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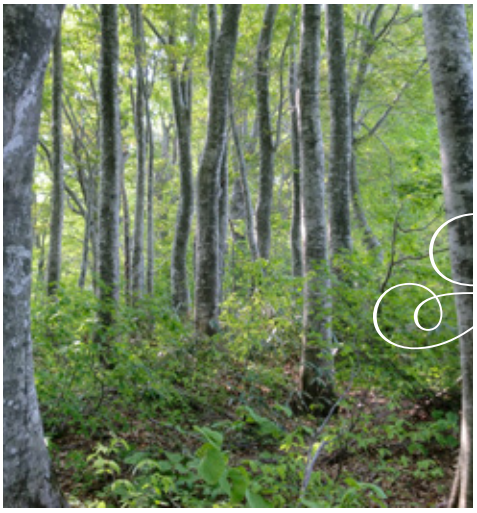

THEME FOR **JULY:**

THE JAPANESE AND THE FORESTS

According to the Government of Japan's Forestry Agency, approximately two thirds of Japan's land is covered in forest. What are the characteristics of Japan's forests? What are their functions? And how do Japanese people utilize this most abundant of natural resources? In this month's *Highlighting Japan*, we introduce some examples of the mutual relationship between the Japanese and the forests.

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ON THE COVER
Beech forest
Photo: Courtesy of Shirakami-Sanchi Visitor Center

EDITORS' NOTE
Japanese names in this publication are written in Japanese order: family name first, personal name last.

G7 CORNWALL SUMMIT

Group photograph session with the leaders of the G7 members

FROM June 11 to June 13, 2021, Prime Minister Suga Yoshihide attended the G7 Cornwall Summit held in Cornwall, United Kingdom.

This was the first face-to-face G7 summit since the beginning of the global COVID-19 pandemic. The leaders agreed to work together as the G7 to overcome COVID-19, to build back better, and to promote open, democratic economies and societies based on international cooperation and multilateralism.

The G7 leaders had candid discussions under the overall theme of "Build Back Better" as advocated by the G7 Chair, UK Prime Minister Boris Johnson. With the participation of outreach countries and international organizations, they discussed global health including the current response to COVID-19, climate and nature, and open societies.

As a summary of the three days' discussions, the G7 Summit Communiqué was released, along with three Annexes and other documents.

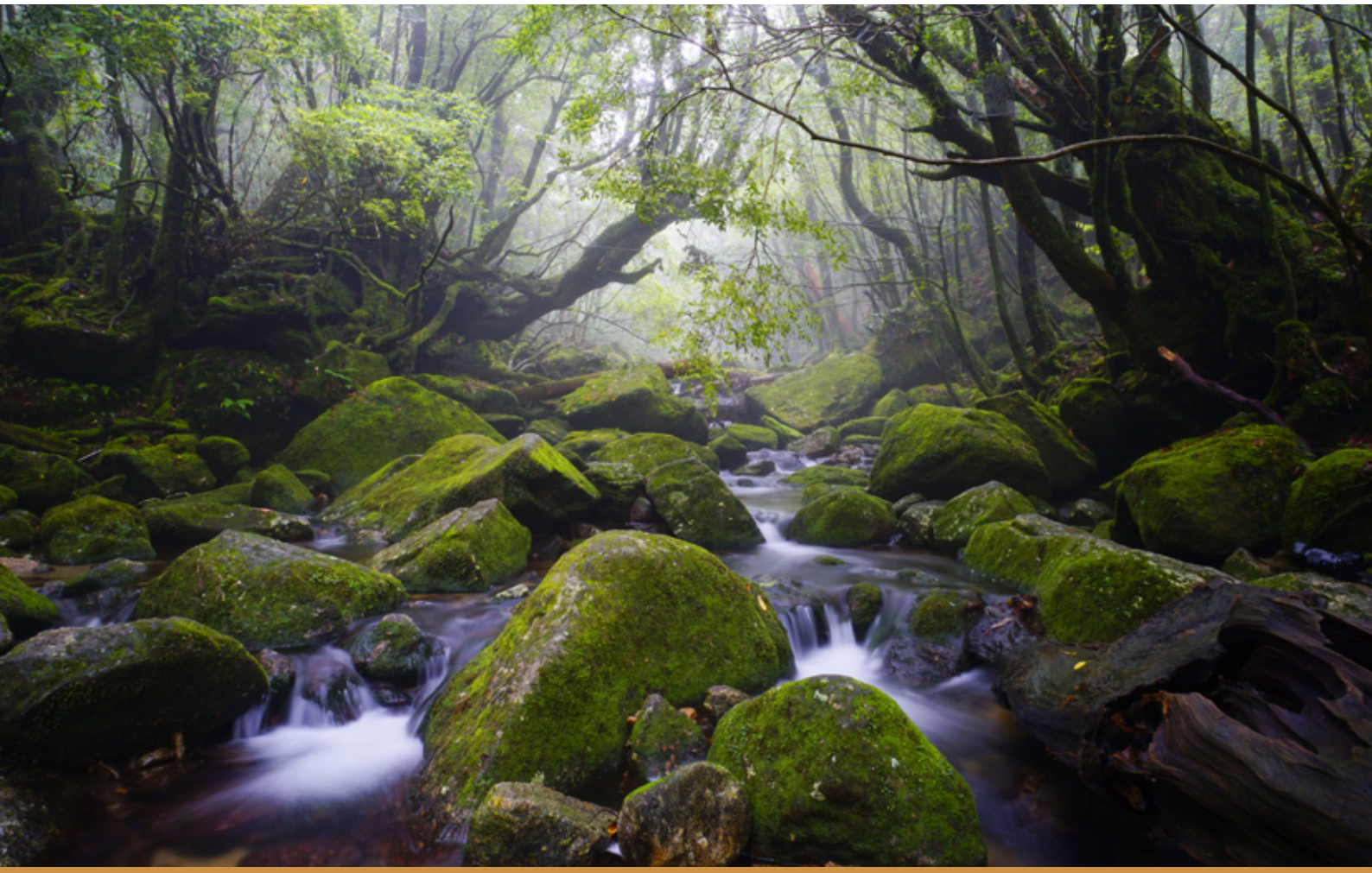
Prime Minister Suga served as the lead speaker for some sessions, actively contributing to the G7 discussions, and led candid discussions among leaders on key issues, including the response to COVID-19 and global health, the global economy and free trade, climate change, and regional affairs.

Session on building back better from the coronavirus pandemic

Session on global health

All photos: Courtesy of Cabinet Public Relations Office

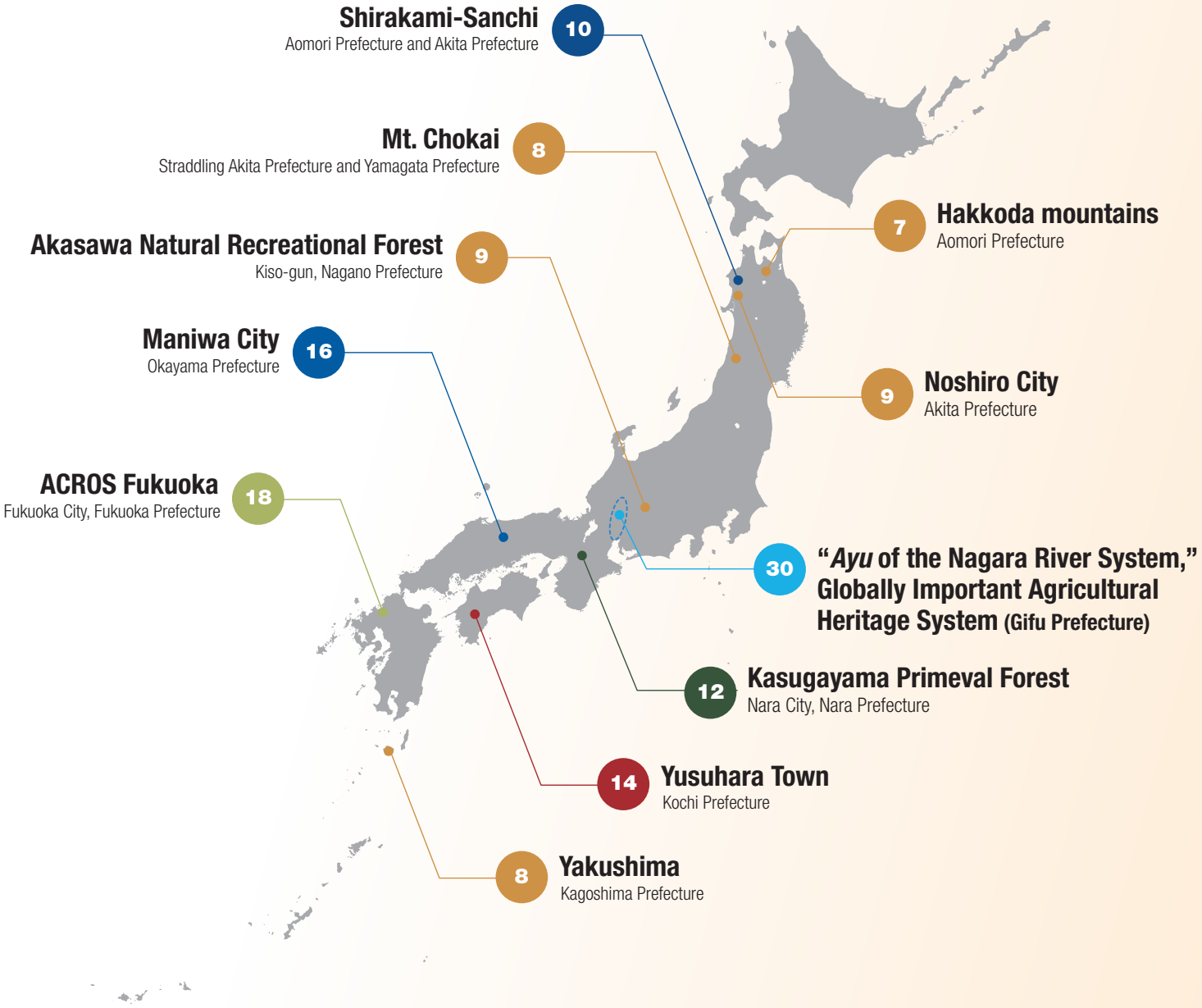
Note: This article has been created with the consent of the Ministry of Foreign Affairs of Japan and on the basis of materials published by the Ministry



THE JAPANESE AND THE FORESTS

Photos: Sufia/PIXTA; Courtesy of ACROS Fukuoka; AKI/PIXTA

According to the Government of Japan's Forestry Agency, approximately two thirds of Japan's land is covered in forest. What are the characteristics of Japan's forests? What are their functions? And how do Japanese people utilize this most abundant of natural resources? In this month's *Highlighting Japan*, we introduce some examples of the mutual relationship between the Japanese and the forests.



Japan's Diverse Forests

Nakashizuka (Asano) Tohru, President of the Forest Research and Management Organization
Photo: Courtesy of Nakashizuka Tohru

SINCE ancient times, Japanese people have lived their daily lives utilizing the blessings of forest resources. We interviewed Nakashizuka (alias Asano) Tohru, President of the Forest Research and Management Organization (FRMO), about the characteristics and functions of Japan's forests.

According to the Government of Japan's Forestry Agency, approximately two thirds of Japan's land is covered in forest. What are the characteristics of Japan's forests?

Because Japan is sufficiently warm and humid for forests to grow, the original vegetation of most places in Japan was forests. Moreover, because Japan's land covers a wide range from north to south and has both lowland and alpine areas, the climate varies according to the region. So, there is a diversity of forest type, which can be roughly categorized as follows. There are evergreen forests that form in warm-temperate regions, mainly containing *shii* (Japanese chinquapin, *Castanopsis sieboldii*) and *tabu* (Japanese bay tree, *Machilus thunbergii*); deciduous forests that form in mountainous and cool-temperature regions, mainly containing beech (*Fagus crenata*) and oaks (*Quercus* spp.); and conifer forests that form in the mountainous areas of low-temperature regions, mainly containing fir (*Abies* spp.) and spruce (*Picea* spp.).

Forests similar to those found in Japan exist in Europe and eastern areas of North America too, but Japanese forests are richer in tree species. For example, in the case of deciduous forests, there are around twice as many tree species in Japanese forests as in European or North American forests. In Europe and North America, many trees became extinct during an ice age over 10,000 years ago, but in Japan there were few extinctions, presumably because glaciers and ice sheets did not develop at that time.

What kind of functions do forests have in Japan?

Forest ecosystems have a variety of functions. For example, they have the function of supplying resources such as timber and non-timber forestry products. Examples of non-timber forestry products include medicinal plants and edible wild plants and mushrooms, and these are abundant in Japanese forests. Forests also have a disaster risk reduction function. Because Japan is mountainous and rainy, landslides can easily occur. But trees develop deep root

A Japanese beech forest in the snowy Hakkoda mountains
Photo: Courtesy of Nakashizuka Tohru

"Agariko Daio," a giant 300-year-old Agariko beech tree in the foothills of Mt. Chokai in Akita Prefecture
Photo: Courtesy of Nakashizuka Tohru

systems on mountain slopes, securing the earth, sand and rocks and preventing landslides. Woods along the coast act to weaken the power of a tsunami and prevent coastal sand being carried inland by wind. And forests also have a cultural function. For example, there are many sacred forests around temples or shrines, or forests with beautiful autumn colors which many tourists visit to enjoy.

During some periods in Japan, many trees were felled to build huge castles, temples and shrines, but more recently we have begun to regulate the areas for logging and to actively plant trees. In particular, Japanese cedar and hinoki cypress grow straight and are easy to process, so many were planted. In fact, around 40% of Japan's forest area is planted forest and at present 70% of that area is Japanese cedar and hinoki cypress[i] forest.

You have researched Japanese beech forests for many years. What are some of the notable beech forests in Japan?

The beech forests in high snowfall areas by the Sea of Japan coast and in the Tohoku region are special. Mountainous regions there get over two to three meters of snow deposits in winter. Globally, it is extremely unusual to find beech forests in regions with such heavy snowfall. In spring one can see beautiful scenes that combine new green beech leaves and lingering snow. Shirakami-Sanchi was registered as a World Natural Heritage site because one of the world's largest expanses of mostly untouched primeval beech forest remains in the high snowfall environment. In the case of the beech forest in the Hakkoda mountains, at the beginning of the twentieth century, horses and cattle were pastured in the forests, and they ate up the bamboo grass that obstructs beech regeneration. The forests were also cut for charcoal production after seedling growth became dense. Then, about 100 years later, beech forests of an almost even age became established in a very beautiful way.

A forest, stream and moss-covered rocks on the island of Yakushima
Sufia/PIXTA

Also, on the foothills of Mt. Chokai in Akita Prefecture, there is a forest where strange-shaped beech trees known as "Agariko" (pollard) grow. The trunks of normal beech trees extend straight upwards, but the trunks of Agariko are thick and uneven, and many thin trunks extend out

i It is said that around four in ten of the Japanese population suffers from hay fever caused by cedar pollen. As a way to deal with this, the Forestry Agency has been implementing measures such as cutting down and using Japanese cedar plantations, replanting with saplings that produce little pollen, and realizing technology to reduce the amount of cedar pollen produced.

from about two meters above the ground. And there is a reason for this. In that region, during winter locals cut down beech trees in the snow and used the wood for fuel and charcoal. Numerous new trunks would regenerate and grow from the stumps of the cut-down beech trees. Some of those newly-grown trunks would be left and some cut, and through this repeated cycle they became "Agariko" without withering or dying. One might say that the Agariko represent a sustainable relationship between humans and beech forests.

Before the spread of COVID-19 many people came from abroad to Japan to enjoy nature. Please tell us about the forests you'd like people from overseas to visit when the spread of COVID-19 is under control.

As well as the beech forests I mentioned previously, I recommend the forests of Yakushima, another World Heritage site. The forests are dim with thickly growing Japanese cedar and other trees and moss that covers the ground. They were the model for the forests that appear in the animated film Princess Mononoke. Also, in Noshiro City in Akita Prefecture, a region famous for Japanese cedar production, there is a forest that is tightly packed with big cedar trees aged on average around 250 years. It is wonderful to see straight-trunked and around 50-meter-tall cedars standing together. In the Kiso-gun district of Nagano Prefecture, which is famous for the production of hinoki cypress, there are various places where one can enjoy walks in hinoki forests, including the Akasawa Natural Recreational Forest, the birthplace of *shinrin-yoku* (forest bathing), the practice of healing mind and body by walking in the forest.

A Japanese cedar forest in Noshiro City, Akita Prefecture
AKI/PIXTA

The world's forests face various problems. How is Japan helping to solve those problems?

Forests have various functions; not just providing timber, but also functions such as CO_2 absorption, disaster risk reduction and food production. By making use of the knowledge and techniques accumulated over many years, Japan helps in the conservation and improvement of those functions in developing countries. For example, the FRMO works with Japan's Forestry Agency and the Japan International Cooperation Agency (JICA) to help Vietnam strengthen the disaster risk reduction function of its forests. It is also giving technological assistance related to management of forests and measurement of CO_2 storage amounts in Peru and Brazil, with the aim of controlling climate change through the conservation of tropical rainforests.

Colorful autumn leaves in the Akasawa Natural Recreational Forest, Nagano Prefecture.
eson1m/PIXTA

By comprehensively analyzing the various functions of forests, the FRMO will continue to conduct research to quantify how and to what extent forests should be conserved, or whether, if they are used, sustainable and effective use is possible for that region, country, or the world. I believe that such efforts can also contribute to achieving the Sustainable Development Goals (SDGs).

Interview by SAWAJI OSAMU

Beech forest

Shirakami-Sanchi —A Beech Forest "Natural Museum"

Waterfall on the Anmon Gorge trail

Shirakami-Sanchi, a UNESCO World Heritage site, is a mountainous area where a beautiful virgin beech forest and a diverse array of flora and fauna coexist.

SUGIYAMA MAMORU

SHIRAKAMI-SANCHI is the general name for a mountainous area of some 130,000 hectares straddling the border between Aomori and Akita Prefectures in the Tohoku region of northeast Japan. In December 1993, 17,000 hectares of the most pristine natural beech forest in Shirakami-Sanchi was registered by UNESCO as Japan's first World Natural Heritage site. The registration also took into consideration cultures unique to the area such as the hunting culture of the Matagi people who live in the mountainous areas of the Shirakami-Sanchi and hunt in the traditional way, and the mountain worship of Shirakami-dake (height 1,253 meters). Six rivers thread through the steep terrain of mountains over 1,000 meters high, and many waterfalls can be seen. What's more, due to the harsh climatic conditions, with snow covering the area for around half of the year, barely any human activity occurs other than Matagi people hunting bears, gathering edible wild plants and mushrooms, and making charcoal. As a result of this minimal human impact, the forest has been preserved in its primeval state.

All photos: Courtesy of Shirakami-Sanchi Visitor Center

Rare species endemic to Shirakami-Sanchi include the perennial Silene aomorensis (left) and black woodpecker (right)

Enveloped in quiet, the natural beech forest is a habitat for species endemic to the region, including plants such as Silene aomorensis and Tsugaru misebaya, fish such as Japanese char and dace, birds such as the black woodpecker and golden eagle, and mammals such as the Japanese serow and Japanese black bear. It's like a "natural museum" that preserves and exhibits the virgin forest. When beech trees, which are said to have a lifespan of around 200 years, decay over time they gradually become nourishment for the soil and nurture the forest. This soil has been found to contain Shirakami Kodama yeast, suitable for baking bread. Shirakami Sasara, a lactobacillus, has also been found, and research is underway to utilize it in future biotechnology business. The nutrients from the mineral-rich beech forests are eventually carried down mountain streams and from there to the sea, where they become nutrients for plankton that nurture a variety of seafood and algae. The delicious fish nurtured in these rivers and sea waters are branded as "Shirakami Fish."

The most appealing aspect of Shirakami-Sanchi is undoubtedly the scenery that changes with the seasons.

"Each of the four seasons is wonderful: spring when the young yellow-green beech leaves bud, summer when fresh breezes blow, autumn when the entire mountain is ablaze with red and yellow foliage, and winter with a blanket of snow," says Tsujimura Osamu, director of the Shirakami-Sanchi Visitor Center in Nishimeya Village, Aomori Prefecture.

The Visitor Center runs guided tours suitable even for novices. There are seven walking trails to choose from, including the Beech Forest Walking Trail, an easy way to experience the beech forest; the Anmon Gorge Trail, taking in three waterfalls; the Shirakami-Sanchi Lookout Trail, with panoramic views of Shirakami-Sanchi to enjoy; and the Juniko Lakes (Twelve Lakes) Walking Trail, where visitors can enjoy *shinrin-yoku* (forest bathing) (see *Highlighting Japan*, August 2019 issue). In addition, there are seven climbing trails ready for mountaineers. Visitors can feel the breath of the beech forest, listen to the song and chatter of birds, and admire the pretty flowers at their feet.

As well as working to train the younger generation of guides, the Visitor Center is proactive in holding extracurricular classes and welcoming school excursion parties to impart an appreciation of Shirakami-Sanchi by delivering a fun learning experience about the forest, traditional foods, and crafts.

Tsujimura says, "We would like to expand opportunities for as many people as possible to experience Shirakami-Sanchi."

Trekking in Shirakami-Sanchi

Kasugayama Primeval Forest
Photo: Courtesy of Kasugataisha Shrine

The Forest in the Sacred Precincts of Kasugataisha Shrine

The Kasugayama Primeval Forest in Nara City, Nara Prefecture is a sacred forest of Kasugataisha Shrine and a primeval forestial ecosystem that has been sustained by people for more than 1,000 years.

YANAGISAWA MIHO

Nara City was the site of the capital Heijo-kyo from 710 to 784 and prospered as a center of politics and culture. Even after the capital moved, it has accumulated more than 1,300 years of history as a former capital, fostering tradition and culture. In 1998, the Nara Palace Site as well as the Kasugataisha Shrine, the Kasugayama Primeval Forest and eight Buddhist temples, including Todai-ji, were jointly registered as UNESCO World Heritage Sites under the name "Historic Monuments of Ancient Nara." (See *Highlighting Japan*, December 2020[i]).

The main building of the Kasugataisha Shrine is said to have been constructed at the order of the emperor in 768. Legend has it that Takemikazuchi-no-Mikoto, one of the deities enshrined in Kasugataisha Shrine, rode down on a white deer from Kashima Jingu Shrine in Ibaraki Prefecture to descend on the 283-m-high Mt. Mikasa to the east of Kasugataisha Shrine. The deer in Nara have thus been protected as messengers of the gods since ancient times, which explains why deer can be seen in many places in Nara City.

Either of and sometimes both the two mountains holy Mt. Mikasa and Mt. Hanayama (497 m), which lie beyond Mt. Mikasa, are referred to as "Kasugayama." As part of the sacred precincts of Kasugataisha Shrine for more than 1,000 years, the 250 hectares or so of "Kasugayama Primeval Forest," which includes the two mountains, has preserved its primeval appearance up to today, while people have been prohibited from hunting and felling other than to replenish native species. It is said that more than 2,200 *shinji* (divine services) take place at the Kasugataisha Shrine every year. Some services take place inside the main shrine, while it is said that others take place at Mt. Mikasa and other locations inside the Kasugayama Primeval Forest, attended only by priests of the Shrine since time immemorial. One reason for the registration as a UNESCO World Heritage Site is this cultural background of ancient faith passed down by the Kasugayama Primeval Forest and the Kasugataisha Shrine together as a unit.

Arai Kiyoshi, a priest at the Kasugataisha Shrine, says, "Services conducted in areas where members of the general public can't enter are often conducted only by priests. There is solemnity to services performed in the mountains and forest since ancient times."

Of the Kasugayama Primeval Forest

Hanging scroll titled "*Kasuga Deities Departing from Kashima Shrine*." Takemikazuchi-no-Mikoto is depicted descending on the back of a deer, with Mt. Mikasa in the background.
Photo: Courtesy of Kasugataisha Shrine

itself, Arai says, "One feature of the forest is that it is a climax forest[ii] in a temperate area so that the forest as a whole is lumpy like a broccoli. It has a gentle appearance unlike mountains planted with artificial forests of conifers such as cedar or cypress to obtain lumber. I think it's rare globally to have an evergreen forest of *shii* (Japanese chinquapin) and oak so close to central urban areas."

However, at the same time, some trees do wither and die owing to damage caused by deer[iii] and pathogens carried by pests, and this has led to some tree planting.

Arai says, "Although people have been prohibited from entering the mountains, records exist that describe how since ancient times the powerful of the time have planted trees there. They must have thought that trees dying signified the descended gods' return to the heavenly realm. They likely planted trees to prevent that."

Even today when the state is in charge of forest management, the Kasugayama Primeval Forest is protected by human intervention as needed, such as replacing fallen trees as well as finding and destroying non-native plants.

In order to protect the Kasugayama Primeval Forest for future generations, it is important to know about the primeval forest.

Arai says, "Mt. Hanayama has areas where people are allowed to enter. There are footpaths and hiking courses. I recommend Takisaka no michi (Path of Waterfall Slopes), which is a footpath passing through the valley between Mt. Hanayama and Mt. Takamado. The name comes from the many small waterfalls along the mountain path. There are ancient Jizo statues and also Buddha reliefs carved on the walls of small hollows, so you can feel people's faith along the path as well. I hope that places like this for people to visit might give a feel for the value of the primeval forest. When the chestnut flowers bloom in May, there are places with wonderful views as if everywhere shines with a faint shade of gold. The mountain is also home to the endangered ruddy kingfisher, which is also known as the 'bird of fire.'"

Shrines across Japan have sacred forests called "*chinju no mori*" (sacred shrine forest) within their precincts or nearby. These are carefully looked after by people. The Kasugayama Primeval Forest, where a deity is said to have descended, and that has peacefully lived on for more than 1,000 years, really is the chinju no mori and sacred grounds of the Kasugataisha Shrine, and it is precious heritage that will be passed on to future generations as a symbol of the ancient capital Nara's spirituality.

1 Mt. Mikasa
2 Kasugataisha Shrine
3 A section of the cobblestone Takisaka no michi path

Photos: Courtesy of the photographer, Kuwabara Eibun (1); Courtesy of Kasugataisha Shrine (2, 3)

i https://www.gov-online.go.jp/eng/publicity/book/hlj/20201201.html
ii The change in species and number of individuals making up plant clusters is called ecological succession and when the succession stops this state is known as "climax".
iii Deer originally lived in parks rather than the primeval forest to avoid stray dogs or other dangerous animals, but their numbers have increased, they now also live in Kasugayama, and the ecological system has changed.

Logging cedar in Yusuhara Town
Photo: Courtesy of Yusuhara Town, by Tsurui Taisuke

A Town Handing Down Forest Resources to the Future

Yusuhara Town in Kochi Prefecture is blessed with abundant forest resources. Here, the local government and local residents are working together to achieve a sound material-cycle society.

SATO KUMIKO

Located on the magnificent Shikoku Karst Plateau at an elevation of 1,455 meters above sea level, Yusuhara Town is home to a population of 3,300 (as of June 2021) and is surrounded by forest. "Karst" refers to terrain where limestone rock has appeared on the surface of the earth due to factors such as rain erosion, and Yusuhara Town's location on the high-elevation Shikoku Karst Plateau has earned it the description of "the town above the clouds." The town has six facilities[i] designed by architect Kuma Kengo, who is known for such works as the New National Stadium, the main venue of the 2020 Tokyo Olympic and Paralympic Games. Harmonizing beautifully with Yusuhara Town's lush forest, the series of structures originates in Kuma's renowned concept of "the architecture of defeat," which advocates that a building should not be a statement in itself but rather blend into its surroundings.

When demand for housing from Japan's 1950 to 1970 period of rapid economic growth settled down, the Japanese forestry industry began to gradually decline. With 91 percent of its area covered by forest, Yusuhara Town was no exception.

Following a series of consultations to review the utilization and conservation of forest resources, in 2000 Yusuhara Town formulated its Basic Ordinance on Forestation. With the basic principle of maintaining the high-performing functions of forests and developing a sustainable forestry industry, Yusuhara has ensured the protection of forest and water resources, and addressed reforestation from various angles to help local people coexist more harmoniously with nature. In October of the same year, 2000, the Yusuhara Forest Owners Cooperative

Central Yusuhara Town, Kochi Prefecture
Photo: Courtesy of Yusuhara Town

became the first forest cooperative in Japan to obtain FSC (Forest Stewardship Council) Certification (an international system to recognize appropriately managed forests), and it is now working to conduct sustainable forestry industry management by appropriate forest management.

"The people of Yusuhara have been forming communities and working together to sustain themselves from the bounty of the forest since ancient times. These efforts became the driving force behind the townspeople's strong sense of autonomy, and the concept that 'human beings are also a part of the forest' took root," says Tatemichi Hitoshi of the Yusuhara Town Creation and Promotion of Forest Culture Division.

The town office provides a grant for the town's forest management projects, which are funded by profits from the sale of electricity generated by wind power and from small-scale hydroelectric power generation projects run by the town that make use of the mountainous terrain. Also, thinned wood and unused lumber remnants are compressed into solid fuel (wood pellets) and used for boilers in private facilities and air conditioners in public facilities.

Yusuhara Town has set a goal of reducing greenhouse gas emissions by 70 percent, increasing absorption by 4.3 times (compared to 1990), and achieving over 100 percent energy self-sufficiency through the use of local resources by 2050. To this end, it has been undertaking pioneering initiatives such as the use of woody biomass energy. This system of recycling local resources has been highly evaluated by the Japanese Government, with Yusuhara Town selected as an Eco-Model City in 2009.

A pressing issue is fostering successors in forestry techniques. As well as providing opportunities for exchange among young people who work in forestry to learn forestry techniques, Yusuhara Town is recruiting new residents who have lived elsewhere and want to learn techniques at the town, two of whom so far have been accepted.

Kumo-no-Ue Library (Yusuhara Town Library), designed by Kuma Kengo and built with cedar grown in Yusuhara Town
Photo: Courtesy of Yusuhara Town, by Tsurui Taisuke

The town is also focusing on the use of local human resources to offer experiences such as local cuisine, *omotenashi* hospitality, overnight stays in private lodgings, and Forest Therapy Road, a forest bathing program that offers modern people a healing experience facilitated by guides.

Says Tatemichi, "We would like to make as many people as possible aware of the significance of developing forest resources for the future. In order to achieve this, I believe our role is to create opportunities for people to come into contact with the forest."

i Yusuhara Town Office, Machi-no-Eki Yusuhara (Community Market and Hotel), YURURI Yusuhara (Yusuhara Town Integrated Welfare Facility), Kumo-no-Ue Library (Yusuhara Town Library), Kumo-no-Ue-no Gallery (Wooden Bridge-Shaped Art Gallery), Kumo-no-Ue-no Hotel

Yusuhara Town uses local human resources to offer experiences such as local cuisine, overnight stays in private lodgings, and a forest bathing program
Photos: Courtesy of Yusuhara Town, by Tsurui Taisuke (left); Courtesy of Yusuhara Town (right)

Maniwa Biomass Plant

Biomass Power Generation from Wood Waste

In the Okayama Prefecture city of Maniwa, wood from forest thinning and woody waste such as the branches, leaves and bark produced in the lumbering process are being used as fuel to generate biomass power, the aim being to create a sound material-cycle society and thereby revitalize the local community.

SASAKI TAKASHI

Located in central northern Okayama Prefecture and with a population of around 44,000 (as of June 2021), Maniwa City occupies an area of some 828 km², of which approximately 80% is forest. The forestry industry has long flourished here, and artificial forests such as cedar and cypress, planted as saplings and cultivated by local people, account for around 60% of the total forest area.

Among these forestry resources, Maniwa City has paid special attention to the effective utilization of unused wood as biomass[i], in particular wood from forest thinning and woody waste such as the branches, leaves and bark produced in the lumbering process. Sugimoto Takahiro, who is a councilor in the city's Forestry and Biomass Industry Section, explains:

"Maniwa City has been actively planting cypress trees since 1950. For cypress trees to grow tall, the first thinning must be carried out thirty to forty years after planting. However, thinned wood has little commercial value and the aging of forestry workers meant there were not enough people to handle it, so they had to leave wood in the mountains. This led to the deterioration of the forest and also contributed to the occurrence of natural disasters. Also, sawmills generate large volumes of waste matter such as branches, leaves and bark. We wanted to somehow make effective use of this thinned wood and timber waste, so began planning the development of power generation using wood biomass and not relying on burning fossil fuels."

Maniwa City was established in 2005 through the merger of nine towns and villages. The forestry and lumber industries were flourishing in these areas, and research was being conducted on how to effectively utilize wood biomass. At the time of the city's inauguration, the status of the biomass being produced by the region was ascertained and discussion was held on how to use it. The city decided to establish a comprehensive biomass utilization system, covering wood biomass, livestock waste and food waste, and the Maniwa Biomass Plant started operations in April 2015.

The plant is fueled by 90,000 tons of wood a year from forest thinning and other unused lumber from the region, as well as 58,000 tons of general lumber such as woody waste from lumber mills, producing some 10,000 kilowatts of output, enough electricity to power around 22,000 ordinary households. The electricity produced is sold to power companies for the purpose of returning funds to the community. The total project cost, including the cost of constructing the biomass power plant system, was 4.1 billion yen, while the anticipated annual income from the sale of electricity is 2.1 billion yen. The city is using the funds to develop and preserve forests, creating new jobs in the forestry industry and revitalizing the local community. Furthermore, the annual output from the power plant exceeds that required to power the approximately 18,000 (as of June 2021) households that make up Maniwa City, achieving over 100% self-sufficiency in electricity through the biomass power plant alone.

A cypress forest in Maniwa City

All photos: Courtesy of Maniwa City

Maniwa Biomass Collection Center

The timber market in Maniwa

Cross Laminated Timber (CLT), a building material made of wood, has recently been attracting attention as a way to use up forest resources without waste. CLT consists of thin planks of sawn, glued, and layered wood, with each layer being oriented perpendicular to the previous. It is a structural material with superior heat insulation, fire resistance and earthquake resistance properties, and is used for the walls, floors and roofs of buildings in Japan, as well as for high-rise buildings in Europe and the United States. The largest manufacturer of CLT in Japan is Meiken Lamwood Corp., headquartered in Maniwa City. In 2016, the company completed a mass production facility in the industrial park across from the Maniwa Biomass Plant. In fact, the two facilities are connected by underground pipes, through which the large volume of wood chips and other waste produced during the CLT process is transported to the power plant as fuel. Meanwhile, the heat produced during power generation is being used to dry the CLT.

A block of Cross Laminated Timber (CLT)—planks of wood glued together in layers, with each layer oriented perpendicular to the previous

Says Sugimoto, "Maniwa City is actively using CLT in the construction of public facilities as well as subsidizing private housing that uses CLT. In addition, when residents bring trees, branches and leaves from their yards and the hills behind their homes to the collection point they are remunerated for supplying biomass, and this is very popular. Once a harmful nuisance, wood from forest thinning and woody waste now have value as resources, while the primary resources for generating wood biomass power, along with energy and money, are circulated within the community. Not only will this create new industries and jobs, but it will also help regenerate mountain forests."

These initiatives to effectively utilize forest resources have been highly evaluated. In 2014, Maniwa City was selected as a Biomass Industrial City, a concept jointly promoted by seven ministries including the Cabinet Office, Ministry of Internal Affairs and Communications, Ministry of Agriculture, Forestry and Fisheries, and Ministry of Economy, Trade and Industry. And in 2018, the city was selected as one of twenty-nine SDGs Future Cities and one of ten Local Government SDGs Model Projects. In March 2020, Maniwa declared itself a Zero Carbon City, defined by the Ministry of the Environment as "a local government where the municipality or the local government head himself or herself has announced that it aims to reduce greenhouse gas emissions or carbon dioxide emissions to virtually zero by 2050," and has begun to move toward the new goal of achieving effectively zero carbon dioxide emissions by 2050.

i Biomass is plant or animal resources used as fuel to produce electricity or heat.

Public restrooms in Maniwa City made from Cross Laminated Timber (CLT)

ACROS Fukuoka in the spring

Building a "Forest" in the Middle of the City

ACROS Fukuoka in the fall

All photos: Courtesy of ACROS Fukuoka

ACROS Fukuoka following its completion in 1995. The stepped pathway is visible to the left and right of the central glass atrium.

ACROS Fukuoka in 2018

With a population of about 1.62 million (as of June 2021), Fukuoka City in Fukuoka Prefecture is one of Japan's biggest cities. And in Fukuoka's Tenjin downtown area there is a facility for residents to rest and relax; a building constructed some twenty-five years ago with the concept of gradual transformation into a mountain.

YANAGISAWA MIHO

A small green "mountain" rises up unexpectedly in the heart of the city. ACROS Fukuoka, which local residents affectionately dub "ACROS Mountain," is a multi-purpose commercial complex in the Tenjin area of Fukuoka City, Fukuoka Prefecture, the island of Kyushu's premier downtown area. A multi-purpose commercial complex can be used for many things, but this one was built with the concept of "becoming a mountain in sixty years," and has drawn interest since its construction. ACROS Fukuoka's north-facing facade is a glazed building, but the south side adjacent to Tenjin Central Park is distinguished by the "Step Garden," a tree-lined terrace. When the complex opened, 37,000 trees of seventy-six varieties had been planted, creating the impression of a dense mountain forest.

ACROS Fukuoka is 60 meters high with a green path of about 400 steps to the "summit" on which visitors can enjoy "mountain climbing." The rooftop observation deck, designed to resemble a mountain summit, is open on weekends and holidays, affording visitors expansive views over Fukuoka City and Hakata Bay.

Kawano Atsuko, a representative of the company that manages the complex, says, "You can enjoy a pleasant view over Fukuoka City from the observation deck, but the restrictions on building height in the area have been eased and rebuilding work is now underway all over the place, so much so that this area is being called the 'Tenjin Big Bang.' No doubt we'll see a different view from the observation deck after a few years."

When trees grow, birds come to visit more frequently as well. More than twenty-five years have passed since construction was completed in 1995, and birds and bugs have brought seeds of flowers and trees so that the number of types of trees and plants has increased to about 200, more than twice the number at the beginning. A variety of birds can be seen throughout the year, such as brown-eared bulbuls in spring, blue-and-white flycatchers in summer, Daurian redstarts in fall, and pale thrushes in winter.

Kawano explains, "The plan is to return the trees to a mountain in the Kyushu countryside when the building's service life of sixty years has passed and it can't be used anymore. We weren't anticipating this when the building was constructed, so there were also trees planted that are not normally found in Kyushu, but in recent years we've been replanting to get back to rearing as many types native to Kyushu as possible. We're also gradually increasing the number of trees with leaves that change color in autumn so that everyone can enjoy different seasonal views."

The weight of the soil is generally considered to be the main issue when planting greenery on a building. ACROS Fukuoka utilizes "aqua soil," an artificial soil that is one-third the weight of normal soil. The soil is about 50 centimeters deep including a layer of natural perlite that is also lightweight and effective at both retaining and draining water. The soil prevents trees from falling over since the roots spread like capillaries and also reduces the risk of building damage since the growth of the roots stops at a certain point. Furthermore, this construction method of using artificial soil generates fertile soil as the trees' leaves fall and are mixed in, so that in some cases there has been no need to replace or add soil in sixty years.

Moreover, rainwater not absorbed by the trees is stored in tanks then used in sprinklers and toilets. The trees also provide leafy shade which helps to alleviate the heat island phenomenon. An investigation of ACROS Fukuoka by nearby Kyushu University found that at night following sunny days air cooled by radiative cooling formed a cool breeze, flowed to the adjacent park and yielded lower temperatures than surrounding urban areas.

Even if development continues in the area and the view from ACROS Fukuoka changes, the value of this mountain that rises up in the downtown area of a large city will not change, while it celebrates greenery as a "forest" and continues to provide visitors with tranquility and rest.

Wooden Straws from Thinned Wood

Wooden straws formed by rolling slices of wood using the *kannagake* technique

Wooden straws, an environment-friendly alternative to plastic straws

All photos: Courtesy of Aqura Home Co.

Inspired by traditional techniques called *kannagake*, a Japanese home builder has developed wooden straws with excellent functionality and safety performance by finely shaving thinned wood.

SATO KUMIKO

THE "Osaka Blue Ocean Vision" announced at the G20 Osaka Summit in June 2019 is still fresh in our minds. The aim of the vision is to reduce additional pollution from marine plastic litter to zero by 2050. With plastic waste reduction now a global issue, some companies are discontinuing the use of plastic straws. Meanwhile, wooden straws developed in Japan are attracting a great deal of attention both at home and abroad.

In Japan, a variety of alternative products, such as straws made from paper and bamboo are arriving on the market. Among them, wooden straws have been developed by Tokyo-based home builder Aqura Home Co. by coiling thin slices of wood just 0.15 mm thick into a helical shape. Since going on sale in 2018, the wooden straws have won numerous accolades, including the Good Design Award. They were also used at the G20 Osaka Summit.

The wooden straws are the brainchild of environmental journalist Takeda Yuri and Nishiguchi Ayano of Aqura Home's public relations department, borne of a shared concern about forest management. During her news-gathering activities, Takeda learned that the torrential rains that devastated western Japan in 2018 were partly caused by the decline in the water source cultivation function[i] of forests, and that the solution demanded management measures such as thinning[ii] to increase the forest's ability to store rainwater. Takeda approached Nishiguchi of Aqura Home with the suggestion that finding a groundbreaking use for thinned wood would accelerate thinning, and they came up with the idea of wooden straws.

However, Aqura Home is a home builder and producing everyday goods is a very different area of expertise. Mindful of this, Nishiguchi persuaded people in her company by highlighting the significant value of being involved in forest conservation activities as a manufacturer that works with timber, and it was decided to start the project.

Developing straws made from immature, soft thinned wood brought with it many problems. The solution was found in the age-old technique of *kannagake* for shaving wood into a smooth surface, a technique valued by the company since its establishment in 1981. Using a traditional Japanese hand plane called a *kanna*, thinned wood is finely shaved and rolled up, producing wooden straws with the grain of the wood showing through that are not only beautiful but also have excellent functionality and safety performance.

Kit for making wooden straws

"We cannot contribute to solving environmental issues by simply making products. We need to create awareness about wooden straws, so that by using them people produce a resource recycling model that is plowed back into the maintenance and management of forests," says Nishiguchi.

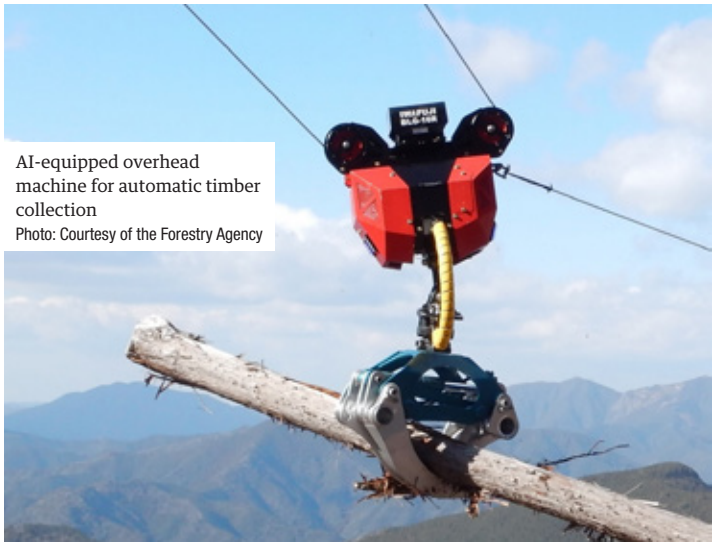
This idea has led the company to make its manufacturing process available free of charge, working with numerous organizations to promote the use of wooden straws and raise awareness of resource recycling. Rolling up the sliced wood is a simple manual process that does not require the use of machinery, helping provide work for people with disabilities and reducing CO_2 emissions. Indeed, the "wooden straw" project is gradually expanding, with the City of Yokohama now participating in the manufacture and sale of the straws, and an associated company of East Japan Railway Company (JR East) manufacturing the straws and using them on the Shinkansen bullet train service.

Aqura Home sells not only finished straws but also kits for individuals to make their own wooden straws. Says Nishiguchi, "When it comes to tackling environmental issues, it is important to improve awareness among people one by one. I want as many people as possible to consider the environment when coming to know about wooden straws. Growing awareness in this way can be very powerful."

It may just be a small thing, but the kits contain a wish that the user will feel the warmth of wood and think of the forests, the ocean and the earth.

i The function of forest soil to alleviate flooding by storing precipitation and equalizing the quantity of water flowing into rivers, and to stabilize river flows

ii Work to address dense forest growth by cutting down some trees and encouraging the growth of those that remain



AI-equipped overhead machine for automatic timber collection
Photo: Courtesy of the Forestry Agency

Forwarder during unmanned unloading work
Photo: Courtesy of the Forest Research and Management Organization

Unmanned freight forwarder transporting timber
Photo: Courtesy of the Forest Research and Management Organization

Smart Forestry

Japan is promoting "smart forestry" that can facilitate safer and more efficient timber production through advanced technology.

YANAGISAWA MIHO

JAPAN is blessed with abundant forest resources, with about 67% of the land covered in forests. However, because most of the forest is steep and complex terrain, there are many challenges in forest management and administration. For example, it is difficult to use large machinery to maintain forests growing on slopes, so forestry workers have to fell trees and cut branches manually, which has low labor productivity. There is also a lack of progress recruiting young people to forestry, while current workers are becoming older and older.

"Smart forestry" is a measure to try to overcome those challenges so as to maintain and utilize the forest resources with which Japan is blessed. According to the Forestry Agency of the Japanese Government, smart forestry uses geospatial information, ICT, and other advanced technologies to considerably improve operational productivity and safety, as well as facilitate advanced timber production that meets demand.

The Forestry Agency has been implementing "practical measures for smart forestry" in twelve areas with planted forests of cedar, cypress and other trees in places like Nagano, Ishikawa and Kumamoto Prefectures since fiscal 2018 as a way to promote smart forestry. As detailed below, various technologies to support smart forestry are being demonstrated in those areas.

LASERS, DRONES AND SMARTPHONES

Previously, forestry workers would have to venture into the forests in person and conduct measurements in order to gather information about the forest resources, including the types and height of trees, which would take both manpower and time. Now, in order to conserve manpower, it has become possible to obtain such information more easily and quickly by

AI image recognition technology enables quick and easy survey and collection of timber
Photos and Image: Courtesy of the Forest Research and Management Organization

introducing the measures of laser measuring from aircraft and analyzing images taken by drones.

A timber inspection system using smartphones has also been implemented. The system only requires photographs of cut logs in order to analyze information such as number of logs and log diameter using AI image recognition technology, enabling quick and easy survey and collection. This system also reduces labor significantly compared to conventional inspections that require forestry workers to count and measure.

GRASPING CONSUMER NEEDS

In the past, it was difficult to quickly supply consumers with the timber they need due to insufficient sharing of information such as "what wood consumers want" and "where and how much wood is produced." Now, cloud management of data gathered through ICT and other technologies to make supply and demand matching smoother has facilitated better sharing of forest information among forestry workers. Thanks to this, timber supply has sped up. For example, it used to be that timber logged in the forest was temporarily routed through a "marketplace" for timber before it was supplied to the sawmill, but advance information about demand and needs has made it easier to transport timber directly from the forest to the sawmill.

Moreover, Japan is seeing the gradual introduction of remote-controlled vehicles that can cut and transport trees on sloping terrain which construction machines cannot reach and of machines that can collect timber automatically using AI image identification of logged timber. Moreover, "forwarders" (vehicles for collecting timber) that enable unmanned self-driving timber transportation with the help of guidance sensors along the path are being developed.

NEW TIMBER TREE SPECIES

In addition to this development of advanced forestry technologies, Japan is researching, developing and popularizing new timber tree species. Special efforts are being made to popularize species that grow quickly. One issue is that cedar and cypress, which make up the large part of Japan's planted forests, require a long time, fifty years or so on average, from planting to logging. As such, research is being conducted on ways to cultivate new types of trees, such as bead tree (*Melia azedarach*) and Chinese fir (*Cunninghamia lanceolata*), that can be logged after twenty to thirty years, and trial planting has started in several locations.

Innovations such as those mentioned above are expected to help in overcoming the various challenges Japan's forestry faces, while also enhancing the possibilities of Japanese forest resources further in the future.

Water and Japan

Photo: Courtesy of Japan Water Forum

Uchimizu

Uchimizu, sprinkling water on streets and yards, is a Japanese practice carried out to provide relief from the summer heat through the effect of vaporization. More recently, uchimizu is also being seen as a means of dealing with the heat island effect and global warming.

Japan is pursuing initiatives to make effective use of its limited water resources and engaging in international cooperation on water-related issues.

SAWAJI OSAMU

Japan's Water Resources

Average annual precipitation in Japan is 1,668 mm, which is 1.6 times the global average. However, Japan's rivers are short and the water quickly flows into the sea due to its precipitous geography. Moreover, the amount of habitable land is limited and the population density high, so the amount of usable water available per person in Japan per year is 3,373 m^3 (equivalent in volume to about seven 25-meter swimming pools), which is about half the global average.

This is why Japan has for many years been investing in the development of water resources. One example is dam construction. Dams play roles including flood control—storing massive amounts of water inflow water upstream to reduce downstream flood damage by controlling the water flow—and maintaining the normal functions of a river such as by releasing its stored water when the downstream river flow is insufficient. Japan has 2,650 dams (as of the end of March 2018), which enables stable water use throughout the year.

To increase citizens' interest in and deepen understanding of the finiteness of water, the preciousness of water, and the importance of developing water resources, Japan has designated the first day of August as "Water Day"—since August is a month when a lot of water is used—and the first week of the month as "Water Week." A number of events are held during "Water Week," including the promotion of *uchimizu* (the sprinkling of water on streets to cool the surrounding area) and holding a "National Writing Competition on Water for Junior High-School Students" and an "Interactions with Water Photo Contest."

International Cooperation on Water

Japan has worked to guarantee a stable supply of tap water domestically for many years. As a result, Japan's water supply pipelines have a total length of about 670,000 km. The tap water supplied has to conform with fifty-one water quality criteria, including for E. coli bacteria, lead, and taste. It is thanks to this strict safety management that Japan's tap water boasts one of the world's highest levels of safety.

Using its advanced technology, Japan has long been providing official development assistance (ODA) in the areas of water supply development and public hygiene, and is the world's top provider of assistance in these fields among the countries providing foreign aid, recording a five-year average of about 1.39 billion dollars between 2013 and 2017. Japan is giving comprehensive support for infrastructure development and human resource development mainly in developing countries in Africa and Asia.

Japan is also strengthening international cooperation on water-related issues. In 2018, Japan founded the Asia Wastewater Management Partnership (AWaP) together with five other Asian countries. AWaP has an aim of "halving the proportion of untreated wastewater," which is one of the targets of the Sustainable Development Goals (SDGs), and is promoting wastewater treatment in Asia.

The 4th Asia-Pacific Water Summit, which is an international meeting for raising awareness about water issues and encouraging concrete resource mobilization and action, is planned to be held in Kumamoto City in April 2022, and Japan is working to strengthen international cooperation for resolving global water resource issues and achieving the SDGs.

Note: This article has been created with the consent of the Ministry of Land, Infrastructure, Transport and Tourism and on the basis of materials published by the Ministry.

Unique Ways of Using Water in Japan

Yousuke/PIXTA

Shishi-odoshi

Shishi-odoshi ("deer-scare") is a device that uses water and sound to give Japanese gardens an elegant atmosphere. The structure is a hollow bamboo tube that moves up and down like a seesaw with its center as the fulcrum. The weight of the water flowing into the tube is used to move it up and down, so that one of the sides strikes a stone on the ground and makes a pleasing sound. The sound was originally used to drive away pesky deer and wild boar that would ravage the fields.

Mizubune

The city of Gujo in Gifu Prefecture has a unique water system called *mizubune*, meaning "water boats." It is a system where two or three water basins are placed next to each other at different heights in the home and into which water flows from springs or mountain streams. The residents use the water in the top basin for drinking and to rinse food, while the water in the bottom basin is used to wash dishes and for other household cleaning. Any food scraps left in the bottom tank become feed for the carp in the house pond. In this system, the water is naturally purified and flows into the river.

Photo: Courtesy of Gujo City

Photo: Courtesy of Ministry of Agriculture, Forestry and Fisheries

Circular Tank Diversion

Circular tank diversion is a system for distributing agricultural water fairly to prevent conflicts over water among farmers. Water from rivers and other resources are diverted into a cylindrical basin with the water from the basin then flowing into irrigation channels leading to the surrounding plots of farmland. By dividing the basin's circumference in a way that is proportional to the size of the plots where the water is distributed, the volume of water flowing into each irrigation channel is fair.

Waju Ring Levees

Areas near rivers are often suitable for agriculture, having abundant water input and fertile soil sustained by the river. However, downstream and river confluence areas in particular are at risk from flooding. To counter this, communities in some areas have built what are known locally as *waju* (*wa* means "ring" and *ju* is an area surrounded by a ring levee), surrounding their villages with successive levees (embankments) to protect their houses and farmland.

Photo: Ministry of Land, Infrastructure, Transport and Tourism, Hokuriku Regional Development Bureau, Kanazawa Office of River and National Highway

Wood brews (large bottles) and wood distillates (small bottles) produced on a trial basis from (left to right) cedar, birch and cherry wood

Fragrant Alcoholic Drinks Made from **Wood**

Technology is being developed to ferment drinking alcohols from wood. Once the safety of drinking such alcohols has been confirmed, it may become possible to commercialize alcoholic beverages characterized by the diverse woody fragrances of trees found across Japan.

UMEZAWA AKIRA

The Forestry and Forest Products Research Institute, Forest Research and Management Organization (Tsukuba City, Ibaraki Prefecture) is developing technology to produce richly fragrant drinking alcohols with distinctly woody tones using wood as the raw material. The background to the development is a slump in wood prices and the issue of how to efficiently use wood not suited for construction. The research is being conducted as part of measures to utilize forest resources for regional economic revitalization, including resolving the aforementioned issues by promoting new industries in mountain village areas and creating jobs.

Initially, the goal of the research was to develop technology for producing methane gas fuel and bioethanol from wood. Bioethanol is alcohol used for fuel that is made from wood through chemical and heat treatment with sodium hydroxide. Drinking alcohols are made by yeast fermentation of the sugar content of cereals and fruits. Although about half of the content of wood is cellulose, a carbohydrate that also contains sugar, the cellulose is stiffened by a substance called lignin and packed in the cell walls. Normally, therefore, chemical or heat treatment is needed to break down the cell walls, which renders the alcohol produced unsuitable for drinking and only suitable for use as fuel.

Schematic flowchart of the combined wet-type bead milling process, enzymatic saccharification, alcohol fermentation, and distillation process for food-grade processing of wood to produce wood brews and wood distillates (latest standard manufacturing procedure) (Otsuka et al., 2020)

The research team sought to newly develop a technique called "wet-type milling" that does not require chemical or heat treatment of the wood. Wood powder and water are mixed and thrown into a high-speed rotary machine called a "bead mill" that is used for food processing. The mill pulverizes the wood on the nano level (pieces smaller than 1/1000th of a millimeter) and successfully exposes the cellulose packed in cell walls without using chemical or heat treatment.

Otsuka Yuichiro of the Forest Research and Management Organization team explains, "Using this technology, we can expose cellulose stiffened by lignin by breaking down the cell walls and making it edible for microorganisms. This means it can be saccharified and fermented. In the beginning, we fermented methane and alcohol from wood, making many attempts at producing methane gas fuel and bioethanol from wood."

After adding food additive enzymes and yeast to the cream-like substance that emerges from the wet-type milling and letting it ferment for two to four days in a tank, an amber-colored solution was produced with an alcohol content of about 2%. Distilling this fermented solution yielded distillate with an alcohol content of 28-30% that gave off an aromatic fragrance characteristic of the wood used.

It was then that they had an idea. Could this method be used to make alcoholic beverages?

Otsuka says, "With the wet-type milling, the machine was one used in food processing and all the ingredients added were food additives. So we thought, wood fermentation could open up a new field other than energy production. As a result, we took on the challenge of trialing the production of alcohol richly fragrant with woody tones, and we succeeded. If we use cedar lumber with a diameter of 30 cm and a length of 4 m, we can make fifty bottles of 'wood distillate' (750 ml) with an alcohol content of 35%."

There was a fresh fragrance peculiar to cedar coming from the distillate of the fermented cedar. When the researchers tried again with white birch, they created alcohol with a sweet and deeply mellow fragrance. Analysis of these odorants has revealed that they contain the kind of maturation aromatics produced in whiskey and brandy during long cask maturation.

Additionally, the researchers have experimented with cherry, Mongolian oak and kuromoji (*Lindera umbellata*), and potential has emerged for regional specialties with their own flavors and fragrances.

Nojiri Masanobu of the research team has high hopes for the technology.

"It's said that we have 1,200 types of trees in Japan. If we can realize technology to make delicious alcohol from trees, then we'll have new regional alcoholic drinks made from trees characteristic of different areas around Japan. Future research might identify new beneficial components. If we can create local specialties with high added value, that can hopefully promote domestic forestry."

If this alcoholic beverage made from wood is commercialized, it would be the world's first. Already, there has been a steady stream of inquiries about the production method from brewers and distillers. The technology is still in the trial stage (as of July 2021), but it is thought that production will accelerate and sales will begin once it is has been confirmed that alcohol brewed from wood is safe to drink. A time might eventually arrive when not only rice sake but also Japan's new woody alcoholic beverages are enjoyed around the world.

Photo and Image: Courtesy of the Forest Research and Management Organization

The "Tree Climbing" Pioneer in Japan

Born in the United States and raised in Canada, John Gathright introduced the recreational activity of Tree Climbing ® to Japan about twenty years ago. The activity, which incorporates the ancient Japanese view of nature, is now well established and expanding beyond Japan's shores.

SATO KUMIKO

According to the NPO Tree Climbing® Japan[i], Tree Climbing® (hereinafter "tree climbing") is the practice of climbing trees using special ropes, saddles and safety gear to experience a sense of unity with trees, forests and nature. While originally it was a technique used by tree specialists known as arborists for pruning tall trees without harming them, tree climbing gained popularity as a recreational activity in the United States in the 1980s.

John Gathright established Tree Climbing® Japan in Seto City, Aichi Prefecture in 2000 to introduce tree climbing to Japan and continues to be the country's leading expert in the field and promotes it by such means as training over 6,000 qualified persons.

Raised on Vancouver Island in Canada, Gathright's interest in Japan was sparked in his childhood when he found what appeared to be a wooden tool washed up on the shore that turned out to be a *geta* (traditional wooden Japanese sandal). That spark kindled a desire to go to Japan one day, a desire that was fulfilled when

John Gathright at the top of an ancient giant sequoia tree

he began an undergraduate course at a Japanese university in 1985. It was then that he encountered the culture of wood once again. This time, it was a bento lunch box that captured his imagination.

"In Japan, the leaves of trees are used to impart fragrance to food and preserve it. If you think about it, lunch boxes and chopsticks are made of wood. I realized that trees are truly at the heart of Japanese people's lives," says Gathright.

After graduating from university, Gathright began writing about and promoting nature and the environment, in particular the forest culture of Japan. He started tree climbing when he was contacted by a woman with paraplegia in Japan who said she would like to climb the giant sequoia tree in California that Gathright had written about. Giant sequoias only grow in limited areas—about 1,000-2,600 meters above sea level in the Sierra Nevada in California—and are among the world's tallest trees, reaching heights of up to a hundred meters.

Gathright set about organizing a team of experts in Japan, including a doctor, and in 2001, after three years preparing for the climb, the woman was able to leave her wheelchair and fulfil her dream, spending the night 80 meters up in the arms of the giant tree. According to Gathright, she was the first severely physically challenged person in the world ever to climb an ancient giant sequoia tree.

A few years later, Gathright created a nature experience program to enable visitors to EXPO 2005 AICHI, JAPAN to experience tree climbing firsthand.

In 2007, Gathright received a doctorate from Nagoya University for his research on tree climbing which found that the activity helps reduce stress and regulate the autonomic nervous system. In the same year, his tree climbing program, based on the concept of "Energizing people, energizing trees" (*Hito mo ki mo genki ni naru*) was awarded the first Kids Design Award[ii], promoted by the Ministry of Economy, Trade and Industry (METI). Gathright's program to familiarize people with the forest was praised as "impressive for its inclusion of rules for entering the forest and rigorous safety measures."

Gathright leads a tree-climbing class for children in Japan

In 2013, he established the Arborist® Training Institute, which focuses on training professional arborists mostly in Japan but also overseas.

"I'm glad I was able to start a tree climbing activity in Japan, where people believe that each and every tree is inhabited by a deity. When we work overseas, we call out "*O-jama shimasu*" (a kind of apology for intruding) when entering the forest, and say "*Arigato*" (thank you) to the trees. When I explain that this custom is based on the traditional Japanese view of nature, they understand and join in with me," Gathright says with a smile.

Tree climbing, introduced to Japan by Gathright, is now spreading among forest lovers around the world, incorporating the view of nature held by the Japanese since ancient times.

Gathright's tree-climbing programs are accessible to people of all physical abilities

The Arborist® Training Institute trains professional arborists in Japan and overseas

i. https://www.treeclimbing.jp
ii. Awarded for outstanding products, services, spaces, activities, and research that provide solutions for social issues related to children and child-rearing

All photos: Courtesy of John Gathright

Children catch *ayu* sweetfish by hand on a stretch of the Nagara River
Photo: Courtesy of Gifu Prefecture

Ayu of the Nagara River System

The Nagara River and the *ayu* sweetfish which thrive in its clear waters have been protected by local people for generations. In 2015, in recognition of these efforts and related traditions, "Ayu of the Nagara River System, Japan" was designated as a Globally Important Agricultural Heritage System (GIAHS) by the Food and Agriculture Organization (FAO) of the United Nations.

KATO KYOKO

The 166-km-long Nagara River flows from its source on Dainichigatake, a mountain in northwestern Gifu Prefecture, through Gujo, Mino, Seki, Gifu and other cities in Gifu Prefecture before emptying into the Pacific Ocean off Ise Bay in Mie Prefecture (see map p. 6).

The symbol of the Nagara River is the *ayu* sweetfish (*Plecoglossus altivelis*), a river fish known as the Queen of the Clear Waters. Wild ayu grow by eating nutritious algae that accumulate on rocks at the bottom of the river.

People eat small young ayu deep fried as tempura while adult ayu are often grilled with salt. The adult fish has a unique bitterness and a watermelon-like mellow aroma. On account of this fine aroma, which is not found in other fish, since ancient times ayu has been called *kogyo*, which means "aromatic fish."

The Nagara River is rich in biodiversity. In addition to ayu, approximately 100 species of fish live in the river, including the red-spotted masu salmon (*Oncorhynchus masou ishikawae*), as well as the Japanese giant salamander, a Special Natural Monument, one of the world's largest amphibians.

A variety of traditional fishing methods to catch ayu have been passed down along the Nagara River.

For example, *ukai* is a method of catching ayu with over 1,300 years of history that ingeniously makes use of tethered cormorants to catch the fish.

Sebari ami ryo is a method for catching ayu in a static state with a cast net. A strip of white cloth or vinyl is laid out at the bottom of the river above which a rope is stretched across the surface of the water. Gravid ayu swimming down the river to spawn from around October are surprised by the sound of the rope hitting the water and stop swimming.

Another method is *yoami ryo* (nighttime net fishing), in which ayu are caught at night after being driven by the sounds of paddles hitting the water's surface and by the light of bonfires on the boats.

Inoue Akane from the Satokawa[1] Promotion Division, Department of Agricultural Policy of the Gifu Prefectural Government, explains some of the ways in which the Nagara River and ayu are utilized.

"In addition to tempura and salt-grilled ayu, there is also ayu sushi and Japanese-

Ukai cormorant fishing on the Nagara River
Photo: Courtesy of The Gifu Prefecture Tourism Federation

1. Satokawa is a river that enriches the lives of people in the basin through proper management.

style sweets made into the shape of ayu. Without a doubt, ayu from the Nagara River are synonymous with the food culture of Gifu. There are also many traditional satokawa crafts in the regions along the river that are deeply connected with the waters, including Honminoshi (high-quality handmade paper), which is listed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity."

In this way, the Nagara River and ayu are deeply connected to the traditional foods and culture of the river basin, and the people here have taken good care of this nature and their traditions for generations. This led to their recognition as a Globally Important Agricultural Heritage System (GIAHS) in 2015, with the official title of "Ayu of the Nagara River System, Japan—The Connection Between Ayu and the People of the Satokawa."

Inoue says, "The river was recognized as a GIAHS because the unique Nagara River system in which the ayu, its clear waters, efforts to protect these waters, the preservation of the forests that add nutrients to the river at its source, the fishing industry, and traditional culture are all connected, continues to function well.

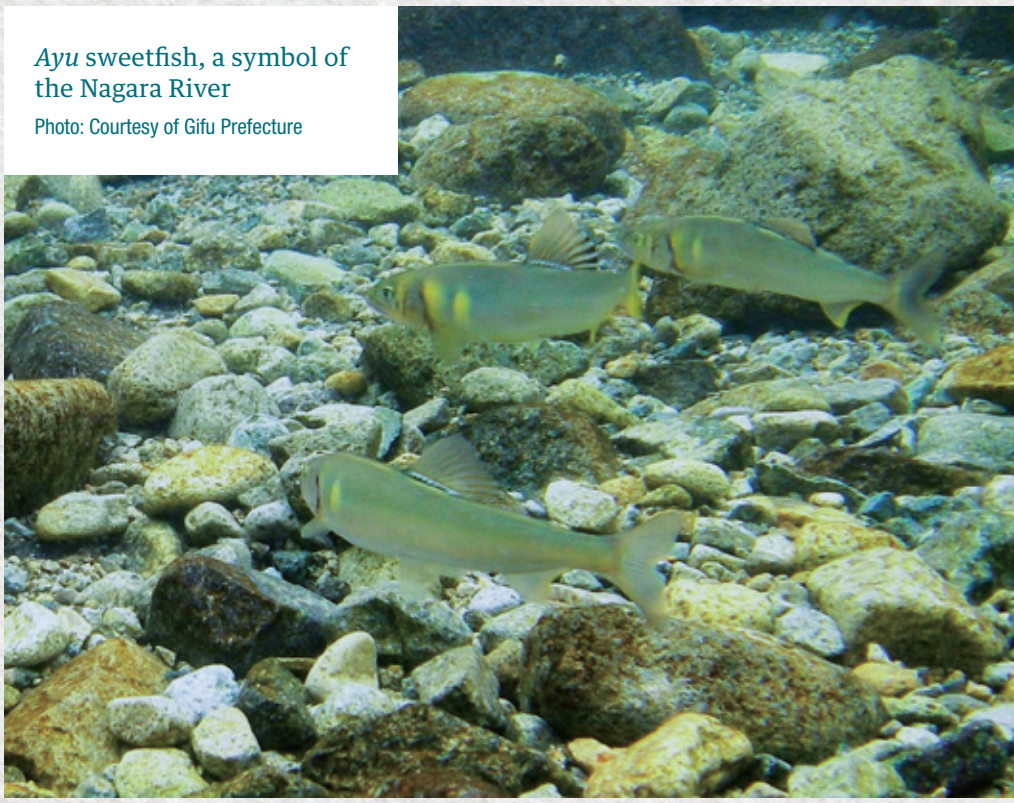
This is why the people along the river have not only enjoyed its benefits, but have also continued a variety of efforts to protect the natural river environment."

For example, a tree-planting project at the river's source is progressing through the cooperation of fishers, foresters and local residents. The local governments are also expanding designated fish-breeding forests, where tree felling and other activities are restricted to support the habitation and breeding of fish. This forest preservation controls soil and tree runoff into the Nagara River, and prevents the water quality from deteriorating. Local governments in the river basin also monitor water quality, and local companies and residents participate in river cleanup activities, as well. Thanks to these efforts that involve various individuals and organizations, the clear waters of the river and its biodiversity are protected, while as many as 860,000 people live in the river basin. And because this environment is maintained, the local traditions and culture are also protected.

To pass on the clear waters of the Nagara River to the next generation, a variety of individuals and organizations will continue to work together and manage the Nagara River.

A stretch of the clear Nagara River

Photo: Courtesy of Gifu Prefecture



Ayu sweetfish, a symbol of the Nagara River

Photo: Courtesy of Gifu Prefecture

The GIAHS Nagara River Ayu Park in Gujo City, Gifu Prefecture, where visitors can enjoy catching and eating ayu

Photo: Courtesy of Gifu Prefecture

Salt-coated ayu grilled the traditional way over charcoal

Photo: Courtesy of The Gifu Prefecture Tourism Federation

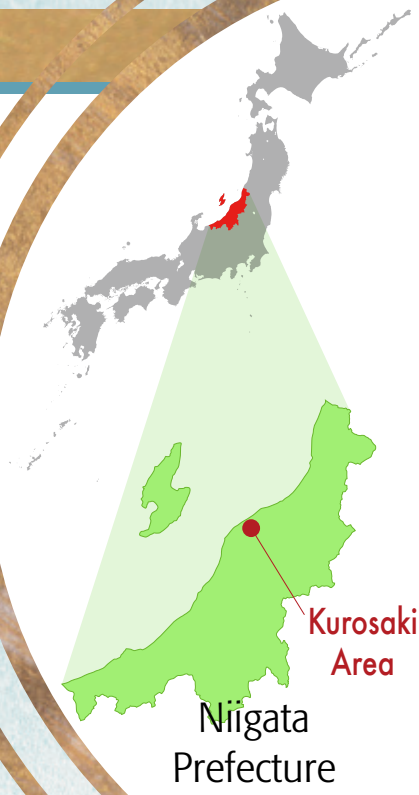
Photo: Courtesy of Kurosaki Chamame

GI JAPAN PRODUCTS

Kurosaki Chamame

くろさき茶豆

Kurosaki Soybeans



Kurosaki Chamame are *edamame* (soybeans) with the characteristic "color," "fragrance" and good mouthfeel of a variety derived from the *Kohirakata* soybean. Since the thin skins in the pod are brown, they came to be called *chamame* (brown beans). Their "fragrance" can be likened to that of roasting tea or popcorn, and when this is added to the "fragrance" and texture of green soybeans, the result is a taste you never tire of.

Because they have a unique aroma when they are boiled and a good balance of flavor and sweetness, they are widely used for gifts, and have earned a high reputation as a luxury edamame.

The production area of *Kurosaki Chamame* is located in the alluvial land area downstream of the Shinano River. Most of the fields are converted fields which are zero meters above sea level, and their fertile soil is ideal for the growth of edamame. However, *Kurosaki Chamame* is difficult to cultivate and manage compared to other varieties, and if the sowing season is earlier, there is a risk the plant will grow higher and topple over. This has been overcome with integrated efforts across the whole production area, with cropping patterns and cultivation management that suit the variety.

During cultivation, the appropriate sowing and harvesting time are set so that the edamame's unique characteristic of "fragrance" and "taste" can be brought out to the fullest extent. Also, harvesting is usually carried out in the morning as maintaining freshness is a priority.

Text and images courtesy of Ministry of Agriculture, Forestry and Fisheries: https://gi-act.maff.go.jp/en/register/entry/29.html