary natural environment, as is represented in the yato area, through the partnership among the city government, land owners, NPOs, volunteers, and other participants.
- Meanwhile, the Tokyo Metropolitan Government has designated the areas of Machida City where traditional land uses and agriculture of the yato area are still living as the "Zushi-Onoji Historical and Environmental Conservation Area" under the Ordinance Concerning Conservation and Restoration of Nature in Tokyo. At the same time, a plan (conservation plan) concerning policies and regulations for the protection and restoration of the nature to promote the conservation of the natural environment, history, and culture of the yato area has been prepared.

3. Details

(1) Overview

The Tokyo Metropolitan Government has designated approximately 37,000 m^2 of Zushi and Onoji areas of Machida City, where traditional topography and land uses of the *yato* area are preserved, as the "Zushi-Onoji Historical and Environmental Conservation Area" (hereinafter referred to as the Historical-Environmental Area) under an ordinance.

The Historical-Environmental Area is an area where private land and public land (owned by The Tokyo Metropolitan Government) are mixed. The Machida History and Environment Management Association (hereinafter referred to as the History-Environment Association) (chair: Mr Koichi Tagoku), a voluntary organization established by local farmers, is commissioned by The Tokyo Metropolitan Government to implement the conservation activities of public land.

The History-Environment Association is also working for the Narabai *yato* area in the northern hill area of Machida City under a commission agreement with Machida City.

The vegetation management in public land is described below:

Location	Zushi-Onoji Historical and Environmental Conservation Area (Zushi and Onoji, Machida City, Tokyo Metropolitan Prefecture, Japan)
Involved Parties	**[Implementing body of the use and management of natural resources]** Machida History and Environment Management Association ("Rekikan-Kanri-Kumiai") (voluntary organization of local farmers) **[Land owner/executor of conservation policy]** The Tokyo Metropolitan Government **[Expert]** The Liaison Committee for History and Environment Researchers (a network of experts who are involved in research on the conservation of the natural environment and the historical and cultural environment of the target area) **[Supporter]** Machida City, private companies, and volunteers
Background and history	**[1978: The Tokyo Metropolitan Government designated the "Zushi-Onoji Historical and Environmental Conservation Area"]** • In light of the value of the natural environment as well as the historical and cultural environment of the target area, The Tokyo Metropolitan Government designated the relevant area as the "Zushi-Onoji Historical and Environmental Conservation Area" in 1978. (About half of the area is owned by The Tokyo Metropolitan Government and the remaining half is privately owned.) • The Historical-Environmental Area is designated under the policy of limiting the entrance of people and conserving the natural environment only through agricultural activities. It was determined to apply strict restriction on the use of the conservation area. • However, behaviors that disturb local residents have been increasing since the designation was made: for example, some visitors misunderstood the conservation area as parks and drove private vehicles into such areas. • Farmers who are affected by the national government's policy to reduce the acreage of agricultural land lost their will to continue agricultural operations in privately owned land within the conservation area. They stopped farming practices and the remaining land deteriorated due to abandonment. • Furthermore, only specified businesses with bidding eligibility are commissioned by The Tokyo Metropolitan Government to manage the vegetation in publicly owned land. However, proper management was not implemented and the land deteriorated. [1996: Local farmers organized the Machida Rekikan Kanri Kumiai and started the restoration of the yato area] • Troubled by the above-mentioned circumstances, local residents organized the Machida Rekikan Kanri Kumiai (History and Environment Management Association). They proposed that local farmers who are familiar with traditional agricultural practices should be in charge of the vegetation management of publicly owned *yato* areas within the conservation area. • In cooperation with The Tokyo Metropolitan Government, they compiled traditional agricultural practices and vegetation management methods in the *yato* area into the Management Practices for *Yato* in Conservation Area. • The Tokyo Metropolitan Government commissioned the vegetation management to the Machida History and Environment Management Association.

Purpose and Purpose and objectives	• The organizational document of the Machida History and Environment Management Association states that the purpose is to involve the land owners of the conservation area and other Involved Parties in environmental conservation activities by providing workforce in their own capital and personal capacities in the spirit of mutual cooperation to environmental conservation and vegetation maintenance work in the area and thereby to enhance the environmental conservation of the area as well as the living environment and economic situation of local people.
Main contents	**[Policy]** • The policy of the Machida History and Environment Management Association is to "secure biological diversity", to "conserve *yato* landscapes in good condition", and to "implement the management with focus on the conservation of the aquatic environment and the flood control in the upstream area". **[Main activities]** • Vegetation management (eg. mowing and raking fallen leaves) • Conservation work (eg. installation of signboards) • Restoration of *yato* (restoration of abandoned *yato* areas in order to create waterside environments that provide habits to diverse wildlife) • Animal management (eg. removal of crows in order to protect the breeding and nurturing grounds for the northern goshawk (*Accipiter gentilis*)) **[Characteristics of the activities]** • Compilation of locally inherited traditional techniques into a manual book, the Management Practices for *Yato* in the Conservation Area, and implementation of vegetation management in accordance with the manual. • Local farmers are carrying out the management of the area even though the area is a conservation area that includes publicly owned land. • Rather than simply protecting species on the Red List of threatened species, this system aims for the recovery of species that are adapted to traditional agricultural practices by maintaining the traditional agricultural practices.
Main achievements	• *Yato* that used to be deteriorated to the point that no one could enter has been restored to good condition by collecting materials from nearby forests and utilizing traditional civil engineering skills. • In 1997, The Tokyo Metropolitan Government added selective thinning and agricultural reservoir construction to the work commissioned by the government. Timber obtained as a result of the selective thinning was used as the raw materials for piles and dams to construct the reservoirs. *Yato* was restored based on the methods that fully utilized traditional agricultural civil engineering skills. • Meticulous construction utilizing the traditional agricultural civil engineering skills that were inherited in the area brought various species back to the area. Flora and fauna, mainly plants growing around waters that used to inhabit and grow in *yato*, have returned. The biodiversity unique to aquatic ecosystems has been improving significantly in comparison to before the *yato* restoration. • Rare species that were hibernating as buried seeds have also returned as a result of traditional agricultural operations.

Picture: *Yato* before management

Picture: *Yato* under management

(Photographs provided by Mr Koichi Tagoku, the chairman of Machida Rekikan Kanri Kumiai)

(2) Details of the Use and Management of Natural Resources from the "Five Perspectives" of the Satoyama Initiative

The table below shows the primary relevance of this case to the five perspectives.

Details are given below the table for the perspectives which have high relevance (items with the " " mark in the table).

Five Perspectives	Relevance to this Case	
	Degree of relevance	Summary of Relevance
1) Resource use within the carrying capacity and resilience of the environment	◎	• This case aims at the improvement of biodiversity and the ecosystem service by restoring the sustainable use of land and natural resources in the yato. • Regular monitoring survey of organisms is carried out in the area, and the result is reflected in the vegetation management. ** Details to follow.*
2) Cyclic use of natural resources	○	• The project in this area uses the byproducts of the vegetation management work for the purposes of *yato* restoration as much as possible based on the resource circulation that was conducted in *yato* in the past.
3) Recognition of the value and importance of local traditions and cultures	◎	• To restore traditional use of land and natural resources, the History-Environment Association organized with the local farmer carried out the vegetation management. • The Association produced a manual on traditional skills and is implementing the vegetation management work in accordance with the manual. ** Details to follow.*
4) Natural resource management by various participating and cooperating entities	◎	• The Involved Parties of this area include The Tokyo Metropolitan Government, which is the land owner, and The History-Environment Association, which is the implementing body of the vegetation management, as well as people from various sectors such as researchers. The projects are conducted through role assignments and cooperation based on their positions and expertise. ** Details to follow.*
5) Contributions to local socio-economics	◎	• The local farmers have become more proud of their own occupation that contributes to the conservation of the natural environment as well as the historical and cultural activities and the community tie has become stronger. ** Details to follow.*

1) Resource use within the carrying capacity and resilience of the environment

[Succession of sustainable land use that is adapted to natural environment]

- Today, large irrigated rice fields are found on flatlands in many areas of Japan. However, when agricultural tools and agricultural civil engineering skills to conduct irrigational agriculture on flatlands were underdeveloped, yato was a valuable place for irrigated rice farming because spring water was readily available. Also, the continuous utilization of the forests on the slopes of yato as secondary forests supplied fuel woods, manures, tools, and construction materials.
- With such background, the land use that combines various features including irrigated rice fields in yato

and secondary forests on slopes was established as a suitable land use method for the natural environment (topography, soil, climate, etc.) in *yato*, including the target area.

- The sustainable management and utilization of natural resources within the range of the environmental carrying capacity and resilience of the natural environment used to be practiced in the yato area in the past. Thanks to such practice, a healthy secondary natural environment that nurtured great biodiversity was retained.
- Efforts in this area aim to pass on the land use of yato which is adapted to such natural environment of Japan to future generations.

[Understanding and assessing biodiversity and ecosystem services]

- In respect to the multidimensional values of yato including biodiversity, landscape, history and culture, the Tokyo Metropolitan Government designated the relevant area as the Historical-Environmental Area as they established policies to conserve these values.
- The History-Environment Association, which is commissioned by The Tokyo Metropolitan Government to manage the area's vegetation, fully understands the biodiversity and ecosystem services of the target area and manages the area under the following three policies.

Table Relationship between the management policy of History-Environment Association and the value of ecosystems and ecosystem services

Management policy	Values of relevant ecosystems and ecosystem services
Secure biolodiversity	• Biodiversity
Conserve *yato* landscape in good condition	• Cultural service (historical and cultural environment)
Implement management with focus on the conservation of aquatic environments and upstream water control	• Supply service (nurture water resources) • Adjustment service (flood control)

[Monitoring of biodiversity]

- The Tokyo Metropolitan Government and researchers are continuing biological surveys on organisms. They assess individual survey outcomes and examine the effectiveness of the efforts through comparative progress analysis of these outcomes.
- A survey on yato management practices for the conservation area was conducted by the Tokyo Metropolitan Government in 1995, which found that cultivated and well-managed yato areas enjoyed higher biodiversity than abandoned yato areas.
- Monitoring survey results showed that yato restoration work based on traditional methods had positive impacts on biodiversity. The table below descries an example of such impacts.

Table An example of positive impacts of traditional methods on the conservation of biodiversity

Survey period	Overview
1986	• The "Animal and plant survey of the Zushi-Onoji History and Environment Conservation Area", conducted by the Bureau of Environment, The Tokyo Metropolitan Government in 1986 before the start of the *yato* management work, identified 591 species (115 families) of native plants.
1996 to 2002	• Surveys conducted from 1996 to 2002 identified 680 species (128 families) of native plants. In comparison to the 1986 survey, 89 plant species were additionally recorded. • Additional species included many rare and precious species. • The number of plant species clearly increased since the start of the *yato* management work.

Source: Report of Commissioned Survey on Precious Plant Species in the Zushi-Onoji History and Environment Conservation Area, Tama Environment Office, The Tokyo Metropolitan Government and Ryokusei Research Institute Inc. 2002.

3) Recognition of the value and importance of local traditions and cultures

[Maintaining and employing traditional land use and resource utilization/management]

- In the Historical-Environmental Area, rice paddies, which were one of the traditional land uses, were rarely operated in public land owned by The Tokyo Metropolitan Government in the period from the designation of the area in 1978 up to around 1995.
- Based on the suggestion from local farmers that local farmers who are familiar with traditional agricultural methods would be desirable as the managers of the yato vegetation, the Tokyo Metropolitan Government conducted the "Survey on Yato Management Practices for the Conservation Area" in 1995. In this investigation, they compared the biota between the yato where the rice paddy operation was continued and the abandoned yato and also studied traditional methods practiced by local farmers to take care of yato for a long time.
- This investigation found (1) that in abandoned yato rice paddies had changed to dry land and the environmental features became homogeneous, (2) that, in the meantime, yato in which irrigated rice farming was continued had small environmental segments such as farm roads, irrigational canals, reservoirs, levees between rice fields, and fallow fields, and (3) that the combination of such segments with the surrounding forests resulted in a mosaic of different land uses that were associated with high biodiversity.
- The Tokyo Metropolitan Government decided to commission the vegetation management work to the History-Environment Association based on the above findings.

[Reintroduction of traditional knowledge into modern technologies]

- The History-Environment Association produced a manual on traditional skills that were studied in the "Survey on Yato Management Practices for the Conservation Area" and is implementing the vegetation management work in accordance with the manual.
- The goals of the vegetation management work included the restoration of traditional environmental segments such as farm roads, irrigational canals, reservoirs, levees between rice fields, and fallow fields in abandoned agricultural fields where the environmental features were becoming homogeneous.
- The traditional agricultural civil engineering skills and methods founded on the concept of material circulation were adopted in individual projects. For example, in a reservoir restoration project, timber produced as part of the selective thinning of the surrounding forests was used as the construction materials of piles and dams to construct the reservoir. The reservoir was restored, using methods that utilized traditional agricultural civil engineering skills.
- As a result of the reintroduction of such traditional knowledge into the present-day vegetation management work, the abandoned yato that had been deteriorated to the point that no one could enter has been successfully restored.

4) Natural resource management by various participating and cooperating entities

[Some of the on-going joint usage and management plans of land and natural resources]

- In addition to the two main entities; the Tokyo Metropolitan Government, the land owner, and the History-Environment Association, the implementing body of the vegetation management; other Involved Parties from various sectors such as researchers (Liaison Committee for History and Environment Researchers) are also involved in this project. Respecting their position and field of expertise, these Involved Parties carry out the project in collaboration by sharing roles.
- The most distinctive feature of the project in this area is that local residents established a system to continue traditional and proper management on publicly owned land designated as a conservation area of Tokyo.
- The table below lists the Involved Parties in this area and the use of natural resources. The projects are conducted through role assignments and cooperation based on their positions and expertise.

Table Involved Parties and role assignments of this project

Land	Stakeholder	Role
Zushi-Onoji Historical and Environmental Conservation Area (publicly owned land)	The Tokyo Metropolitan Government	Land owner; executor of conservation measures
	The History-Environment Association (voluntary organization of local farmers)	The main management body (commissioned by the Tokyo Metropolitan Government)
	Liaison Committee for History and Environment Researchers (a network of experts who are involved in research on the conservation of the natural environment and the historical and cultural environment of the target area)	Conduct biological monitoring surveys and provide expert opinions.
	Machida City, private companies, and volunteers	Provide human and financial resources.

5) Contributions to local socio-economics

[Improving the well-being of local communities]

- • The activities of the History-Environment Association are not intended for economic profits; the commission fees provided by the Tokyo Metropolitan Government for the vegetation management work are used to cover the necessary expenses. Farmers who are the members of the association feel threatened by the deteriorating natural, historical, and cultural environment of yato, which they have nurtured for many generations. They are certain and proud that they have inherited traditional wisdom and are capable of restoring the environment. They are translating these feelings into actions, successfully producing positive results.
- This project is a rare case of the management of publicly owned land by local residents. Only a few examples of similar cases are to be found in Japan. Besides, this project has multi-dimensional significance such as the inheritance and utilization of traditional knowledge of the region and the improvement of biodiversity through the reintroduction of human interventions for management purposes. Therefore, this project is attracting attention from the Involved Parties living in other suburban areas near a large city in Japan who face similar problems; several prizes were awarded to this project.
- The local farmers have become more proud of their own occupation that contributes to the conservation of the natural environment as well as the historical and cultural activities. And the community tie has become stronger.

End