In Japan No. 2	Agriculture coexisting with crested ibises in Niigata Prefecture, Japan

1. Regional Profile

<table>
<tr><td rowspan="3">Geographical Location</td><td>Country and Region</td><td>Sado City, Niigata Prefecture, Japan, East Asia</td></tr>
<tr><td>Longitude and Latitude</td><td>North Latitude 38° 01’ 06”, East Longitude 138° 22’ 05” (Sado City hall)</td></tr>
<tr><td>Geographical Conditions</td><td>• Agricultural, mountainous, and fishing area
• Approximately 280 km from Tokyo (capital)
• Approximately 55 km from Niigata City (prefectural capital)</td></tr>
<tr><td rowspan="4">Natural Environment</td><td>Topography and Altitude</td><td>• Located on Sado Island, an isolated island which has a total area of about 855 km^2
• The Osado mountain range is in the north of the island and the Kosado mountain region is in the south, with a plain in between.
• The lowest point is 0 m (sea level), and the highest point is 1,172 m.</td></tr>
<tr><td>Climate</td><td>• The annual average temperature is approximately 13.2°C and the annual precipitation is 1667.0 mm in Ryotsu, Sado City.
• According to the Koeppen climatic classification, the climate is classified as Cfa (humid subtropical climate).</td></tr>
<tr><td>Vegetation and Soil</td><td>• There are paddy fields on the plain, consisting mostly of paddy herbaceous plant communities. Secondary forests of konara oak and red pine are distributed around a hilly area, and the hilly area is mostly occupied by chestnut and Quercus crispula. Beech forests are distributed in high elevation areas.
• The soil is brown forest soil in the mountain area, and stagnic and alluvial soil in the plain area.</td></tr>
<tr><td>Biodiversity and Ecosystem</td><td>• A large portion of the natural environment in Sado City is a socio-ecological production landscape consisting of areas such as farmland and secondary forests formed and maintained by humans over a long period. Various animals and plants live here.
• This was the final area in Japan to be inhabited by the crested ibis before their extinction in the wild, and test releasing has begun in 2008 to release artificially bred crested ibises into the wild. The crested ibis is a bird that mostly inhabits Satoyama, therefore the maintenance and creation of a good secondary ecosystem is desired.</td></tr>
<tr><td rowspan="3">Social Background</td><td>Population and Changes in Population</td><td>• The population of Sado City was 113,296 in 1960, and has decreased to 67,386 in 2005.
• The aging rate (the percentage of people of 60 or older in the population) was 8.7% in 1960, however, it was as high as 34.9% in 2005.</td></tr>
<tr><td>History and Culture</td><td>• Sado Island has been the gateway to the continent since ancient times. It once thrived because of its gold and silver mines, however, it primarily became a rich island through its production of abundant rice and marine products. Annual events which were formed in an annual cycle in farming and fishing villages still remain.</td></tr>
<tr><td>Regional Economy (Major Industries, Livelihood (including data and forecasts))</td><td>• In the plains, rice is cultivated making use of the abundant water supply. Fishery is also active due to its geographical condition as an isolated island.
• The number of workers in each industry sector in 2005 is as follows.
<table>
<tr><td>Primary Industry (agriculture, forestry, and fishery)</td><td>8,789</td><td>24.2%</td></tr>
<tr><td>Secondary Industry (mining, manufacturing, and construction)</td><td>7,777</td><td>21.4%</td></tr>
<tr><td>Tertiary Industry (commerce, tourism, and others)</td><td>19,711</td><td>54.3%</td></tr>
<tr><td>Total*</td><td>36,277</td><td>100.0%</td></tr>
</table>
*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%.</td></tr>
</table>

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

- Of the total area of 855.25 km2 of Sado City, mountain forest accounts for 371.5 km2 (43.5% of the total area), and farmland accounts for 130.5 km2 (15.3% of the total area).
- In the hilly and mountainous areas terraced paddy fields and yatsuda using abundant spring water are formed, bordered by sloping forests, rivers and villages, which exhibit mosaic land use.
- In the past natural resources were used and managed with the interaction among different land uses as shown in the figure below, however, such relationships have decreased considerably today.

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

- Forestry: It is thought that forest products such as lumber, charcoal, and compost were produced before, however, production has decreased significantly in recent years.
- Agriculture: Agriculture is one of the key industries of Sado City, and rice in particular accounts for most production. Rice is followed by fruits, vegetables, and dairy cattle.
- Fishery: Fishery is also one of the key industries, the Japanese common squid in particular accounts for the largest catches in sea fishery. Oyster farming is also operated in brackish Lake Kamo.

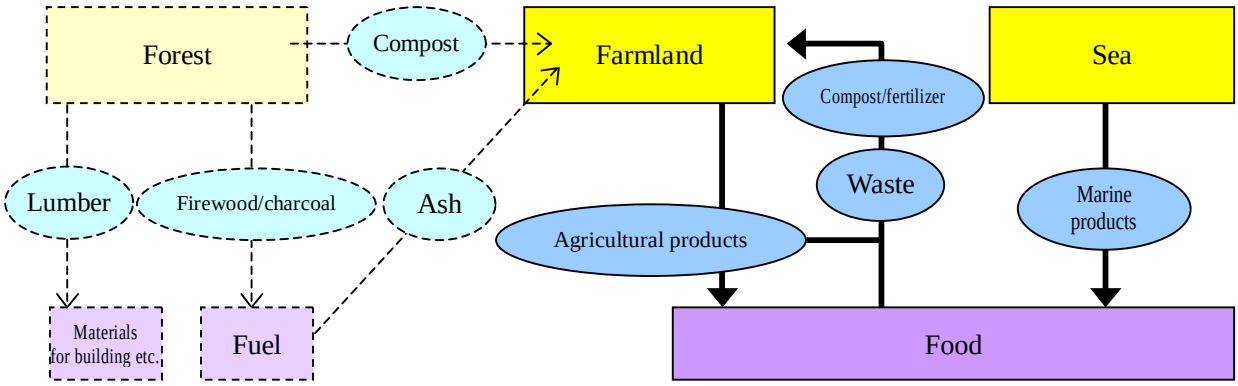

Figure: Overview of the use of natural resources
(Light-color and dotted lines: items whose use has decreased considerably now)

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

- Due to a decrease in demand for firewood and charcoal with the spread of fossil fuels, and a decrease in demand for compost from forests with the spread of chemical fertilizer, the use of forests significantly decreased and succession has progressed in secondary forests that had been maintained for a long time , causing a deterioration of wild animal and plant habitats.
- With the spread of chemical fertilizer and pesticide in agriculture, productivity has increased, but wild animal and plant habitats have deteriorated.
- With the decline of industries including agriculture, forestry, and fishery, population outflow to urban areas and aging trend took place, causing a decrease in people who manage and use natural resources, and an expansion of abandoned farmlands and degradation of forest management.
- Furthermore, a vicious cycle has been formed such that insufficient management causes an increase of bird and animal damage to farmland, leading to a further decline in agriculture, forestry, and fishery.
- Sado Island used to be the last habitat for crested ibises in Japan; however, due to a deterioration of the satoyama environment described above, wild crested ibises in Japan became extinct.

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

- The Ministry of Agriculture, Forestry and Fisheries, Ministry of Land, Infrastructure and Transport, and Ministry of the Environment developed the “Crested Ibis Protection and Breeding Project” in 2004.
- The Ministry of Environment, which is promoting the restoration of crested ibises in the wild, prepared the “Crested Ibis Reintroduction and Environmental Regeneration Vision” with a goal of resettling 60 crested ibises in east Kosado by around 2015.
- Niigata Prefecture developed the “Crested Ibis Reintroduction Promotion Program” and is mainly improving the habitat environment for crested ibises around farmland.
- Sado City developed the “Crested Ibis Reintroduction Action Plan.”

3. Details

(1) Overview

In Sado Island, with hopes for the recovery of wild crested ibises, various efforts have been undertaken, including environment-friendly agriculture to preserve terraced paddy fields and other types of lands that will be their future habitats, and to improve the environment.

Such efforts for "agriculture coexisting with crested ibises" are introduced below.

Location	East Kosado, Sado City, Niigata Prefecture
Involved Parties	**[Parties which manage and use natural resources]** There are more than 30 parties (farmers and villages) **[Administration]** Sado City, Niigata Prefecture, Ministry of the Environment **[Research Institute]** Niigata University **[Liaison organization]** Liaison Counsel for the Recovery of the Wild Crested Ibis
Background and history	**[Extinction of the crested ibis]** • Crested ibises used to be common birds in satoyama in Japan, but hunting, pesticides, and the development of agricultural infrastructure caused its extinction in the wild. • Sado Island was the last habitat for crested ibises in Japan. They were thought to survive because Sado Island had a good environment for the diet for crested ibises with a number of terraced paddy fields that utilized spring water in the mountain area. • In 1981 the last crested ibis born in Japan was captured and artificial breeding was attempted. It died in 2003 and the Japanese species became extinct in the wild. **[Artificial breeding and efforts to improve the environment for recovery of wild crested ibises]** • In order to restore crested ibises, birds born in China (exactly the same species that was in Japan) were donated in 1999 and artificial breeding began. This artificial breeding was successful and the number of captive bred individuals increased. • In 2003 the Ministry of the Environment developed the "Crested Ibis Reintroduction and Environmental Regeneration Vision" and set a goal of restoring 60 wild crested ibises to Sado Island by around 2015. Activities such as creating feeding grounds for crested ibises started to spread in various parts of Sado Island around that time. • In 2004 the Liaison Counsel for the Recovery of Wild Crested Ibis was established, and the coordination of various activities spread in Sado City began. • In the fall of 2008, 10 captive bred crested ibises were released on a trial basis.
Purpose and objectives	• By spreading environment-friendly agriculture, the feeding environment for crested ibises will be restored and the restoration of wild crested ibises in Sado Island will be achieved. In addition, safe, secure, and tasty rice will be produced for humans. • Not only for the recovery of wild crested ibises, it is also hoped that Sado Island will become a model of a cyclic society coexisting with nature, and that these efforts will be developed all over Japan.
Main contents	• Environment-friendly agriculture • Improvement of crested ibises habitats • Remaking desolated paddy fields into biotopes • Environmental education and learning experiences for mountain villages and satoyama • Corporate social responsibility • Exchange between producers and consumers • Involvement by universities

Main achievements	• Activities to create feeding grounds for crested ibises which were not widely implemented around 2003 have spread to various areas and biotopes have been formed in several places, and environment-friendly agriculture where humans and wildlife coexist began to be implemented. Through these efforts, biodiversity around waters have been conserved and improved, restoring an environment which was inhabitable to crested ibises. • The agriculture that spread during the second half of the 20th century which emphasized productivity was partially inconsistent with the conservation of biodiversity; however, it is thought that we can construct a framework that contributes to a reconciliation between agriculture and the conservation of biodiversity by adding new value through the branding of "rice which makes villages that coexist with crested ibises" produced by implementing environment-friendly agriculture.

Picture: Terraced paddy fields in early summer in Sado City

(Photos provided by Environment Planning Department, Niigata Prefecture)

(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	◎	• In this area, the use of natural resources was insufficient when compared to the resilience of nature in the past, and forests and farmlands were degraded by vegetation succession. However, by implementing environmentfriendly agriculture aiming for the recovery of wild crested ibises, we have attained a use of nature in balance with the resilience of the environment, and the quality of the secondary ecosystem is recovering. ** Details to follow.*
2) Cyclic use of natural resources	○	• Through environmentfriendly agriculture, a conversion from chemical fertilizers, which are exhaustible resources made from oil, to composts and other types of fertilizer capable of recycling has been under way.
3) Recognition of the value and importance of local traditions and cultures	○	• The environment that existed in paddy fields where crested ibises lived before the development of agricultural infrastructure has been reintroduced by methods of constructing waterways called "ko."
4) Natural resource management by various participating and cooperating entities	◎	• Various parties, including local residents, are involved in these activities, and coordination of the activities is sought by the Liaison Counsel for the Recovery of Wild Crested Ibises. ** Details to follow.*
5) Contributions to local socio-economics	◎	• With the introduction of a certification system for "villages coexisting with crested ibises," new value has been added to the main product of rice, leading to an invigoration of agriculture. ** Details to follow.*

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

[Recovery of the secondary ecosystem]

- There are paddy fields on the plains of Sado Island, and there are also paddy fields in the hilly, valley, and mountainous areas. These paddy fields nurtured various aquatic organisms and were the primary feeding grounds for crested ibises. However, the paddy field environment has changed due to the inappropriate use of pesticides and the development of an agricultural infrastructure in Sado Island. This degraded the secondary ecosystem to such an extent that crested ibises could not survive.
- Furthermore, because of an aging farming population and a decrease in human population in recent years, the insufficient management of paddy fields has also become a big problem in the region. Paddy fields

with insufficient management will soon undergo a vegetative succession and will be covered by grass and trees. Thus, wetland environment will be lost and the habitat for diverse aquatic organisms will be lost.

- In Sado Island, environment-friendly agriculture has been introduced toward the recovery of a paddy field environment in order to bring back wild crested ibises. Efforts to turn abandoned paddy fields into biotopes have also been taken.

[Environment-friendly agriculture in Sado Island, “agricultural methods that nurture life”]

- The environment-friendly agriculture at paddy fields in Sado City is referred to as "agricultural methods that nurture life." The agricultural methods that nurture life are those which not only reduce the use of pesticides and chemical fertilizers but also create a paddy field environment which makes it easier for living organisms to inhabit. Specifically, they include the installment of "ko (deep spots)" in paddy fields and waterways, flooded paddy fields in winter, the designing of waterways to include fish ladders, and the installment of biotopes.
- “Ko” is a catch drain that remains flooded all year round. Before the development of agricultural infrastructure, they were often installed in paddy fields as warm waterways or catch drains in Sado Island and other places. Especially in places where spring water was used as a water source, such as yatsuda or terraced paddy fields, they were installed to warm water as a measure to protect crops from cold weather (In areas other than Sado Island, it was called under various names such as horiage, tebi, teaze). They were flooded for a longer period than paddy fields which had temporary waters, and were thought to be providing habitats for aquatic organisms. The aim is to reintroduce this “ko” into modern paddy fields and to make part of the paddy fields stable habitats for aquatic organisms by managing them as permanent waters.
- Modern paddy fields normally have subterranean drains, and are dry during the agricultural off-season; however, in the winter flooding system, paddy fields are flooded again after harvesting rice. The agricultural methods that nurture life recommend flooding from November to February at a depth of 5 cm. Winter flooding is expected to create habitats and wintering places for aquatic organisms that will become valuable feeding grounds during winter when crested ibises have returned to the wild.
- In paddy fields where irrigation canals and drainage canals are separated for efficient water use, there is a large gap between the paddy fields and the drainages, which makes it impossible for fish such as loaches and crucian carp to enter paddy fields. Fish ladders connect these paddy fields and canals and make it possible for creatures such as fish to travel through. As paddy fields are temporary waters, large carnivorous fish cannot inhabit them, and as they are warm dead waters, microorganisms such as plankton tend to grow. Therefore they are good breeding grounds for the young of loaches and crucian carp. Loaches and crucian carp are thought to have travelled between paddy fields and canals and bred in accordance with agricultural cycles in the past, and so it is thought that the reproductive rate of these fish will increase by reconnecting the canals and paddy fields.
- As a part of environment-friendly agriculture, habitats (biotopes) for living organisms that do not facilitate agricultural production are being installed. The aim is to develop housing complexes to nurture living organisms by incorporating biotopes into the network of paddy fields and canals. In Sado City, it is required to conduct research on living organisms when a biotope is installed.
- Additionally, delays in mid-summer drainage (mid-summer drainage is done to temporarily dry the land while growing rice, delays in mid-summer drainage give frogs and toads which grow in paddy fields time

to metamorphose before draining), early flooding, no-tilling farming, and research on living organisms outside biotopes are also conducted.

[Turning desolated paddy field into biotopes]

- In Sado Island, there are problems involving not only the deterioration of paddy field environments, but also a decrease in the number of paddy fields themselves.
- As a counter measure, efforts have been made to turn desolated paddy fields into wetland environments (biotope) that can be flooded so that waterside creatures can inhabit within them.
- Sado City has implemented the "Crested ibis Biotope Development Program" and supports organizations that make biotopes such as flooded paddy fields by providing them with grants (21,000 yen per tan).

Picture: A biotope which a local organization developed as a feeding ground for crested ibises

(Photos provided by Environment Planning Department, Niigata Prefecture)

4) Natural resource management by various participating and cooperating entities

[Cooperation of parties involved by the "Liaison Counsel for the Recovery of Wild Crested Ibises]

- In Sado City, more than 30 organizations such as agricultural associations, citizen groups, NPOs, research institutes, and corporations are taking action. In order for these organizations to coordinate their actions, the "Liaison Counsel for the Recovery of Wild Crested Ibises" has been established.
- As local groups, NGOs, universities, and farmer groups which are engaged in activities in and outside Sado Island exchange information on activities to restore wild crested ibises, share schedules, and cooperate in activities centered around the Liaison Counsel for the Recovery of Wild Crested Ibises, the movement for the recovery of wild crested ibises becomes more active and the creation of new conservation activities is attempted. In addition to activity groups, the Crested Ibis Exchange Hall, Sado City, Niigata Prefecture, Sado Regional Promotion Bureau, Hokuriku Regional Agricultural Administration Office, and the Ministry of the Environment are participating in the Counsel as observers.

[Support by organizations outside the region]

- Several corporations work as volunteers in the development of biotopes as part of social action programs and employee welfare. For example, a local TV station is carrying out the "Crested Ibis Project" as a social action program in cooperation with other companies. The Crested Ibis Project has volunteers recruited in urban areas develop biotopes and cultivate terraces paddy fields in villages on the island. The volunteers visit the island 15 times a year and provide valuable labor.
- University students from outside the region stay in the activity sites as part of their study during summer

vacation and engage with local people in activities such as the improvement of forests and creation of feeding grounds. In addition, they conduct field work in mountainous areas and farm villages in Sado. Several villages such as the Noura District, Tsukifuse District, Katanoo District, and Kujikawachi District have accepted college students, and although the local communities bear some of the costs to prepare to accept them, the students are helpful in operations such as developing new biotopes and therefore are welcomed as they vitalize the communities.

- The local academic research institute Niigata University has established a cooperative project across departments called the "Niigata University Crested Ibis Project." This project conducts research while experimenting and verifying the recovery of the ecosystem by recovering waterfronts of abandoned fields and managing forests in satoyama mainly in the Kisenjo District located on a mountain in Kosado.
- An exchange effort between farmers and consumers has also been undertaken. As an exchange program between farmers who implement environment-friendly agriculture aiming for coexistence with crested ibises and consumers who purchase their products, consumers visit the area and help with weed pulling and the examination of living organisms. Other activities to deepen exchanges between producers and consumers are also taking place.

5) Contributions to local socio-economics

- Sado City has introduced a certificate system "Creating villages coexisting with crested ibises," and the certificate mark is attached to rice which meets certain standards.
- As the crested ibis is one of the representative birds of Japan, and the efforts toward its recovery in the wild are widely known in Japan, the rice that is given the certificate is traded at higher prices than ordinary rice. This helps vitalize agriculture which has been declining, and is expected to lead to the promotion of more environmentally-friendly agriculture.

●What is the "creation of villages coexisting with crested ibises" certificate program?

- A program to certify safe and tasty Sado rice
- It is awarded to rice which is cultivated according to agricultural methods that nurture living organisms by reducing the use of pesticides and chemical fertilizers

●Certification standards

- It is cultivated in Sado
- It is awarded with the certificate of Eco Farmer*
- The use of pesticides and chemical fertilizers is reduced (reducing the use of chemical pesticides and chemical fertilizers to under 50% during cultivation)
- It is cultivated according to "agricultural methods that nurture living organisms"

** Farmers who are certified by Niigata Prefecture for their plans to engage in "soil improving technology," "chemical fertilizer reduction technology," and "chemical pesticide reduction technology"*

Source: Website of Sado City (URL: http://www.city.sado.niigata.jp/eco/info/rice/index.shtml)

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