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KOREA ARBORETA AND GARDENS INSTITUTE ANNUAL REPORT 2022

# KOREA ARBORETA AND GARDENS INSTITUTE

## ANNUAL REPORT 2022



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# KOREA ARBORETA AND GARDENS INSTITUTE

ANNUAL REPORT 2022



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## Chairman message

With all of the abnormal weather events that have been happening around the globe, it may seem as though we are experiencing the beginnings of a climate apocalypse. Frequent wildfires and floods, and abnormal temperature fluctuations are all worrying omens. At a time like this, many among us feel a greater need to be mentally soothed, so the role of arboreta and gardens, the perfect place for healing and rest, has been growing.

The Korea Arboreta and Gardens Institute took its current name in 2022 as a way of reflecting its commitment to its expertise. The past year has been one of great effort for the promotion of garden culture and industry. We opened our integrated garden information platform to the public, attracted more domestic visitors to the arboreta and gardens in Korea by giving them plants to take home, and performed a multi-faceted validation of gardening resources, the smart garden, and other aspects of the garden industry to identify and help resolve setbacks. These are some of the ways we help create new business activities in the Korean garden industry. We are also creating more gardens in the everyday environments of Koreans through garden-building programs that are open to public participation, and are developing and distributing garden-building guidelines.

Another focus of the Korea Arboreta and Gardens Institute is the preservation and restoration of forest bio-resources in response to climate change. In the wake of a number of devastating large-scale

wildfires that have occurred in Korea in recent years, we have formed strategies for ecological restoration of the areas stricken by such disasters to restore and even improve the economic, social, and environmental value of the damaged forests as response on a national level.

We are trialing native plant supply centers for the ecological restoration of forests through the planting of native plants. These centers will form the foundation of a system for mass cultivation of native plants for restorative purposes. The Korea Arboreta and Gardens Institute is the first public institution in Korea to be formally assigned responsibility for these forest bio-resources. It is an honor that will see us develop into a global seed vault.

The Korea Arboreta and Gardens Institute operates national arboreta comprising various climate and vegetation zones to create a national safety net for the preservation of biodiversity and promote the utilization of forest bio-resources. By establishing green spaces in cities, fostering the garden industry, and promoting a garden culture in the daily lives of the public, we strive to provide a social value that enfold nature and people in harmony. The Korea Arboreta and Gardens Institute Annual Report 2022 is a concise record of our achievements in the past year. We hope it will help you understand the role and importance of the Korea Arboreta and Gardens Institute.

The Korea Arboreta and Gardens Institute will continue to promote and utilize biodiversity as a climate change response, promote the garden industry and culture, and perform other functions of national importance to achieve results that enrich the lives of Koreans.

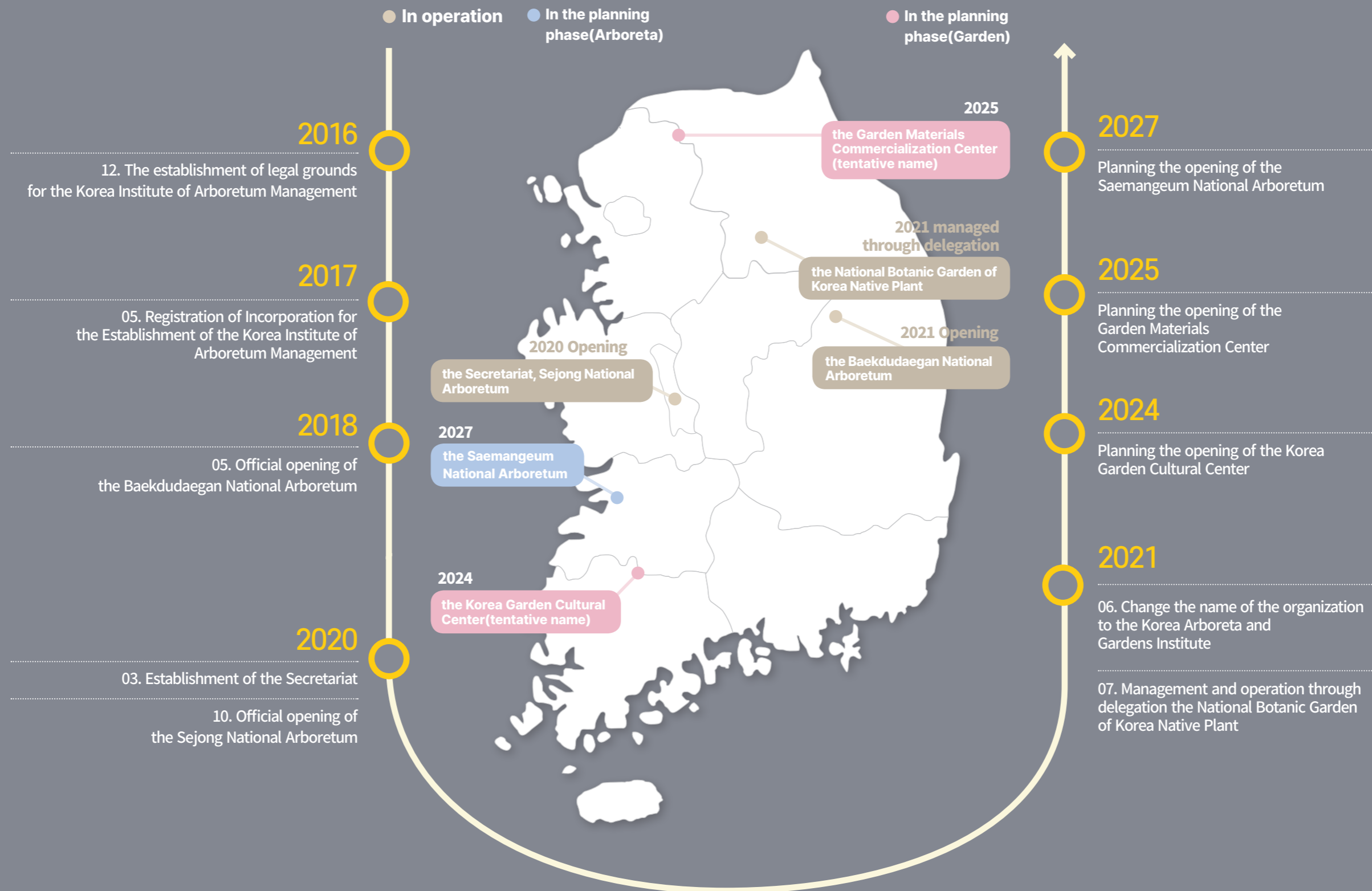
Thank you.

Chairman,  
Korea Arboreta and  
Gardens Institute

**Kwang-soo Ryu**



## History & Future



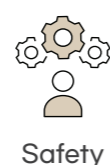
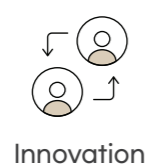
## Mission & Vision

### Management strategy

**Mission** Contributing to the happiness of the people through the promotion of sustainable arboretums and garden values

**Vision** Arboretum and garden platform institution connecting nature and the people

### Core values



### 2030 Management Goals



plant collection  
**10,000 species**



Technology dissemination  
**1,000 cases**



Customer satisfaction  
**95 score**



Korea ESG index  
**100 score**

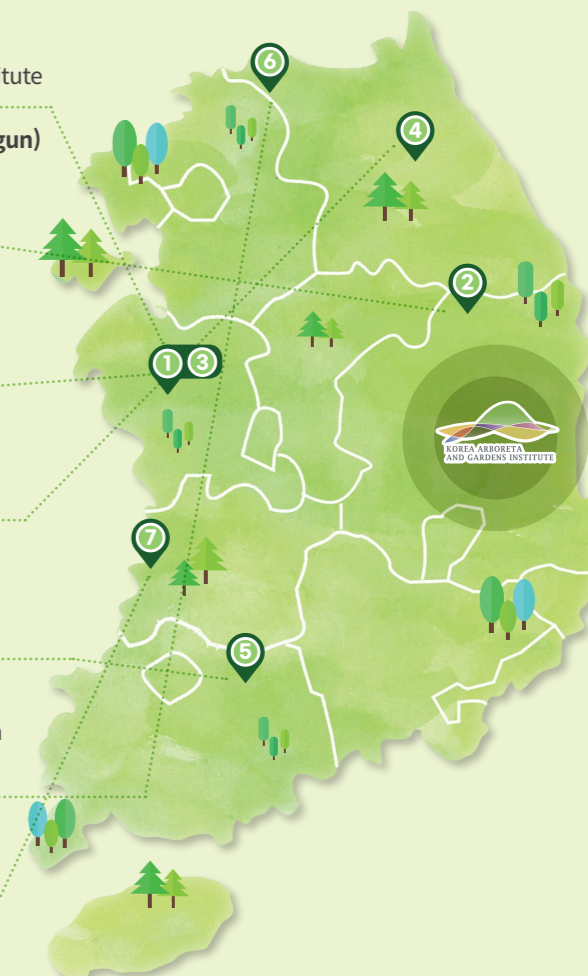
### 4 Major strategic goals

- Establishment of a system for the conservation and restoration of forest bio-resources by region
- Enhancing innovative growth in forest bio and garden industries
- Enhancement of services perceived by the people
- Sustainable innovation in organizational structure

## Facilities

- the Secretariat (Sejong-si)** Head of operations and administration for the Korea Arboreta and Garden Institute
- the Baekdudaegan National Arboretum (Bonghwa-gun)** Conservation and utilization of forest bio-resources in the Baekdu-daegan
- the Sejong National Arboretum (Sejong-si)** Conservation and utilization of forest bio-resources in the central temperate zone and urban
- the National Botanic Garden of Korea Native Plant (Pyeongchang-gun)** Conservation and utilization of forest bio-resources in the northern temperate zone
- the Korea Garden Cultural Center (Damyang-gun)\*** Promotion of garden tourism and training of professionals in gardening (2024)
- the Garden Materials Commercialization Center (Chuncheon-si)\*** The specialized institution for garden plant materials and garden supplies (2025)
- the Saemangeum National Arboretum (Kimje-si)** Conservation and utilization of forest bio-resources in the central and southern temperate zone

\*tentative name



#### Human resources

(Unit : people)	
<b>Total</b>	<b>484</b>
the Secretariat	75
the Baekdudaegan National Arboretum	238
the Sejong National Arboretum	160
the National Botanic Garden of Korea Native Plant	11

#### Budget

(Unit : 1,000KRW)	
<b>Total</b>	<b>80,655</b>
<b>I . Government subsidy</b>	<b>75,866</b>
Private operating subsidy	72,619
Private capital subsidy	990
Private consignment	2,257
<b>II . Business income</b>	<b>4,789</b>

## the Baekdudaegan National Arboretum



Visitor center



Vacation garden



Rainbow garden

### Global arboretum promoting biodiversity in the Baekdu-daegan, discovering and creating value from valuable forest bio-resources, and disseminating knowledge

#### Conservation of forest bio-resources

We develop conservation strategies for endangered plants in the forest bio-resources distributed in the Baekdu-daegan and Korean subalpine zone, which are facing extinction threats due to climate change and other factors.

#### Collection, exhibition, utilization of forest bio-resources

We collect forest bio-resources through various channels, including climate-vulnerable species, species for restoration, Korean crop wild relatives, and those targeted for industrialization, both domestically and internationally.

These resources are utilized for on-site conservation in arboretums, extraction of useful resources, and the creation of a plant history information database.

#### Education and training

We provide customized education tailored to the needs of different generations and demographics. Additionally, we offer practical training programs focused on hands-on experience to cultivate expertise in arboretum and garden-related fields

#### Mutual growth and development

We contribute to the private sector's growth through mutual development with the local community. Additionally, we establish close networks and collaborate with domestic and international arboretums to strengthen the global forest biodiversity conservation system.

**Location :** 1501 Chunyang-ro, Chunyang-myeon, Bonghwa-gun, Gyeongsangbuk-do

**Scale :** 5,179ha

(Focused development area : 206 ha,  
Ecological exploration area : 4,973 ha)

**Opening date :** May 3, 2018

**Plant inventory :** 4,093 species

(Native plants : 1,710 species)

**2022 visitors :** 217,578



Alpine conservatory

#### Main facilities

Facility	Area(㎡)	Contents
Visitor center	5,377	Provides information on the arboretum
Tram waiting area, Sales center	451	Offers a waiting area for tram rides, video viewing, and snack sales
Tiger forest	38,248	Six tigers
Seed valut	2,100	5,424species 192,625 accession
Seed bank	61	1,945species 15,702 accession
Forest environment research center	9,321	Used for research activities and office space for research and administrative staff
Education and training building	5,444	Equipped with facilities for international conferences, large-scale workshops, and seminar rooms
39 Theme exhibition garden	407,380	Alpine conservatory, Children's garden etc

# the Sejong National Arboretum



Landscape



Four-season conservatory



Korean traditional garden

## A world-class urban arboretum leading in the conservation of central temperate forest bio-resources and urban wildlife biodiversity, as well as promoting garden culture

### Conservation of forest bio-resources

We formulate conservation strategies for central temperate forest bio-resources, and promote the development of planting models and the monitoring of biodiversity for the sustainable utilization of urban forests.

### Collection, exhibition, utilization of forest bio-resources

We collect forest bio-resources such as rare plants, endemic plants, plants suitable for gardens, and native plants. These resources are utilized for on-site conservation in arboretums, exploration of garden materials, and the establishment of a plant history information database.

### Education and training

We develop and operate target-specific education and experiential programs for socially vulnerable individuals as well as the general public. Additionally, we nurture experts in the fields of arboretums and gardens.

### Promotion of the garden industry and the activation of cultural initiatives

We conduct research and empirical studies for the exploration of garden materials, contributing to the advancement of the garden industry. Additionally, we promote garden culture in daily life through education on garden plants and providing information on companion plants.

**Location :** 136 Sumokwon-ro,  
Sejong Special Self-Governing City

**Scale :** 65ha

**Opening date :** Oct 17, 2020

**Plant inventory :** 4,121 species  
(Native plants: 762 species)

**2022 visitors :** 797,964

### Main facilities

Facility	Area(㎡)	Contents
Visitor center	1,655	Provides information on the arboretum
Garden shop	122	Arboretum and garden supplies sales
Research center	5,105	Used for research activities and office space for research and administrative staff
25 Theme exhibition garden	401,328	Four-season conservatory, Pollinator garden etc



Bonsai garden

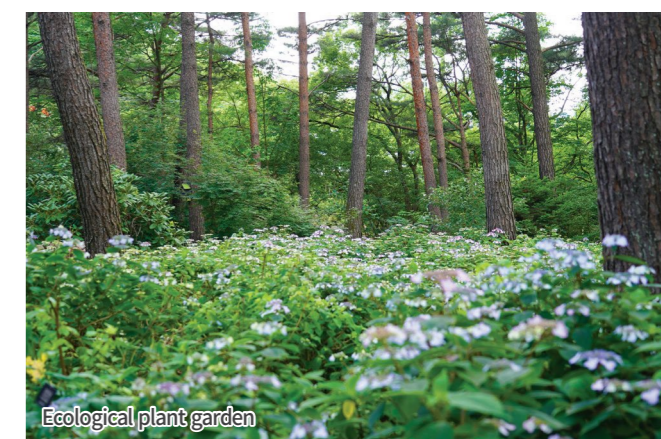
## the National Botanic Garden of Korea Native Plant



Landscape



Cicuta virosa conservation garden



Ecological plant garden

## the Repository of native plants on the Korean Peninsula and sanctuaries for endangered plant species

### Conservation of forest bio-resources

We conserve endemic and rare plants, as well as endangered species that are native to the Korean Peninsula.

### Propagation and exhibition of forest-bio-resources

We collect, propagate, and establish a specialized exhibition garden for rare, endemic, and endangered species. This is to facilitate learning and hands-on experiences for both experts and the general public with native plants.

### Establishment of a wildflower cultivation site

We establish an exhibition garden designed to supply high-quality seeds of native plants and to provide restoration resources for forest degradation.

### Customized experiential programs for consumers

To promote the value of native plants, we conduct tailored interpretation programs for children, teenagers, adults, and individuals with disabilities.

**Location :** 159-4, Biean-gil, Daegwallyeong-myeon, Pyeongchang-gun, Gangwon-do

**Scale :** 10ha

**Managed through delegation :** Jul 07, 2021

**Opening date :** Jul 04, 2022

**Plant inventory :** 1,433 species  
(Native plants : 1,411 species)

**2022 visitors :** 21,520

### Main facilities

Facility	Area(m <sup>2</sup> )	Contents
12 Theme exhibition garden	25,463	Solbaram gallery, Ecological plant garden etc



## the Baekdudaegan Global Seed Vault



Landscape



Seed vault storage



Seed vault stored seeds

### Storage of wild plant seeds worldwide and the establishment of a global seed network

#### Establishment and exchange of a global seed network

We collaborate with international organizations and relevant agencies to undertake global seed conservation initiatives, establishing a permanent storage infrastructure for global wild plant seeds.

#### Planning and operation of a citizen-participation seed conservation program

We plan and operate seed conservation programs that involve citizens, such as seed collection education and practical exercises, targeting university students majoring in relevant fields. This program aims to broaden the public's understanding of seed conservation by actively engaging citizens in seed collection activities.

#### Seed vault promotion

To enhance Seed vault visibility, we conduct promotions targeting international audiences and marginalized communities through the creation of non-verbal promotional materials and book publications. Additionally, we explore and implement various promotional platforms such as exhibitions and newsletters.

**Location :** 1501 Chunyang-ro, Chunyang-myeon, Bonghwa-gun, Gyeongsangbuk-do

**Scale :** 0.2ha (Seed storage area : 0.03ha)

**Seed storage status :** 5,424 species  
192,625 accession

**Facility :** Underground 46m, Tunnel 130m,  
Storage tunnel 37m

**Storage capacity :** 2 million seeds  
(1 million seeds per tunnel)

**Storage environment :** -20°C, Relative Humidity (RH) below 40%, Year-round temperature and humidity control with cooling system



## the Korea Garden Cultural Center



To systematically support the expansion of Korean-style gardens, including the development and dissemination of garden technology and the training of specialized personnel

- Location** The area around Geumseong-myeon, Damyang-gun, Jeollanam-do
- Area** 7ha
- Project duration** 2021~2024
- Main facilities** Greenhouse gallery, Cultivation practice greenhouse, Themed gardens, etc.
- Plan** Opening in 2024

## the Garden Materials Commercialization Center

Promoting the development of the Korean garden industry as a hub for the advancement of 1st to 3rd wave industries, stimulating entrepreneurship, and enhancing the attraction of businesses based on resources such as garden plants, materials, and supplies

- Location** The area around Jungdo-dong, Chuncheon-si, Gangwon-do
- Area** 3ha
- Project duration** 2022~2024
- Main facilities** Demonstration greenhouse, trial garden, practice garden, etc.
- Plan** Opening in 2025

## the Saemangeum National Arboretum

Establishment of a coastal arboretum for the conservation, research, exhibition, education of domestic and international coastal plant resources' biodiversity

- Location** Area around Saemangeum Agricultural and Life Science Complex, Kimje, Jeollabuk-do
- Area** 151ha
- Project duration** 2018~2026
- Main facilities** Plant dome, Themed exhibition garden, Windbreak forest, Research area for natural succession
- Plan** Opening in 2027



## II Key achievements

### Arboretum and garden services

Creation of arboretum and garden visitor culture

Expansion of arboretum and garden education services

Promotion of the garden culture

## Creation of arboretum and garden visitor culture

Project Overview

Development of exhibition content with defined characteristics and provision of customer-centric customized services on a greater scale, to create an arboretum and garden visitor culture that enhances the quality of life for the public

Undertakings and Achievements

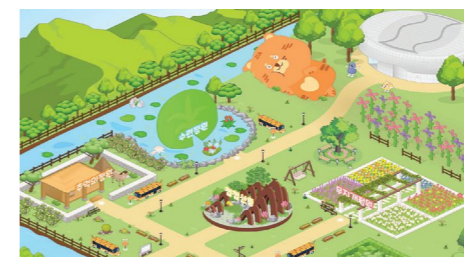
### 1) High-quality arboretum and garden visitor services

#### Undertakings

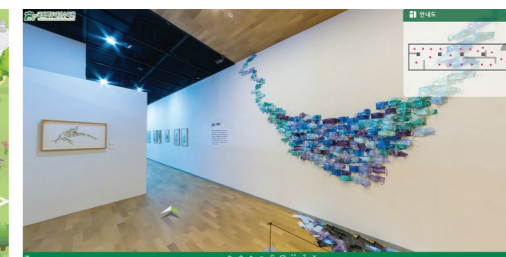
- Provision of unique exhibition content and exhibition and visitor services that incorporated ESG goals to communicate the value of forest biodiversity
- Utilization of a wide range of mediums and technologies, including virtual reality, portal roadmaps, the metaverse, and YouTube, in the provision of information for visitors

#### Achievements

- **1,030,000 visitors** (five-fold increase from 210,000 in 2018)
- Number of festivals, exhibitions, and other events **up by 91%** from 2021 (59 events in 2021 → **111 events in 2022**)
- **Greater visitor satisfaction with exhibitions** (91.5 points in 2021 → **92.5 points in 2022**)
- Awarded in the category of social media at the **2022 Korea Business Communication Awards**



A seed vault visualized in the metaverse



VR exhibition 'Sharing in Art' for 2022 Art Stay



Greenhouse perennials exhibition



Social media category winner at the 2022 Korea Business Communication Awards

Undertakings and Achievements

## 2) Improved service quality through communication with the public

### Undertakings

- Operation of a “Voice of Customers (VOC)” system and expansion of the public service quality assessment group for the systemization and expansion of channels for communication with the public
- Improvements to arboretum visitor services based on visitor feedback, including improved visitor safety, longer operating hours, and more shaded areas

### Achievements

- **Improvement/expansion of the Voice of Customers system** (feedback count doubled, from 24 in 2021 to 48 in 2022)
- **Two-fold expansion** of the public service quality assessment group (42 members in 2021 → **84 members in 2022**)
- **Greater visitor satisfaction** with arboretum services (42 visitors in 2021 → **84 visitors in 2022**)



Inauguration of the public service quality assessment group



Customer service leaders council



Banners promoting Voice of Customers participation



Customer service training

Undertakings and Achievements

## 3) Strengthened public role in arboretum and garden services

### Undertakings

- Personalized benefits with free memberships
- Nighttime exhibitions, education opportunities, performances, and pet plants
- “Healing garden” (two locations) to support residents of areas affected by wildfires and other natural disasters

### Achievements

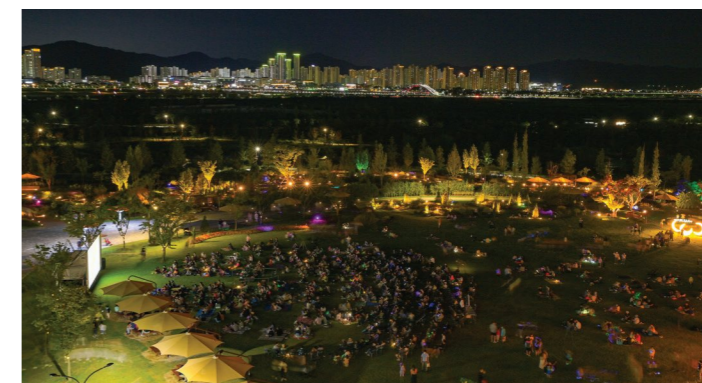
- **6,148 free memberships** (63.1% of total membership)
- **96.2% satisfaction** with nighttime openings, with **96.7% wishing to revisit**
- **Six commendations for public service**, including a citation from the minister of the interior and safety



Pet plant kit concert



Healing garden for people affected by wildfires



Night performance as part of Sejong festival



Forest environment award

# Expansion of arboretum and garden education services

Project Overview

Creation of an education system with set targets and subjects and provision of customized education for the socially disadvantaged to achieve ESG management and improve customer satisfaction

Undertakings and Achievements

## 1) Education for awareness of carbon neutrality for climate change response

### Undertakings

- Carbon neutrality education for the general public, the socially disadvantaged, and professionals to enable the practice of carbon neutrality using the forest environment
- Incorporation of carbon neutrality education into the curriculums of government-designated schools\* as an effort to strengthen climate change response education

\* The Korea forest service, 6 other government departments and 17 municipal and provincial offices of education have designated kindergartens and elementary, middle, and high schools to provide set curriculums in climate change response, ecological transformation, and carbon neutrality

### Achievements

- **Four-fold increase** in students from 2018 (30,000 in 2018 → **120,000 in 2022**)
- **Increase in education beneficiaries** (1,174 in 2021 → **3,504 in 2022**)



Training of carbon neutrality educators



Carbon neutrality education for senior-year elementary school students



A plant-growing project as a carbon neutrality effort



An educational program for carbon neutrality practice

Undertakings and Achievements

## 2) Customized education for the socially disadvantaged

### Undertakings

- Social welfare facilities and educational facilities for islands, remote areas, and special schools to help reduce gaps and blind spots in education; visiting education for residents of areas affected by wildfires
- Jobs at arboreta and gardens for persons with disabilities; cooperation with public institutions in the creation of jobs

### Achievements

- Care and education programs, online/offline content, and healing garden programs provided **for the benefit of 50,729 socially disadvantaged individuals**
- Cooperation with public institutions resulted in **the hiring of two individuals with disabilities**



Hands-on learning activity for special school students



Contactless education for special school students



Gardening program for special school students



Native plant education for special school students

Undertakings and Achievements

### 3) Networking for an expansion of education services

#### Undertakings

- Network strengthening for better communication and cooperation in the provision of education services to the public, at public and private arboreta

#### Achievements

- **Arboretum/garden education network expansion** (15 locations in 2021 → 25 locations in 2022)
- **Large increase in education provided through networking** (2,000 learners in 2021 → 180,000 learners in 2022)



2022 public and private arboretum and garden education network symposium



Networking of public and private arboreta



Networking of public and private arboreta

## Promotion of the garden culture

Project Overview

Expansion of gardening infrastructure in the public's living sphere and creation of a foundation (databases) for the gardening industry to improve the quality of gardens and promote greater customer satisfaction.

Undertakings and Achievements

### 1) Formation of gardens open to public participation for carbon neutrality

#### Undertakings

- Establishment of carbon-absorbing gardens in the living spheres of the public; promotion of public awareness of such gardens
- Cooperation with universities, associations, and volunteer groups in the establishment of carbon-absorbing gardens
- Cooperation with the government, businesses, public institutions, and corporate welfare facilities in carbon absorption, city regeneration, improvement of at-risk locations, and recruitment of personnel for the sustainability of gardens

#### Achievements

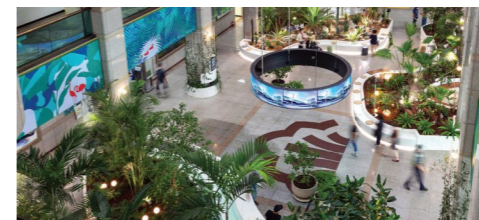
- **Two carbon-absorbing green locations registered**
- **99% public approval of net-zero gardens; 1,000 net-zero garden manuals distributed**
- Members of the public participating in garden installation increased by 6.7 times (147 in 2021 → 990 in 2022)
- Gardens providing daily benefits increased by 1.9 times (74 in 2021 → 144 in 2022)
- Jobs for gardening professionals and members of socially disadvantaged classes increased by 1.9 times (690 in 2021 → 1,294 in 2022)



Local community participation in garden installation at an apartment complex in Gangwon Province



Garden party at Joongbu university in Gyeonggi Province



Indoor garden at Bucheon City Hall, Gyeonggi Province



Garden outside a national tax service building in Daejeon

Undertakings and Achievements

## 2) Improved quality of garden services

### Undertakings

- Operation of national garden assessment standards to improve the quality of gardens
- Expert consulting and supply of resources and technologies at different stages of garden installation
- Public-private networking for the protection, restoration, and stabilization of public and private gardens in areas affected by storms, wildfires, and other natural disasters

### Achievements

- Improvement in garden quality rating for three consecutive years (70 points in 2020 → 81 points in 2021 → **85 points in 2022**)
- 17.9% increase in satisfaction with consulting provided at provincial and private levels (78 points in 2021 → **92 points in 2022**)
- Cost of plant purchases for private garden restoration **down by KRW 69 million**



Private garden consulting



Private garden consulting



A conference for private garden quality improvement

Undertakings and Achievements

## 3) The garden as a part of everyday culture

### Undertakings

- Channels for two-way communication with the public and provision of garden-related information (garden locations, supplies, expert services, etc.) to promote the use of the 'Garden World' web platform database
- Issuing of a handbook on gardens located across Korea, new TV content on gardens and gardening, and other sources of garden-related information for the public
- Experiences for the public at garden expos; Industrial exhibition on pet plants

### Achievements

- Use of 'Garden World' web platform database as a source of information up by 25 times (58 times in 2021 → **1,459 times in 2022**)
- 'Garden TV' Youtube channel subscribers up by 3.6 times, views up by 2.9 times
- Visitors to gardens in Korea up by 1.5 times (5,590,000 in 2021 → **8,500,000 in 2022**)
- 10.7% increase in the public's satisfaction with industrial exhibition on pet plants (84 points in 2021 → **93 points in 2022**)



Handbook on private gardens



Industrial exhibition on pet plants



'Garden World' web platform



'Garden TV' Youtube channel



## Conservation of forest natural habitats

**Project Overview**  
 Assessment of plant species and regions considering their protection from the effects of climate change, and supply of native plants for restorative purposes in support of forest conservation and restoration policies as a climate change response

**Undertakings and Achievements**  
**1) Assessments for the protection of rare plants from the effects of climate change**

### Undertakings

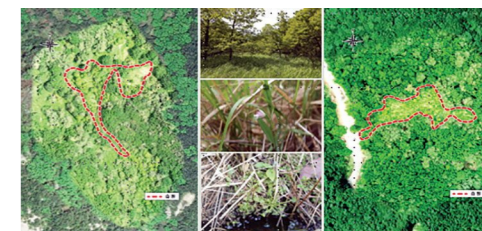
- Scientific data analysis and expert assessment of rare plant conservation for stronger protection and management in a legal context
- Identification and monitoring of habitats of near-extinct coniferous tree species; use of advanced ICT in the protection of a larger area of coniferous tree forests

### Achievements

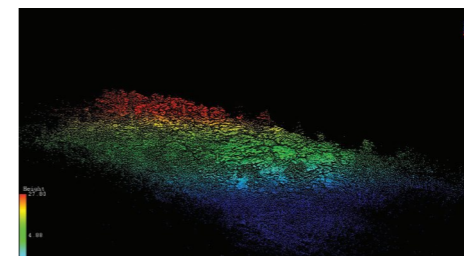
- **Rare plant conservation assessment completed for an additional 5 species** (7 species in 2021 → 12 species in 2022)
- Additional 2,002 new plant samples acquired (8,338 in 2021 → 10,340 in 2022)
- Greater area of coniferous tree forests now under protection
- **Awarded the grand prize at the 2022 forest ICT conference**



Field inspection as part of a conservation assessment



Expansion of protected forests



ICT based advanced forest technology(LiDAR)



Grand prize at the 2022 forest ICT conference

Undertakings  
and  
Achievements

## 2) Improved ecological restoration for the conservation of forest natural habitats

### Undertakings

- Establishment and operation of native plant supply centers for ecological restoration  
\* Native plant supply center : Facilities for the collection, propagation, production, and supply of seeds of native plants of Korea
- Formation of strategies for cooperation among the private sector, the public sector, and universities in ecological restoration of the parts of Korea worst-impacted by wildfires

### Achievements

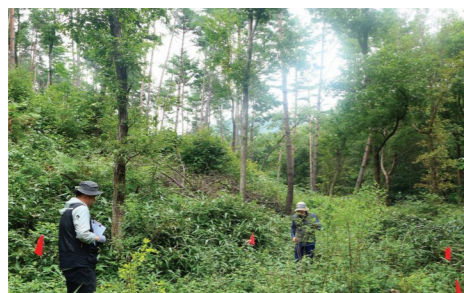
- An additional 20 species acquired for use in restoration (260 in 2021 → **280 in 2022**)
- **2,300** collected seeds analyzed in form, vitality, and DNA
- **16,800** plants produced for restorative purposes



Improved ecological restoration for the conservation of vegetation



Completed ecological restoration of Ihwaryeong



Survey of damaged forest area



Survey of damaged forest area

# Ex-situ conservation

Project  
Overview

Conservation of globally endangered plants and improved global cooperation in seed vaults for the establishment of a national forest plant safety net

Undertakings  
and  
Achievements

## 1) Formation of forest plant and resource conservation areas

### Undertakings

- Establishment of forest plant conservation areas in the stages of plant acquisition, propagation and production, and creation of conservation areas

### Achievements

- **Conservation areas increased in size by 1.4ha** from the previous year
- Conservation of more coniferous tree species (1 species → **10 species**)



Expansion of conservation areas



Planting of birch saplings



Conservation of global alpine plants (Alpine conservatory)

Undertakings and Achievements

## 2) Creation of redundant seed vaults

### Undertakings

- Seed vault manual update, digitalization of management processes, and smart radar security technology\* for improved operation of seed vaults  
\* Smart radar technology : Use of radar technology for real-time monitoring of hazards
- Additional seed inspection processes for seed quality improvement
- Improved networking with AFoCO and CABCN for storage of seeds
- Storage of more seeds of Korean origin with the public's participation

### Achievements

- Ratio of top-grade seeds increased by 16% (84% in 2021 → 100% in 2022)
- Foreign seed storage up by 2.2 times from previous year (32,062 seeds in 2021 → 72,860 seeds in 2022)
- Korean seed storage up by 13% from previous year (105,818 seeds in 2021 → 119,765 seeds in 2022)
- Seeds of 126 new species acquired in 2022 (2,937 species in 2021 → 3,063 species in 2022)



Black box system for seed vaults



Adoption of smart radar technology supplied by U+



Public participation program for seed vault expansion



Smart radar project cooperation agreement ceremony

# Dissemination of awareness on conservation resources

Project Overview

Digital information on preserved resources and diversification of conservation activities entailing the public's participation for the systematic control of plants under management, and increased public awareness of the importance of botanical conservation

Undertakings and Achievements

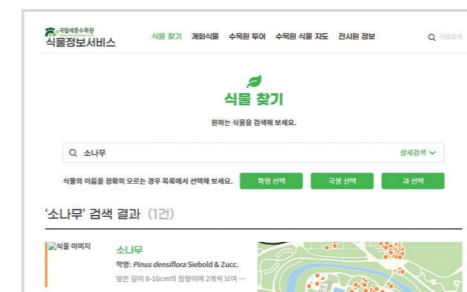
## 1) Efficient control of plants under management

### Undertakings

- Review and classification of plants in accordance with national standards for the accurate indication of plant names
- Development of a new plant taxonomy chart for effective communication of plant names
- Creation of digital, open plant information to promote a better understanding of plants among the public

### Achievements

- \*Names of 161 plants in cultivation added to the checklist of the native plants of Korea
- \* Plants in cultivation : Plants cultivated artificially for certain purposes; wild plants and horticultural varieties of foreign origin included
- Intellectual property rights to new plant taxonomy chart sought; technical training of the relevant agencies in the new plant taxonomy chart provided on four occasions
- Assessed quality of public data up by 97% from previous year (42.4 points in 2021 → 83.7 points in 2022)



Location-based plant information services (Sejong)



promotion working of public data opening business

## 2) Strengthened conservation of forest bio-resources with public participation

### Undertakings

- Sharing, participation, and 43 promotion involving the public to spread a culture of forest bio-resources conservation
- Cooperation with businesses in the formation of coniferous tree conservation areas, collection/storage of native plant seeds, execution of public campaigns, and use of the latest technology to acquire 3D botanical data for improved conservation and restoration of forest bio-resources

### Achievements

- Distribution of native plants as pet plant up by 3 times from previous year (330,000 recipients in 2021 → **1,010,000 recipients in 2022**)
- Public satisfaction with native plants as pet plant rated at **4.5 out of 5**
- **KRW 1.4 billion** acquired as conservation funds (increase by **13 times** from 2021)



First-ever donation of a native plant seed vault by the POSCO university student volunteer group in 2022



“Sharing walk” campaign for public participation



Free distribution of native plants as pet plants



A special winter event for greater awareness of near-extinct coniferous trees

# II Key achievements

## Utilization of forest bio-resources

- Research of forest bio-resources
- Propagation and supply of forest bio-resources
- Demand-oriented industrialization technological support

# Research of forest bio-resources

Project Overview

Identification of demand for native plants and development of native plants to replace imported plants as part of forest bio-resources research aimed at developing the forest bio and garden industry

Undertakings and Achievements

## 1) Establishing big data for seeds and research for industrialization

### Undertakings

- Establishment of inventories of domestic wild relatives\* and other activities for the acquisition of seed information big data, to be opened as public data
  - \* Wild relative : Plants growing in mountains and fields that are genetically closest to crops and have high industrialization value
- Focused research in the discovery of materials for forest bio-resources industrialization, such as forest microbiomes\* and genomes\*
  - \* Microbiome : The microorganisms in a particular environment Forest microbiomes have applications across the biotechnology industry, including the use of forest bio resources for a greater yield of forest products and the development of functional materials
  - \* Genome : The entire set of DNA instructions found in a cell

### Achievements

- Seed information big data doubled from the previous year (29,288 items)
- Three items of export material commercialized, which was enabled by seed utility information
- Discovery of materials for industrialization up by 80% from previous year (5 items in 2021 → 9 items in 2022)
- Registered patents up by 43% from previous year (7 patents in 2021 → 10 patents in 2022)



Single grain of Rubus phoenicolasius



Research on the establishment of seed information



Fruit of Vaccinium oldhamii



Seed information management system

Undertakings and Achievements

## 2) Discovery of superior plants based on research on the environmental adaptability of garden plants

### Undertakings

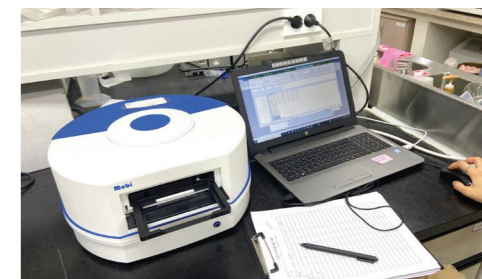
- Establishment of a collaborative research system through linkages with universities, research institutions, and private breeders
- Research on the physiological characteristics of garden plants and expansion of evaluation criteria for adaptability to indoor and outdoor environments for the advanced discovery of superior garden plants

### Achievements

- Discovery of garden plants of merit to replace import plants up by 2 times from previous year (5 plants in 2021 → 10 plants in 2022)



Light adaptability sample collection



Chlorophyll and biochemical analysis equipment



Photosynthesis measurement



Spleenwort

# Propagation and supply of forest bio-resources

**Project Overview**  
Realizing collaborative partnerships with regional farming communities and businesses through the establishment of plant mass production systems and technology dissemination

**Undertakings and Achievements**  
**1) Development and supply of cultivation techniques to meet demand for forest bio-resources**

**Undertakings**

- Establishment of a system to identify demand for saplings, secure sites for automated greenhouse facilities, and other related basic activities
- Development of new domestic varieties to replace imports
- Development of propagation techniques in compliance with cosmetic ingredient production standards; development of techniques for mass propagation of plants to be used as health or functional food ingredients
- Development of techniques for the cultivation of plants of merit that can adapt to city environments in support of garden installation projects
- Establishment of a system for the mass production of plants, comprising four stages :  
① Sowing ② Plug seedling cultivation ③ Uniform seedling production ④ Mass production and supply

**Achievements**

- Plant distribution rates up by 1.25 times from previous year (71% in 2021 → 89% in 2022)
- Technological development research achievements up by 1.6 times from previous year (22 plants in 2021 → 36 plants in 2022)
- Systemized mass production up by 4 times from previous year (50K plants in 2021 → 200K plants in 2022)



Stage 1: Sowing

Stage 2: Plug seedling cultivation

Stage 3: Uniform seedling production

Stage 4: Mass production and supply

**Undertakings and Achievements**

**2) Supply of Propagation and Cultivation Technologies for regional farming community Development Support and New Income Generation**

**Undertakings**

- Sharing of propagation and cultivation techniques used at arboreta with regional farming communities, followed by monitoring and cultivation quality assessment
- Support for farmers' autonomy through the provision of farming training to suit farmers of varying levels
- \*Development and supply of multi-use pots to reduce production cost and labor  
\*Multi-use pot : A new technology which reduces plastic waste generated in the production of plants

**Achievements**

- KRW 1,390 million in income for farmers in 68 locations from contracted farming
- New social enterprise and public sector jobs up by 80% from previous year (67 jobs in 2021 → 121 jobs in 2022)



Strengthened support for regional farming communities

# Demand-oriented industrialization technological support

Project Overview

Sharing of research infrastructure and improved industrial-academic-research cooperation to enable the provision of industrialization technologies that achieves technological proliferation to an extent perceivable by the public

Undertakings and Achievements

## 1) Infrastructure sharing for the promotion of the forest bio industry

### Undertakings

- Technology seminars for businesses and operation of booths at academic events for better discovery of demand for technology
- Improved and increased training and consulting in technology; increased supply of seeds and extracts to outside parties for research purposes, followed by performance tracking
- Technology guidance and a supply system connecting farmers and businesses for post-management of transferred technology
- Technological support for private businesses and joint research for increased commercialization

### Achievements

- Six partnership agreements and two technology transfers
- Beneficiary institutions up by 13% from previous year (23 in 2021 → 26 in 2022)
- Commercialization enabled by specialty local products and plants up by 1.1 times (7 items in 2021 → 8 items in 2022)



Baekdudaegan National Arboretum Research Infrastructure workshop for companies



Joint research agreement with LG Household & Health Care



Joint research agreement with Kyungnong

Undertakings and Achievements

## 2) Business platform for garden industry support

### Undertakings

- Multiple channels to identify demand, for the discovery of opportunities for field validation of new garden technologies and garden-related products
- Expansion of the market for field validation through market expansion support
- Exhibitions and review sessions on Korean garden plants to identify high-value garden plants, and gain an understanding of the garden plant market

### Achievements

- Most-in-demand quasi-governmental institution as a provider of validation services
- Participation in the exhibitions and fairs of 155 companies
- Thirty-five plants identified as Koreans' favorites through public review sessions
- Expert review of garden plant 10 species on novelty, color, texture, and usability



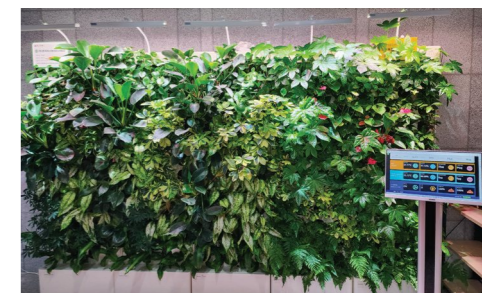
Public infrastructure sharing and market expansion support



Exhibition/review of garden plants



Review session for selection of excellent plants



Korean trial garden validation

## 01 Key statistics

### Visitors

(unit : people)

	Total	2016	2017	2018	2019	2020	2021	2022
Total	2,556,559	19,497	115,471	209,816	205,625	388,023	581,065	1,037,062
Baekdudaegan national arboretum	983,261	19,497	115,471	209,816	205,625	94,322	120,952	217,578
Sejong national arboretum	1,551,778	-	-	-	-	293,701	460,113	797,964
National botanic garden of Korea native plant	21,520	-	-	-	-	-	-	21,520

### Education beneficiaries

(unit : people)

	Total	2017	2018	2019	2020	2021	2022
Total	403,033	16,838	33,483	69,636	68,298	94,006	120,772
Baekdudaegan national arboretum	274,756	16,838	33,483	69,636	20,699	61,482	72,618
Sejong national arboretum	90,081	-	-	-	10,293	32,524	47,264
Secretariat	37,446	-	-	-	37,306	-	140

### Professional workforce development

(unit : people)

구분	Total	2018	2019	2020	2021	2022
Total	2,513	13	514	581	683	722
Baekdudaegan national arboretum	1,262	13	514	115	276	344
Sejong national arboretum	716	-	-	72	266	378
Secretariat	535	-	-	394	141	-

### Publication of research papers

(unit : cases)

	Total	SCIE	SCOPUS	KCI
Total	242	105	28	109
2017	4	1	-	3
2018	34	14	6	14
2019	43	19	3	21
2020	52	17	3	32
2021	53	27	4	22
2022	56	27	12	17

## III Appendix

### Key statistics Academic achievement

Patents and technology transfers

(unit : cases)

	Total	2017	2018	2019	2020	2021	2022
Application	33	3	6	3	12	7	2
Registration	28	-	-	5	6	7	10
Tech transfers	14	-	5	1	3	3	2
Tech dissemination	146	-	-	-	24	52	70

BAEKDUDAEGAN NATIONAL ARBORETUM

Forest bio-resources in arboretum

Plant introduction

	2021	2022
Family	175	175
Genus	937	942
Species	3,940	4,093

\* Cumulative total

Plant introduction by plant type

	2021		2022	
	No. of species	Introduction rate(%)	No. of species	Introduction rate(%)
Native plants	1,652	44	1,710	45.4
Cultivated plants	2,288	-	2,383	-
Total	3,940	100	4,093	-

\* Cumulative total

\* Native plants : Based on the 'Checklist of Vascular Plant in Korea' Revised Edition(Korea National Arboretum, 2017)

\* Cultivated plants : Based on the National cultivated plant list and cultivated plants not included in the list

Introduction of species inhabiting the Baekdudaegan

2021		2022		Yearly changes
No. of species	Introduction rate(%)	No. of species	Introduction rate(%)	
1,152	61.7	1,163	62.3	11

\* Cumulative total

\* 2nd Phase Baekdudaegan forest bio-resource status change survey report 1,867 taxa(Korea Forest Service, 2015)

Planting status by year

Year	No. of species	No. of trees
~2015	1,859	2,681,056
2016	207	640,369
2017	571	210,646
2018	838	301,303
2019	923	607,050
2020	752	934,725
2021	580	279,464
2022	240	378,570

Introduction of rare and endemic plants

(unit : species)

Rare/Endemic plants		2021	2022	Introduction rate(%)	Yearly changes	
Rare plants	Total	571**	315	315	55.2	-
	Extinct in the Wild(EW)	4	-	-	-	-
	Critically Endangered(CR)	144	64	64	44.4	-
	Endangered(EN)	122	76	76	62.3	-
	Vulnerable(VU)	119	82	82	68.9	-
	Least Concern(LC)	70	58	58	82.9	-
	Data Deficient(DD)	112	35	35	31.3	-
Endemic plants		360***	163	163	45.6	-

\* Cumulative total

\*\* Enforcement Regulations of the Arboretum and Garden Creation and Promotion Act [Annex 1 of 3] Rare Plant Standards (2012)

\*\*\* Enforcement Regulations of the Arboretum and Garden Creation and Promotion Act [Annex 1 of 4] Endemic Plant Standards (2012)

Rare and endemic plant holdings

Year	Total	No. of species								
		Rare plants			Endemic plants			the others		
		Herbaceous plant	Woody plant	the others	Herbaceous plant	Woody plant	the others	Herbaceous plant	Woody plant	the others
2021	3,948	225	76	14	118	44	1	2,419	1,038	85
2022	144	-	-	-	-	-	-	67	77	-

\* 2021 : The cumulative plant resource holdings from the establishment of the arboretum until the year 2021

2022 : The newly collected plant resource figures

### Securing native plant materials for forest restoration in 2022

	Family	Genus	Species	Subspecies	Variety	Total species
Total	26	40	232		48	280
Monocotyledon	2	3	8			8
Dicotyledon	24	37	224		48	272
Gymnosperm	22	31	211		12	223
Angiosperm	2	6	13		36	49

## SEJONG NATIONAL ARBORETUM

### Forest bio-resources in arboretum

#### Status of plant introduction

	2021	2022
Family	202	203
Genus	869	903
Species	3,759	4,121

\* Cumulative total

#### Plant introduction by plant type

	2021		2022	
	No. of species	Introduction rate(%)	No. of species	Introduction rate(%)
Native plants	738	19.6	762	20.2
Cultivated plants	3,021	80.4	3,359	-
Total	3,759	100	4,121	-

\* Cumulative total

\* Native plants : Based on the 'Checklist of Vascular Plant in Korea' Revised Edition(Korea National Arboretum, 2017)

\* Cultivated plants : Based on the National cultivated plant list and cultivated plants not included in the list

### Planting status by year

Year	No. of species	No. of trees
2018	56	12,086
2019	1,423	1,388,386
2020	1,901	636,491
2021	1,079	33,978
2022	592	175,498

### Introduction of rare and endemic plants

Year	Total	No. of species								
		Rare plants			Endemic plants			the others		
		Herbaceous plant	Woody plant	the others	Herbaceous plant	Woody plant	the others	Herbaceous plant	Woody plant	the others
2021	3,758	139	55	-	64	27	-	2,050	1,468	-
2022	363	2	1	-	3	2	-	188	168	-

\* 2021 : The cumulative plant resource holdings from the establishment of the arboretum until the year 2021

2022 : The newly collected plant resource figures

### Introduction of rare and endemic plants

		2021	2022	Introduction rate(%)	Yearly changes	
Rare plants	Total	571**	193	196	34.3	3
	Extinct in the Wild(EW)	4	-	-	-	-
	Critically Endangered(CR)	144	42	42	29.2	-
	Endangered(EN)	122	45	45	36.9	-
	Vulnerable(VU)	119	53	54	45.4	1
	Least Concern(LC)	70	38	39	55.7	1
	Data Deficient(DD)	112	15	16	14.3	1
Endemic plants		360***	91	94	26.1	3

\* Cumulative total

\*\* Enforcement Regulations of the Arboretum and Garden Creation and Promotion Act [Annex 1 of 3] Rare Plant Standards (2012)

\*\*\* Enforcement Regulations of the Arboretum and Garden Creation and Promotion Act [Annex 1 of 4] Endemic Plant Standards (2012)

BAEKDUDAEGAN GLOBAL SEED VAULT

Seed storage status

	2021	2022	Yearly change rate(%)	Yearly changes
Family	236	263	11.4	27
Genus	1,531	1,616	5.6	85
Species	4,892	5,424	10.9	532

\* Cumulative total

Seed storage by plant type

	2021		2022		Yearly changes
	No. of species	Storage rate(%)	No. of species	Storage rate(%)	
Total	4,892	-	5,424	-	532
Native plants	1,946	51.6	1,968	52.6	22
Cultivated plants	845	8.1	871	8.7	26
Naturalized plants	215	67	215	67	
Exotic plants	2,655	-	3,145	-	490

\* Cumulative total

\*\* Native plants : Based on the 'Checklist of Vascular Plant in Korea' Revised Edition(Korea National Arboretum, 2017)

\*\* Cultivated plants and Naturalized plants : Based on the 'Checklist of Vascular Plant in Korea'(Before revision, Korea National Arboretum)

Seed storage status of rare and endemic plants

		2021	2022	Storage rate(%)	Yearly changes	
Rare plants	Total	571**	338	363	63.6	25
	Extinct in the Wild(EW)	4	-	-	-	-
	Critically Endangered(CR)	144	60	66	45.8	6
	Endangered(EN)	122	76	81	66.4	5
	Vulnerable(VU)	119	88	93	78.2	5
	Least Concern(LC)	70	63	64	91.4	1
	Data Deficient(DD)	112	51	59	52.7	8
Endemic plants		360***	169	171	47.5	2

\* Cumulative total

\*\* Enforcement Regulations of the Arboretum and Garden Creation and Promotion Act [Annex 1 of 3] Rare Plant Standards (2012)

\*\*\* Enforcement Regulations of the Arboretum and Garden Creation and Promotion Act [Annex 1 of 4] Endemic Plant Standards (2012)

02 Academic achievement('22)

No	Title	Authors	Journal name
1	Production of Daidzein and Genstein from Seed and Root Extracts of Korean Wild Soybean by Thermostable $\beta$ -Galactosidase from <i>Thermoproteus uzoniensis</i>	Shin KC, Kang SH, Oh DK, Kim DW, Kim SH, Na CS and Kim YS	Applied Sciences
2	A new lichen-forming fungus, <i>Aspicilia humida</i> , from a forested wetland in South Korea, with a taxonomic key for Korean <i>Aspicilia</i> species	Lee BG, Shin HT, Hur JS	Mycobiology
3	Two new lecanoroid lichens in the forested wetlands of South Korea, with a taxonomic key for Korean <i>Protoparmeliopsis</i> species	Lee BG, Hur JS	MycoKeys
4	Brief Pollination Assessment of a Critically Endangered Food-Deceptive Orchid ( <i>Cypripedium guttatum</i> ) Using a Network Approach	Lee HB, Lee HS, Bae KH	Plants
5	A new lichenized fungus, <i>Psoroglaena humidisilvae</i> , from a forested wetland of Korea, with a taxonomic key to the species of <i>Psoroglaena</i>	Lee BG, Hur JS	Journal of Fungi
6	Effects of Torrefied Wood Chips and Vermicompost on Tree Growth and Weed Biomass: Implications for the Sustainable Management of Salt-Affected Reclaimed Lands	An JY, Aung Aung, Jonathan Ogayon Hernandez, Seo JM, Han SH, Park BB	Land
7	Microbial Diversity Analysis of <i>Bupleurum latissimum</i> Nakai from Ulleung-Do of South Korea Using Next-Generation Sequencing	Han KM, Choi MN, Pi JH, Kim SH, Kim YS, Na CS	Microbiology Resource Announcements
8	Characterization of L-Arabinose Isomerase from <i>Klebsiella pneumoniae</i> and Its Application in the Production of d-Tagatose from d-Galactose	Shin KC, Seo MJ, Kim SJ, Kim YS, Park CS	Applied sciences
9	Biogenesis and Lipase-Mediated Mobilization of Lipid Droplets in Plants	Choi YJ, Kseniia Zaikova, Yeom SJ, Kim YS, Lee DW	Plants
10	Molecular Properties of $\beta$ -Carotene Oxygenases and Their Potential in Industrial Production of Vitamin A and Its Derivatives	Shin KC, Seo MJ, Kim YS, Yeom SJ	antioxidants
11	Preventing scattering of <i>Tetranychus urticae</i> in <i>Rosa hybrida</i> through dsCOPB2 expression	Lee SY, Shin JY, Kwon DH, Junping X, Kim JH, Ahn CH, Jang SH, Kwon OH, Lee HJ, Kim WH	Scientia Horticulturae
12	Effect of gibberellic acid treatment and alternating temperature on breaking physiological dormancy and germination in <i>Penthorum chinense</i> Pursh(Penthoraceae)	Lee MH, Song CH, Park CH, Song KS, Kim SY, Kim SH and Na CS	Seed Science and Technology
13	VIS-NIR Spectroscopy and Machine Learning Methods for the Discrimination of <i>Transgenic Brassica napus</i> L. and their Hybrids with <i>B. juncea</i>	Sohn SI, Subramani Pandian, Oh YJ, John-Lewis Zinia Zaukuu, Na CS, Lee YH, Shin EK, Kang HJ, Ryu TH, Cho WS, Cho YS	Processes
14	Morphological and molecular data support the separate species status of <i>Syringa fauriei</i> in Korea	Kim DY, Jeon JI, Yi JS, Shin HS, Kim WS	Nordic Journal of Botany

No	Title	Authors	Journal name
15	Does oxygen affect ageing mechanisms of <i>Pinus densiflora</i> seeds? A matter of cytoplasmic physical state	David G, Daniel B, Erwann A, Wolfgang S, Charlotte E. Seal, Nicki MZ, Na CS, Ilse K, Thomas R	journal of Experimental Botany
16	certification paradox: Reverse response on the non-hygiene restaurant certification	Park KM, Kong KH	Journal of Hospitality and Tourism Management
17	A Study on single-dose oral toxicity of D-allose in ICR mice	Choi MN, Kim YS, Lee H, Shin KC	Maejo International Journal of Science and Technology
18	Discovery and Characterization of Chemical Compounds that inhibit the function of bacterial neuraminidase from <i>codonopsis ussuriensis</i>	Koo SC, Woo HS, Kim JW, Kim YS, Kim JY, Kim JH, Yu J, Kim YC, Kim DW	Applied Sciences
19	Seed Dormancy and Germination Characteristics of <i>Vaccinium oldhamii</i> Miq.(Ericaceae)	Lee DH, Park CY, Jung YH, Kim JH, Park SH, Son HJ, Na CS, Park WG	Horticulturae
20	A new species and four new records of <i>Bacidia</i> (Lecanorales, Ramalinaceae) from South Korea, with a key to Korean species	Lee BG, Hur JS	MycoKeys
21	Physiological Dormancy and Germination Characteristics of <i>Maianthemum dilatatum</i> (A. W. Wood) A. Nelson and J. F. Macbr. (Asparagaceae)	Shin US, Lee DH, Jung YH, Kim JH, Na CS	Horticulturae
22	Wettability control of paper through substitution between the hydroxyl group and carbon elements using argon-carbon plasma treatment	Kim HT, Jung SK, Kim DE, Park CY, Lee SY	Vacuum
23	Genetic and demographic signatures accompanying the evolution of the selfing syndrome in <i>Daphne kiusiana</i> , an evergreen shrub	Han EK, Ichiro T, Oh SH, Park JS, Cho WB, Jin DP, Kim BY, Yang SY, Son DC, Choi HJ, Amarsanaa G, Yuji I, Lee JH	Annals of Botany
24	Mechanism of protein tyrosine phosphatase 1B inhibition by theaflavonoid IV isolated from methanolic extract of tea( <i>Camellia sinensis</i> ) seed shells	Woo HS, Im HJ, Kim JY, Lee MS, and Kim DW	Natural Product Research
25	Characteristics of rhizosphere and endogenous bacterial community of Ulleung-sanmaneul, an endemic plant in Korea : application for alleviating salt stress	Swarnalee D, Kim YS, Lee YH	Nature
26	Seed Longevity and Germinability of <i>Pulsatilla dahurica</i> (Fisch. exDC.) Spreng after Storage and Accelerated Aging Test	Park KT, Lee SY, Ji BR, Jang BK, Lee HM, Lee HY, Song SK, and Cho JS	Horticultural Science and Technology
27	Anti-oxidant, Whitening, Anti-Wrinkle, and Anti-inflammatory Effect of <i>Ajuga spectabilis</i> Nakai	Lee MS, Oh YJ, Kim JW, Han MK, Kim DS, Park JW, Kim HM, Kim DW, Kim YS	Plants
28	The impact of climate change on species distribution of <i>Picea jezoensis</i> Carrere in Baekdudaegan using ensemble modelling	Woo HS, Lee SH, Park BJ, Kim JS, Park CJ, Byeon JG	Sensors and materials



# KOREA ARBORETA AND GARDENS INSTITUTE

## ANNUAL REPORT 2022

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