Jeju Batdam Agricultural System

(Black stone fences)

JUNE 2013

Jeju Special Self-Governing Province,

Republic of Korea

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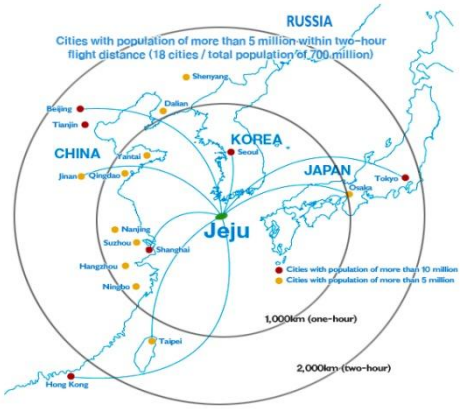
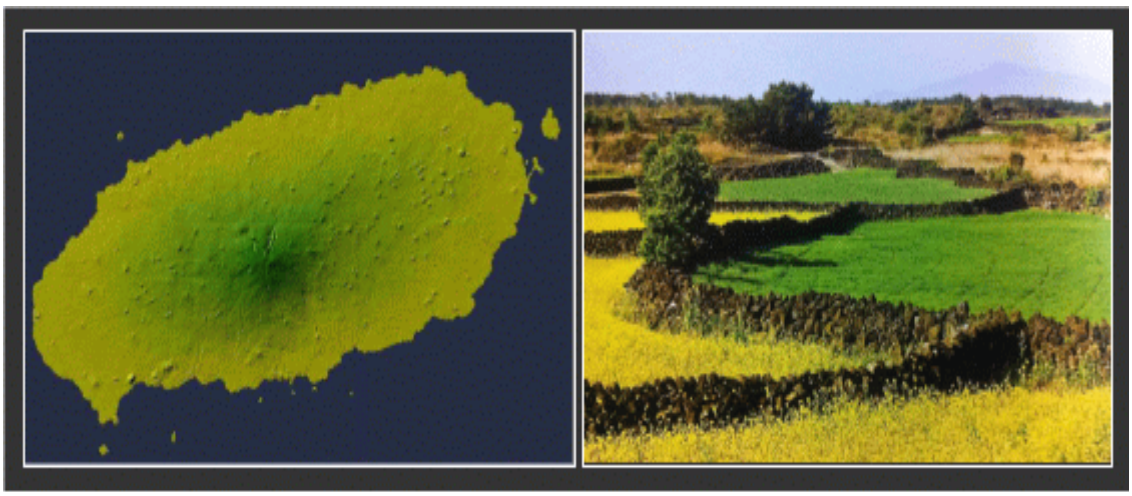
1. Candidate's name	·***Jeju Batdam* Agricultural system**
2. Applicant	· Jeju Special Self-Governing Province
3. Supporting organization	· Ministry of Agriculture, Food & Rural Affairs, Republic of Korea · Federation of Jeju Farmers Organization · Jeju Development Institute
4. Location	·Dry-field farming areas in Jeju, around the core and buffer zones - 90km south from the Korean peninsula, connecting the continent (Russia, China) and the ocean (Japan, South Asia) - world-class resort and tourist destination with beautiful nature - 126°08´~126°58´E, 33°06´~34°00´N 
5. Access	· the southernmost administrative district in Korea, an island, accessible by boat or aircraft - 1hr flight : Jeju ⇒ Seoul, Jeju ⇒ Shanghai, China - 2hr flight : Jeju ⇒ Tokyo, Japan
6. Area	· 541.9 ㎢
7. land use	· citrus orchards, dried-field farming crops(potato, carrot, garlic, white radish, cabbage, barley, beans, etc)
8. Topography	· Volcanic island with Mt. Hallasan in the center, the eastern and western sides have a gentle slope of 3˚~5˚ while the southern and northern sides have a rather steep slope of 5˚.

9. Climate	· Warm temperate oceanic climate, sub-tropical, temperate, polar climate - annual precipitation (mm): Jeju city 1,584.9, Seogwipo city 2,393.3 - mean temperature (℃): Jeju city 15.6, Seogwipo city 16.9
10. Population	· 592,449(232,141 households)
11. Livelihood	· tourism, retail industries, etc. (77.3%), · agriculture, forestry, livestock, fisheries (18.4%)
12. Summary of the Agricultural Heritage System	Jeju island is a volcanic island located in the southernmost part of the Korean Peninsula. The topographic and geological characteristics of the volcanic island made Jeju, the barren island for farming. Jeju abundant with volcanic ash soil, rocks and winds. As farming started in Jeju, people utilized the stones in the soil, building longer than 22,000 kilometer-long *Jeju Batdam* or stone fences to prevent winds and the loss of soil and *Jeju Batdam* has contributed in preserving biodiversity and agricultural culture of Jeju. *Jeju Batdam* offers an outstanding vista of agricultural culture in Jeju with beautiful natural landscape, representing aesthetics of Jeju. Protected by *Jeju Batdam*, agriculture on Jeju Island has survived natural disasters over 1,000 years, but now faces newer challenges like farm land arrangement and widespread urbanization. Registration of the world's one and only about 22,000km black dragon stone fences called *Jeju Batdam* on the GIAHS would provide such opportunities in sustaining the agricultural heritage of *Jeju Batdam* itself and agriculture of Jeju per more effective and efficient preservation application of *Jeju Batdam*.



<Jeju Island & *Jeju Batdam* scenery>

□ DESCRIPTION OF THE AGRICULTURAL HERITAGE SYSTEM

Ⅰ. Characteristics of *Jeju Batdam* Agricultural System

1. Global (or national) importance
2. *Jeju Batdam* and securing food and livelihood
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6. Remarkable landscapes of the *Jeju Batdam*

1. Global (or national) importance

1-1. Jeju, a volcanic island, and the creation *of Jeju Batdam*

▮ Birth of Jeju island

Jeju island was born through phreatic eruption during the first through fourth volcanic eruption periods on earth.

- phreatic volcanic activities 2 million years ago: creating sedimentary layers

→ 600,000 years ago: forming lava plateau

→ 300,000 years ago: forming shield volcano

→ 160,000 years ago: forming lava tubes around Mt. Hallasan

→ 25,000 years ago: forming crater on Mt. Hallasan

→ 18,000 years ago(the last of ice age): the sea level reached the today's level, forming the outline of Jeju island

→ 5,000 years ago: volcanic eruption in the eastern coastal area of the island

→ 1,000 years ago: volcanic eruption in the northern coastal area

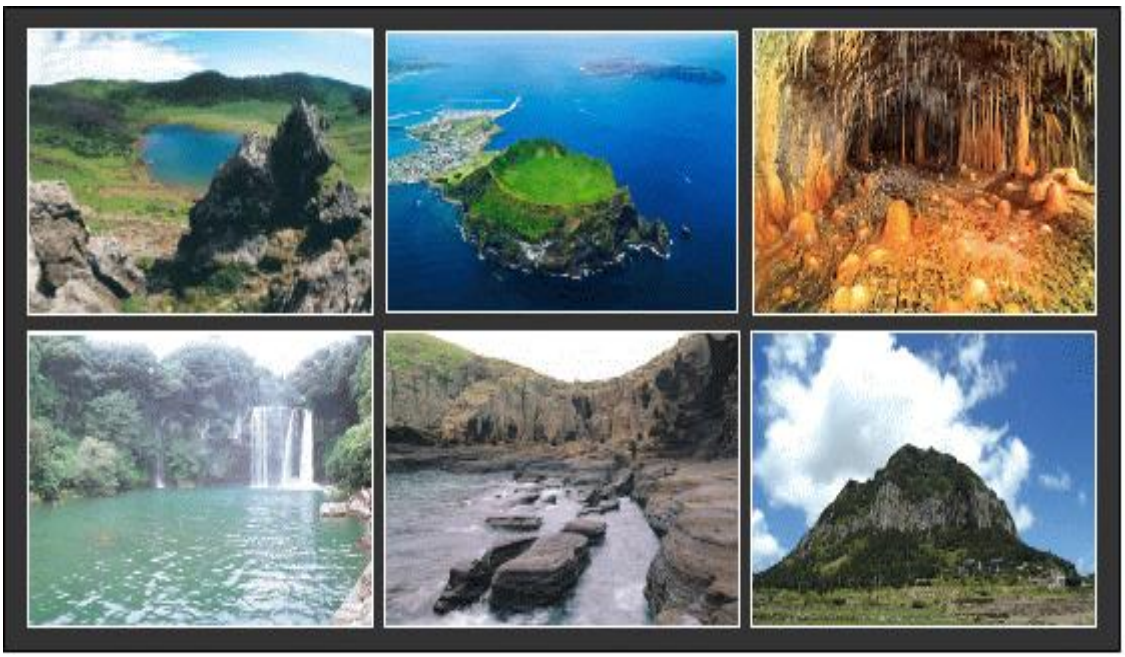
☞ The volcanic island Jeju has retained its original topography and geology from its very beginning to the completion.

=> Three UNESCO designations in natural science field

- UNESCO World Natural Heritage (Jeju Volcanic Island and Lava Tubes), Global Geoparks Network, Biosphere Reserve
- In addition, Jeju has been designated with Ramsar Wetlands, making Jeju a pride for the whole world and valuable heritage for mankind.
- Jeju has been selected as one of the New7Wonders of Nature in 2011.

☞ This backdrop of its birth has made the island of Jeju *a country of stones* and its location gave it a nickname *a country of wind*.

– The barren environment of Jeju Island with overflowing amount or rocks and strong winds forced islanders to overcome and harmonize with the challenges. *Jeju Batdam* Agricultural System is an apparent outcome of their harmonization with the barren environment.



< Core spaces of World Natural Heritage. Clockwise from top left: Baekrokdam Crater at Mt. Hallasan, Seongsan Ilchulbong Sunrise Peak, Dangcheomul Cave, Sanbangsan Mountain, Yongmeori Coast, Cheonjiyeon Waterfalls >

▮ Characteristics of Jeju soil and its distribution pattern

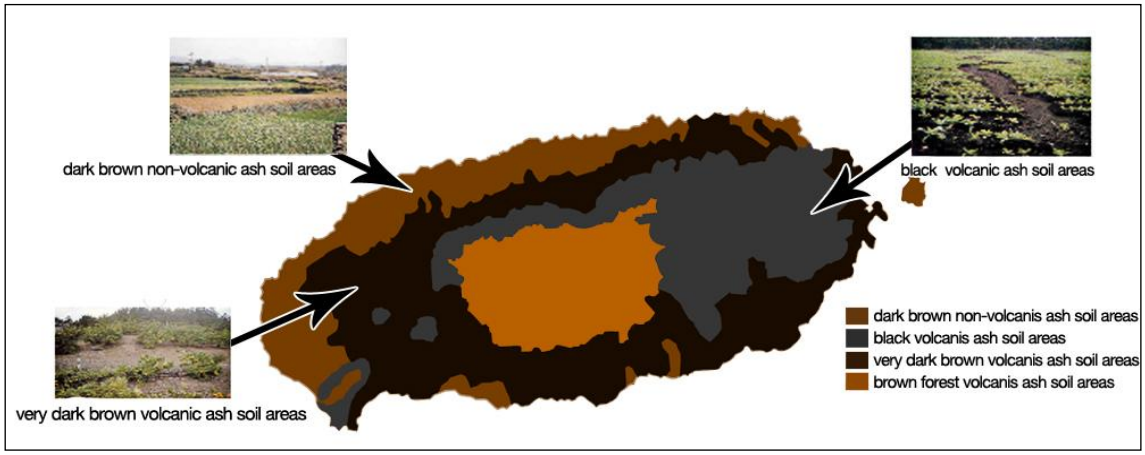
Volcanic island Jeju holds distinctively different agricultural systems with different crops and farming method from others, adapting its soil specifics. Here's some information regarding volcanic ash soil of Jeju Island.

Volcanic ash soil accounts for 77% of the area of the whole island and 60% of arable land

- Volcanic ash soil is highly acidic but lacks phosphoric acid. It stunts growth of crops and has a negative impact on the quality and quantity of fruits.
- It consists of very light basic material. It is prone to wind erosion and its topsoil is washed away when it rains.

=> Farming condition in Jeju is not the greatest and stones are frequently found when you till the dry-field farming (99.9%) land.

=> How to preserve and manage this volcanic ash soil is a prerequisite for farming since Jeju island has strong winds and high precipitation.



<Volcanic Ash Soil Areas and Non-volcanic Ash Soil Areas>

☞ Jeju with mostly dry-field farming although it has much precipitation.

- Volcanic ash soil has high water permeability.
- Average depth of arable land: low at 18.3 ㎝ (Lowest 7 ㎝, Best 35 ㎝).
- Most of soil has high content of gravel up to 40%, and soil with less gravel is not deep enough for farming.
- Non-volcanic ash soil: gravel up to 15% or lower than 15 ㎝ in depth.

< Most of fields in Jeju island are stone fields. >

< *jakjiwat*: field with abundant gravel >

< *billewat*: field with abundant bedrock >

< sandy field >

▮ Beginning of farming and climate characteristics

Started in between A.D. 1 and 1105 (Tamna State Era), an independent state from the Korean Peninsula.

- estimation based on excavated artifacts, including knives, sickles and charred crops from prehistoric times

<Harvesting tool, Paedo>
(Excavated from Kwakji Shell Mound, the 3rd century)

Jeju had relatively many days of strong storms with winds up 10 m/sec, 117 days, especially stronger in summer and winter.

- Jeju is located in the path of a couple of typhoons per summer with 40 to 50 m/sec.

=> Strong winds in Jeju forced people to develop their own self support means of living and farming.

▮ Birth of *Jeju Batdam*

Batdam(stone fences) were built with stones collected during the cultivation to manage wind and soil.

→ Most arable land in Jeju is lava stone fields.

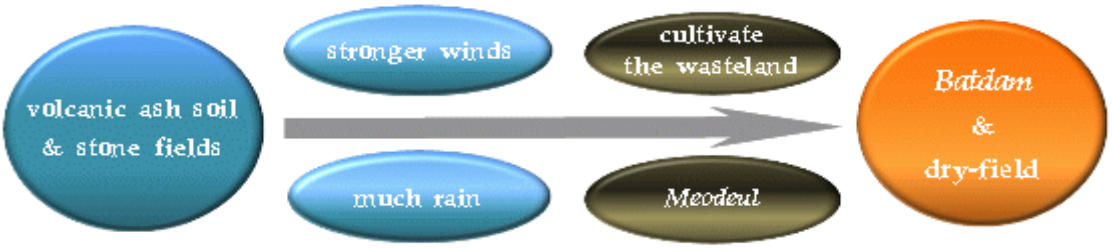
→ Removal of stones and piling them aside was necessary for cultivation.

<piled-up stones collected during the cultivation, called *meodeul*>

→ As rain and winds continued to reveal stones in the lower layers of topsoil, stones had to be removed accordingly.

→ Built to manage strong winds and volcanic ash soil.

→ Served as borderlines between fields.



<Overview: Environment of Jeju Island and Formation of *Batdam*>

No one knows the origin of *Batdam* but estimate the following background.

Another *Meodeul* was made while a farmer and his family tried to make another piece of farmland, by picking and piling rocks out of the land. The farmer was having lunch with his family around his work site and happen to see a big cloud of dust arising as wind swept over the growing vegetables.

The farmer became anxious, knowing his precious vegetables were not growing properly against strong winds. "What shall I do?" Suddenly he realized his sitting spot was rather comfortable even in windy day for *Meodeul* blocked off the wind. "Right, my vegetable can grow better if I block the wind off from the field."

He kept carrying away rocks from *Meodeul*, fencing his fields as high as the hight of vegetables.

Soon, it was time for harvest, and there was a big difference in yield amount between the field with *Batdam* fence around or the field without any fence. *Batdam* evidently had filtered winds and protected soil, helping vegetables to grow far better.

Nearby farmers witnessed his success and started to follow his practice, and farmlands in Jeju soon became fenced by *Batdam*.

=> Over the course of 1,000 years, black lava stones created very long stone fences which look like a black dragon, seen from the air, called the 20,000km black dragon stone fences of Jeju.

=> It was like a revolution that drastically changed the agriculture in Jeju.

▮ *Jeju Batdam* and the agricultural system

Jeju Batdam is one of agricultural systems, adapting Jeju Island's soil condition & climate environments. Farmers had to pick rocks out of their fields for cultivation and fenced around, preventing strong winds and soil losses in the rocky island of Jeju.

Various effects were created. Pork-marked *Batdam* had filtered those strong winds and softened, supporting plants from falling and also maintained the moist level in the field. Unique fertilization systems were practiced to supplement the agricultural system.

Jeju Batdam Agricultural Systems also prevented soil losses by heavy rain and trespasses of cows & horses.

Jeju Batdam Agricultural Systems was a form of boundary in the era of wealth by ownerships. As a clear demarcation of farmlands, *Jeju Batdam* Agricultural Systems has contributed a great deal, preserving the nearby ecological system and now representing the beauty of Jeju's outstanding landscape.

▮ Length of *Jeju Batdam*

Length of total *Jeju Batdam*: **about 22,108 ㎞**

- calculation method: Total areas of arable land in Jeju × average length of field stone fences (541.94 ㎢ x 40.796 ㎞/㎢)

- Total stone fences 36,000 ㎞(over 60%) represents the field stone fences.

Jeju field stone fence totals longer than half the circumference of the earth is called *Black Dragon Stone Fences of Jeju*, referring a black dragon shape stone fences

.

▮ Differences from the Korean mainland

☞ Different geology

- The Korean Peninsula consists of layers from the Mesozoic Era 100 million years prior and oceanic sedimentary layers of the Cenozoic Era 30 million years ago.

→ Jeju Island had not existed until this time and then later volcanic eruption formed Jeju Island.

→ Despite Jeju's abundant precipitation, rice paddy farming was impossible due to the permeability of soil.

=> A limited number of crop (millet, barley) and root vegetables (white radish, carrot, potato, garlic, etc)

☞ Different wind speeds

- Jeju has the most frequent and strongest winds blowing in South Korea and is on the pathway of summer typhoons.

<Comparison of annual mean wind speed between Jeju and other areas in Korea>

	Seoul	Sokcho	Daejeon	Gwangju	Mokpo	Busan	Daegu	Ulreungdo	Jeju
Mean wind speed(㎧)	2.3	2.8	1.9	2.1	3.9	3.7	2.7	3.7	4.2

☞ Jeju field stone fences boast unique shape and size which is difficult to find in any other place on the Korean peninsula.

- Fences of porous lava stone, stretching out as far as eyes can see, do not exist in other places with paddy farming land, which makes them all the more unique landscape on Jeju island with dry-field farming culture.

→ The ROK Ministry of Culture and Tourism designated Jeju field stone fences as one of 'The Top 100 Folk Culture Symbols' in 2007.

→ Constantin-Virgil Gheorghiu, author of <25th Hour> said "*Jeju uldam*, separating houses and other buildings from the roadside, and *Jeju Batdam*, separating fields with stone fences are treasures of mankind.

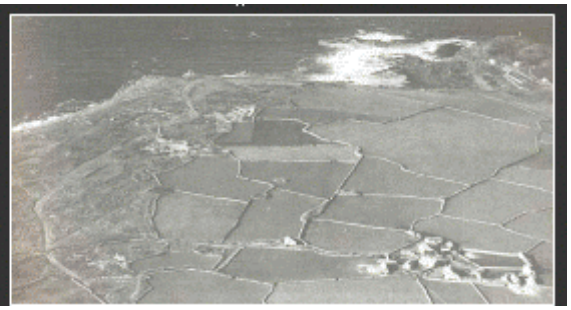
▮ Differences from similar cultures across the world

☞ Compared with Bocage landscape in Europe

Jeju Batdam

Bocage in Ireland

Bocage in France



Bocage in Cornwall, England

< Similarities >

• Demarcation of ownership

• Transition areas between the continent and the ocean, so consequently function as windbreak

• Protection of livestock and blocking its transit

• Favorable conditions for growth and crossbreeding of plants by blocking strong winds and preventing soil loss

< Differences >

Jeju Batdam	Bocage
• Individuals / small family group built through a long period of time. • Built with stones only • Dry- field farming purpose only	• Created over short periods of time through collective readjustment of land • Built with wood, stones, boards, etc • Grassland growing for livestock farming or mixed agriculture with the cattle put out to pasture

2. *Jeju Batdam* and food and livelihood security

2-1. Current state of agriculture in Jeju

▮ Industrial makeup of Jeju and farming houses

☞ Agriculture and fisheries in Jeju stand at 18% of income(2nd), following the tourism service industries of 68%.

☞ Agriculture accounts for larger proportion than the national average of 2.6%.

☞ Ratio of the farming population to the total population of Jeju was at 19.2% (2010), about three times higher than the national average of 6.0%.

- The farming population was 31,407 and the number of faming households decreased 3,726 (9.5%) over the past decade, suggesting that more and more people have left rural areas.

< Total Population and Farming Population of Jeju (2011)>

	Population Farming population		Farming population	
	people	households	farmers	farming households
Total	583284	227873	104802	35388
%	100	100	18	15.5

▮ Arable Land Area and Amount of Crops Produced

Arable land area in 2011(59,030ha) decreased by 177ha(0.3%) compared with 2000(59,207ha).

- Rice paddies decreased 162ha (↓83.0%), while dry-fields increased 15ha, accounting for 99.9%(59,023ha) of arable land(59,030ha) in Jeju.

→ Arable land area was expanded focusing on dry-field farming.

< Amount of Crops Produced >

Crops	Amount (2011)
Food crops	66,632 M/T - potato 48,900, bean 7,442, barley 4,802, sweet potato 1,887, etc
Vegetables	695,809 M/T - white radish 307,109, cabbage 112,087, carrot 61,104, onion 62,333, garlic 45,631, etc
Cash crops	4,810 M/T - sesame 448, green tea 124, rape flower 140, peanut 258, medicinal plants 2,532, etc
Flowers	29,496,000 flowers - lily 17,036, chrysanthemums 3,578, gerbera 1,670, etc
Citrus	588,000 M/T

▮ Status of produce distribution

Entire balance after island consumption is exported to mainland.

→ 880,000 ton of tangerine and vegetable were exported in 2011.
(845,000 ton via sea freight 3,000 ton via air freight)

→ Small amount of international trades exist for tangerine and flowers.

→ Most exportations of productions are practiced in original condition, including various types of packing.

Millet Barley Bracken

House Tangerine Redhyang Tangerine Apple Mango

Status of produce manufacturing & trade

→ Variousproduces are being manufactured & traded.

→ Primary produces of Jeju include powder-processed barley, beans and buckwheat, roasted sesame and dried radish.

Flour Buckwheat flour Bean flour Barley flour

→ Various types of noodles, jam, drinks and powdered tea are manufactured.

→ Various types of snacks, including chocolates and crunches are processed.

→ Various marketing promotions are being aggressively practiced, including gift-wrapped packings.

Roasted sesame | Dried radish | Barley cold noodle | Tangerine Jam

Herb water | Cactus tea | Yeonggyul tea

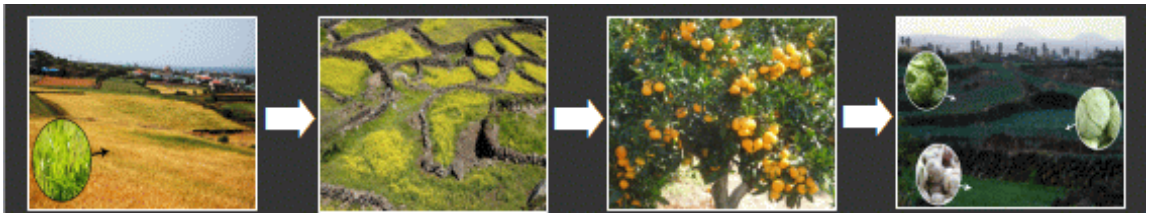
Powered green tea | Sweet potato tarte | Fresh Tangerine chocolate

Hallabong Tangerine crunch | Chili paste | Soy sauce

▮ Changes in Jeju Agriculture

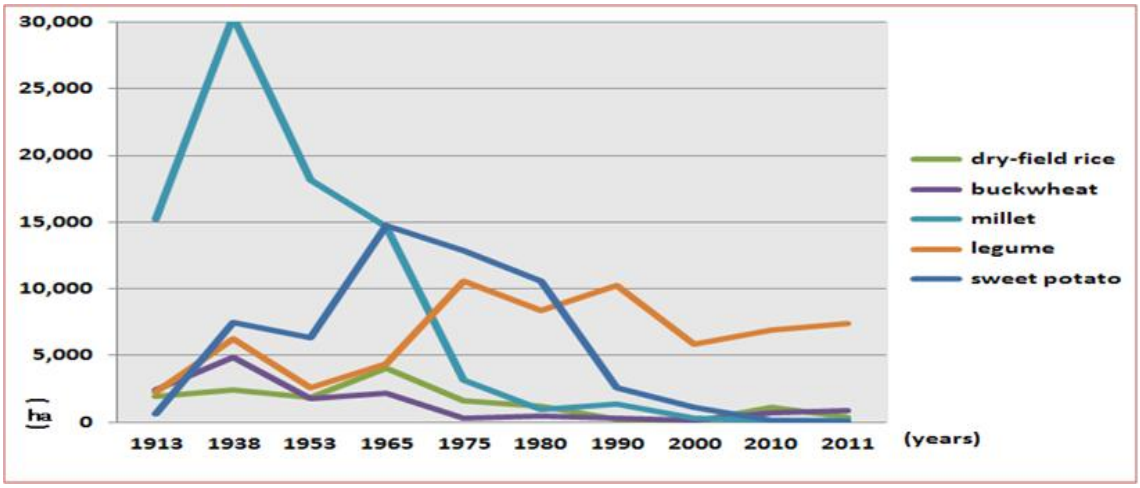
As traditional crops suitable to characteristics of soil, such as millet and barley, have changed into commercial agriculture, niche crops have been developed with changes from cash crops to mandarins and from subtropical crops to winter vegetables.

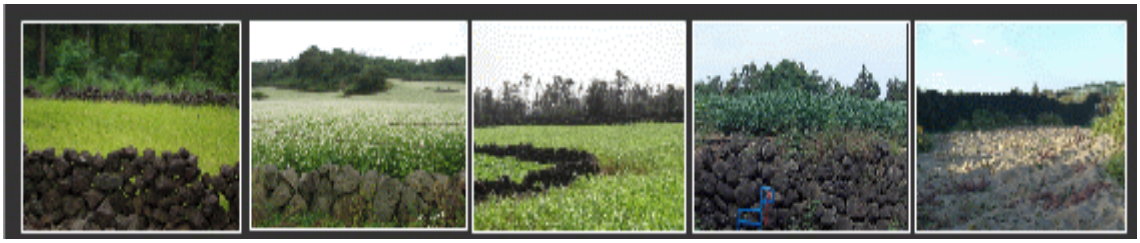
< Changes in Jeju Agriculture>



Food crops: barley Cash crop: rape flowers Fruit: mandarin Winter vegetable: cabbage

< Areas of fields for traditionally main crops in Jeju by year(1913-2011) >





[dry-field rice] [buckwheat] [millet] [legume] [sweet potato]

As shown above, traditional crop cultivation is on demand again, meeting the trend of well-being and the right crops for Jeju soil has substituted for the high marketability.

▮ Main crops by area

Crops vary depending on soil characteristics and height of *Batdam* in different areas.

☞ 40.5% of farmland in Jeju is non-volcanic ash soil, and 59.5% volcanic ash soil.

☞ Non-volcanic ash soil per 100 cc is 70g and volcanic ash soil is 50g.

→ *TTeunddang* or volcanic ash soil is unfavorable for farming.

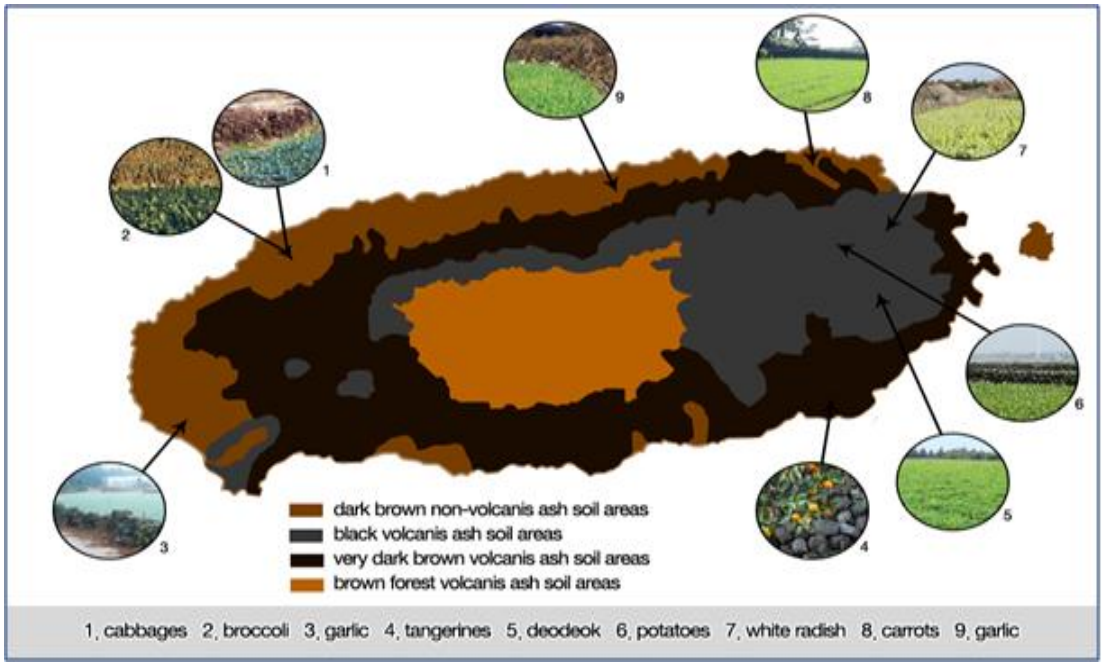
☞ Crops depend highly on soil type.

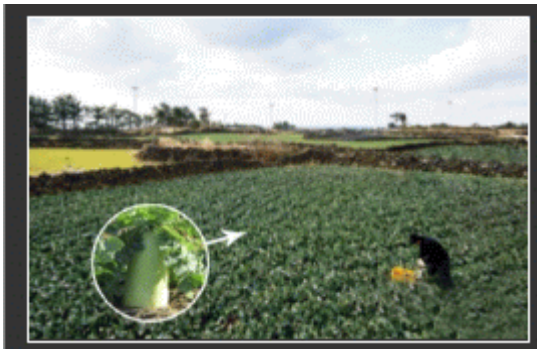
▪ volcanic ash soil (tteunddang) → white radish, mandarin, etc

▪ non-volcanic ash soil (deonddang) → garlic, cabbage, etc

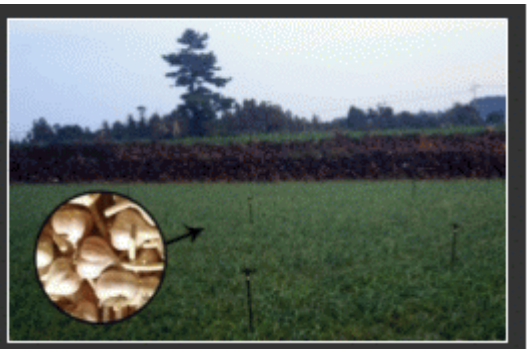
▪ sandy soil → mainly carrot

<Main crops by area depending on characteristics of soil>





Radish in non-volcanic ash soil



Garlic in volcanic ash soil

Carrot in volcanic ash soil

Sandy soil - carrot, etc

▮ Agriculture in Jeju and the sustainability of *Batdam*

Due to the permeable soil, dry-field farming has been widespread in Jeju.

- *Batdam* is not limited to specific areas but scattered across the whole island.

- In some areas, *Batdam* was destroyed through land readjustment, but afterwards rebuilt because sea water sometimes damages crops.

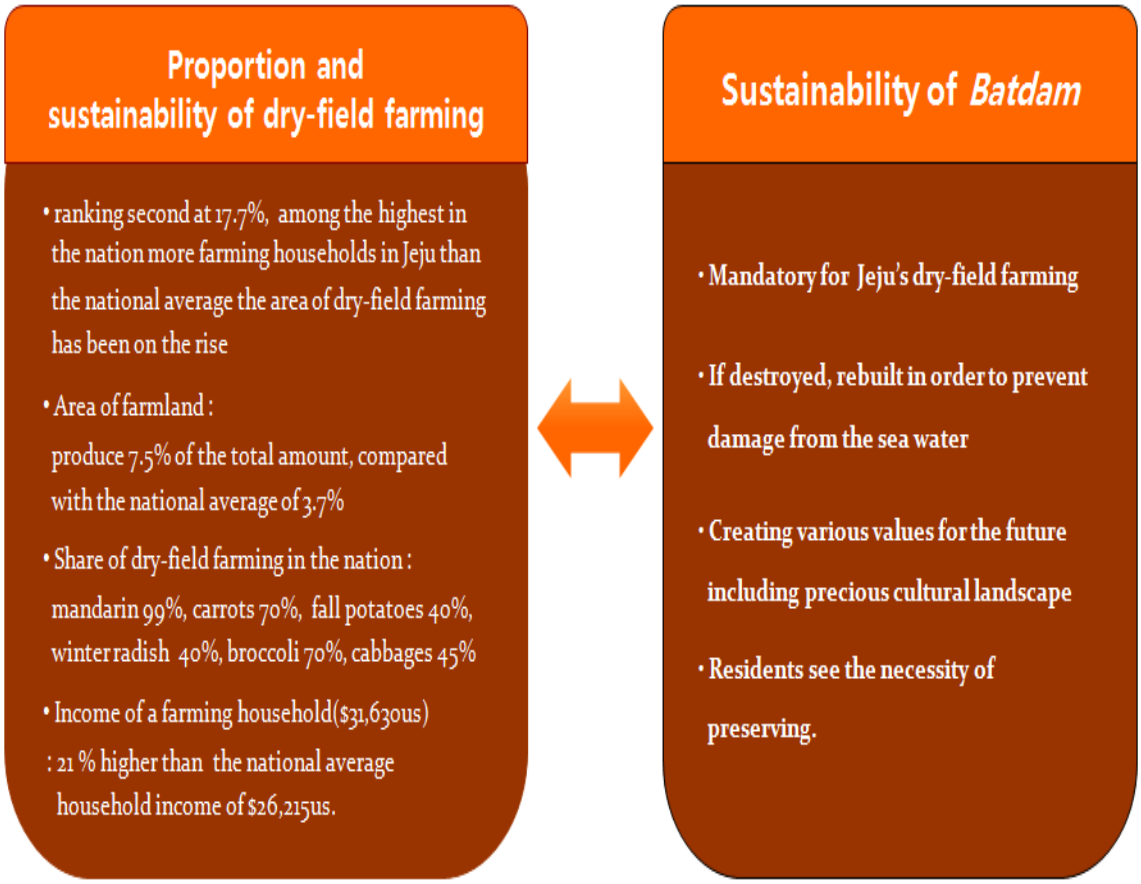
Although a large number of people have left rural areas, agriculture still takes up a larger land portion in Jeju against the national level.

- Recently, more people are returning to rural areas.
- Eco-friendly Jeju style farming has become a trend, suggesting the sustainability of Jeju's agriculture.

Since *Batdam* has become an important factor in the cultural landscape of Jeju, most people of Jeju share the understanding and intention to preserve it.

=> Dry-field farming and *Batdam* in Jeju are inseparable and the sustainability of dry-field farming relies on the preservation of *Batdam*, which is a basis for the farming.

< Agriculture in Jeju and the sustainability of *Batdam*>



3. Biodiversity of *Jeju Batdam* and its ecological functions

The island of Jeju shows various flora and fauna according to its geopolitical location.

⇒ Biosphere Reserve by the UNESCO, Ramsar Wetlands, etc

<Flora of Jeju>

- total 1,990 taxonomic groups (167 families, 770 genera, 1,819 species, 121 mutants and 50 varieties)
- various alpine plants and indigenous Korean fir trees in the Hallasan Nature Reserve

<Fauna of Jeju>

- amphibians(7 species), reptiles (9 species), birds (385 species), mammals (29 species), insects(4000 species)

[Korea fir trees] [colony of Sasa borealis of Jeju] [Roe deer] [spangled drongo]

3-1. Mutual Complementary Biodiversities of *Jeju Batdam*

Bio-diversity of *Jeju Batdam* includes the following three diversities, and the first is bio-diversity depending on nearby environments, including Oreum(or hill), Gotjawal(or volcanic forest), stream, wetland, bangdeui and intertidal region. The species diversity reflects if soil is volcanic or non-volcanic, subtropical and warm climate zone and the rainfall while gene diversity is scattered over 220,000 independent Batdam with unique farming techniques per each and every field, adapting geological characteristics growing environment and traditional knowledges.

Jeju Batdam Agricultural Systems is heavily concentrated in a belt shape, going around the island's lower part from coasts to mid mountain area and has protected the ecosystem of mid mountain area by preventing the rapid speedy developments.

< Ecological diversity >

Ecological diversity of *Jeju Batdam* Agricultural Systems is divided into 6 distinctive type as follows: Oreum demarcation Batdam around 368 Oreum(or volcanic hill), Gotjawal demarcation Batdam around Gotjawal(or volcanic forest) in eastern & western Jeju, stream demarcation Batdam, wetland demarcation Batdam, Jogandae(or intertidal zone) demarcation Batdam, mid-mountain baengdui demarcation Batdam.

[*Oreum* demarcation *Batdam*]

[bush warblers]

[colony of Elsholtzia splendens]

- spread out across the island. Related to the ecological diversity originating from *Oreum*
- Volcanic ash soil friendly crops: carrot, bean, barley, rape seed flower, buckwheat , etc.

[*Gotjawal* demarcation *Batdam*]

[kestrel]

[Galeola septentrionalis Reichb. Fil.]

- located in the eastern and western parts of Jeju. Unique ecology due to the microclimate of *Gotjawal*.
- cotton, tobacco plants, barnyard millet, and sorghum used to grow. Recently garlic has been added.

[Stream demarcation *Batdam*]

[Ussuri mamushi]

[a giant water bug]

- located in the southern and northern parts of Mt. Hallasan Supply and circulation of various materials according to the stream currents
- white radish, vegetables, bean, water dropwort, deodeok or mountain herbs and balloon flowers

[Wetland demarcation *Batdam*]

[moorhen]

[Jeju salamander]

- around villages, small areas in the middle of the mountain, buffer and transition zones to maintain the wetland ecology
- white radish, garlic, barley and rape seed flowers

[Mid-mountain *baengdui* demarcation *Batdam*]

[roe deer]

[scarab beetles]

- important habitats for wildlife living in the wide mid-mountain areas 200 meters above the sea level
- white radish, beans, deodeok, and balloon flowers, which are less affected by winds, grow.

[*Jogandae* demarcation *Batdam*]

[brown-eared bulbul]

[snails]

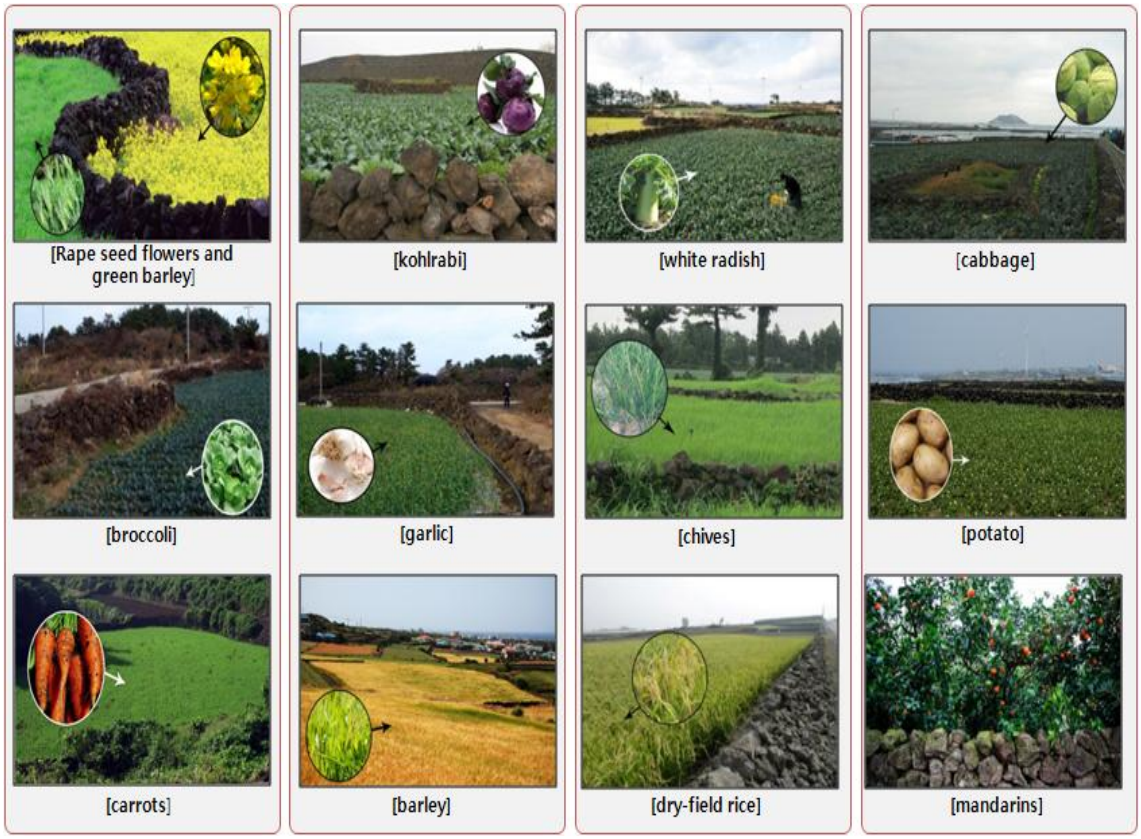
- located across the coastal areas. Rich ecological diversity of land and intertidal zones
- white radish, barley, rape seed flowers and garlic

< Species diversity >

- Species diversity in *Batdam* consists of climate-driven *Batdam* and soil-driven *Batdam*.

- Climate-driven *Batdam* has resulted in diverse Batdam in different regions from the coastal areas to the peak of Mt. Hallasan with vertical distribution of climate ranging from sub-tropical, temperate, polar to alpine climate.
- Areas of sub-tropical climate
: insects and marine creatures besides crops and plants often appear in the southern part of Jeju island.
- Areas of temperate climate
: circulation of material and interchange of energy take place in the eastern and western parts of Jeju and the northern coastal region, based on the ecological diversity.
- Areas of cold climate
: Smeller *Batdam* found in the northwestern and northeastern part of the island above 400 meter altitude.

- **Dry-field crops**



< Genetic diversity >

- The traditional farming method, agricultural environment and traditional knowledge have been culminated in 220,000 separate *Batdam*.
- Jakji-style *Batdam*

: located in the western part of Jeju, found in fields full of small stones with diameter of less than 10cm. Jakji (or gravel) was useful in growing crops, helping control the evaporation of arsenic acid and water from soil.

- Bille-style *Batdam*

: located in the eastern part of Jeju, found in fields dotted with initial landform of lava of 3 meters diameter. Different species sometimes live together with crops, becoming a habitat for soil creatures.

- Sagu-style *Batdam*

: located in the northeastern and western parts of Jeju, found in fields with sand from the ocean laid out. Traditionally peanuts, garlic, millet and barley have been grown in the areas heavily affected by winds.

[*Jakji-style Batdam*]	[*Bille-style Batdam*]	[*Sagu-style Batdam*]
·major crop : cabbage, broccoli Garlic, chwinamul	·major crop : garlic, onion	·major crop : carrot, garlic Scallion, onion

Jeju has various ingenious and rare species geographically and historically.

- fauna: Jeju Weasel, Jeju Salamander, pony, black pig, black cow, the Jeju native dog, etc.
- flora: Korean Fir forest, fringed galax, Tofieldia fauriei Lev. et Vnt., Leontopodium hallaisanense, Adenophora taquetii H. Lev., Salix blinii Leveille, etc

Fringed galax, world's smallest tree	World's only forest of Korean fir	Tofieldia fauriei Lev. Et Vnt.	Lontopodium hallaisanense

Dog native to Jeju	Jeju black pig	Jeju Jorangmal(Pony)	Jeju Weasel

4. Knowledge systems and adapted technologies of the Jeju Batdam

▌Structural characteristics of *Jeju Batdam*

Naturally built with stones found in the fields and nearby areas

- Mostly relatively round and porous lava stones make many gaps.And the gap as an air hole has withstood the strong winds.
- Layers formed by placing an upper stone onto the space between two lower stones, making a stabilizing structure.
- When gaps are big between layers, gravel is inserted to make it stable.

=> *Jeju Batdam* has stood by itself for over one thousand years.

Batdam was connected throughout different fields without stopping, maximizing the structural effects.

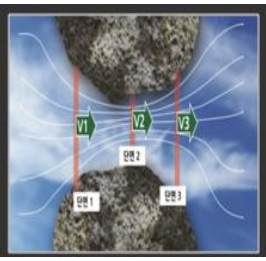
=> creating about *22,000 ㎞ Black Dragon Batdam*

[Pores on lava stones]

[Jeju *Batdam* has many gaps.]

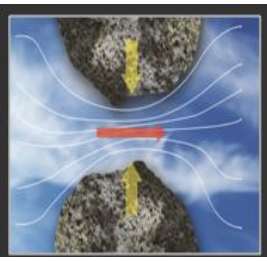
▌How *Jeju Batdam* weathered strong winds.

[Wind blows in streamlined ways]



[Relations between wind blowing through gaps of Batdam and wind]

[Cross section of a wing of an airplane and its lifting force]



[Wind speed through gaps of Batdam and the frictional force]

☞ The reasons why *Batdam* does not collapse easily though it looks very slack are ;

- Frictional forces stones get depending on shapes of stones and windbreak effect from holes between each stone

=> *Batdam* has streamlined shape, resisting wind, and porous lava stones and increased frictional force.

▌ Types of *Jeju Batdam*

Jeju Batdam Agricultural Systemswas built in various structures, depending on the soil condition or environmental condition.

☞ Types are categorized according to the way a fence was built.

- *Oidam*: Single-line fences / Most general type and majority of Batdam are Oidam
- *Jeopdam*: Double-line fences. / Farmland with more rocks would have Jeopdam
- *Jatdam* (or stone filler) is placed between the outer fences.

  : People used to walk on the fence, jatgil (or path). Jatgil is a thoughtful way of helping neighbors to access the land with no roads.
- *Japgutdam* is *Batdam* where small stones are piled up to a certain level and then big stones are put on them.

  : a very wise way of dealing with stones of different sizes from farmland

Oidam

Jeopdam

Jatdam

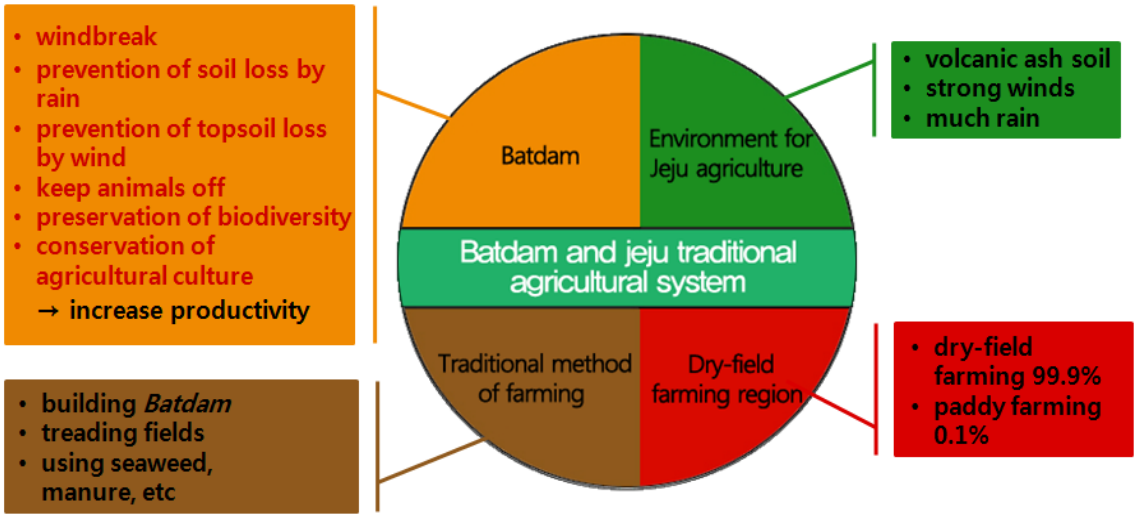
Japgutdam

▌Functions of *Jeju Batdam* and the traditional agricultural system

☞ Jeju Batdam is a core element in Jeju's traditional dry field farming. Understanding Jeju's soil condition and its relation to Jeju's year long strong winds can help reader's understanding as emphasized previous. Jeju's climate specific also includes, 1-2 ㎧ stronger wind all year long compare to Korean peninsula, regular hurricanes in summer and fall and high rainfall.

☞ Jeju's winds stimulate the soil water evaporation, making seeds difficult to sprout. With that background, herbal plants are hard to find in Jeju farming and the soil hardly can manage the organisms to grow into soil. Strong winds also cause soil scatter, spitting out the planted seeds or knock down the vegetables. Heavy summer rain also causes soil losses. Tteuntang(airy soil) make up majority of Jeju lands and effected worse in swepting against Dointang(complete soil)

☞ Jeju's agriculture depends on how to protect and manage soil in such condition, and that is one of main reason that Jeju holds such unique farming technique from Korean mainland, including *Batdam* fence around their field. Blocking off strong wind is a primary reason to protect their field.



<*Jeju Batdam* itself is one of the agricultural systems with many functions.>

↘ Unique agricultural system *Jeju Batdam* can turn the unfavorable environment for farming into better condition.

☞ Farming in windy Jeju was difficult for majority of farmlands were rocky fields with bille and rapid slopes. In those old days with limited farming techniques, Jeju people learned to reduce the size of an individual field but to form multiple number of small fields.

☞ Of course, each border line of thier field was identified with *Batdam* for the circumference of *Batdam* set the size of the field. Farmland was set as big as how big the farmer first set and it's not easy to define if the farmland comes first or *Batdam* in the end. So it's fair to say the farmland and the *Batdam* around it are one body.

Dollengibat. To minimize the effects of wind, farmland is divided into small areas by surrounding it with *Batdam.*

Jeju Batdam looks like a mosaic laid out across the island.

Batdam and crops

- Cultivating crop selection depended on the height of *Batdam*, calming winds and retaining water.

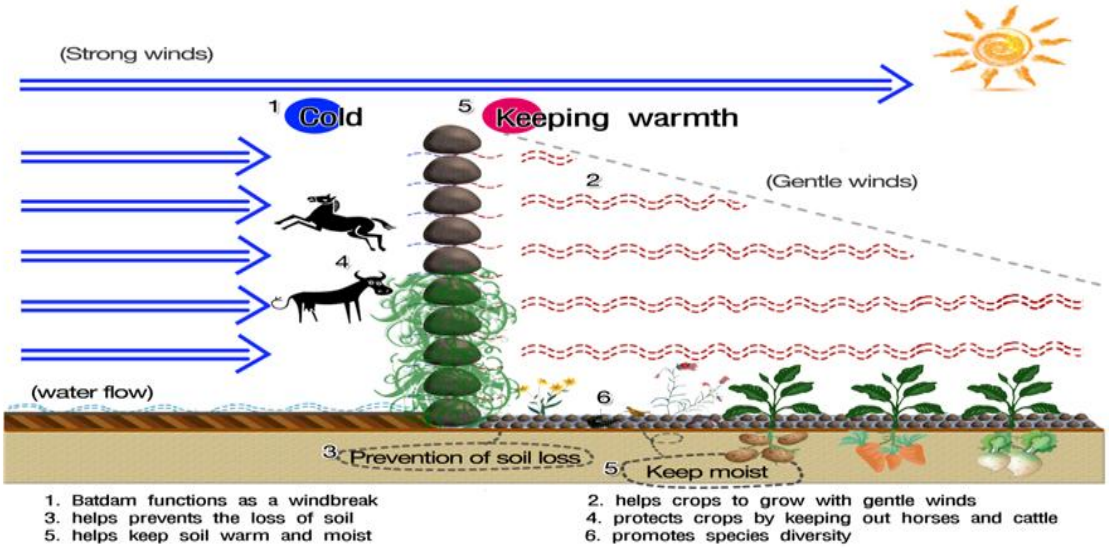
: Lower *Batdam*grow : short plants - bulbs root vegetables- potato, carrot, sweet potato, white radish, Chinese cabbage , garlic

: Higher *Batdam* mostly grow: millet, barley and rape seed flowers can be raised, though not the same in all cases

- Of course, *Batdam's* height is not the only factor, selecting his or her crop. Seeding period and winds' seasonal intensity played an important roll, preventing damages of winds as much as possible. In heavy rainy summer season with one or two typhoons, farmers cultivated short crop like sesame and millet. In winter, farmers cultivated potato, radish, broccoli and cabbage against the strong see breeze. Also, some farmers planted grass which gets less harm from

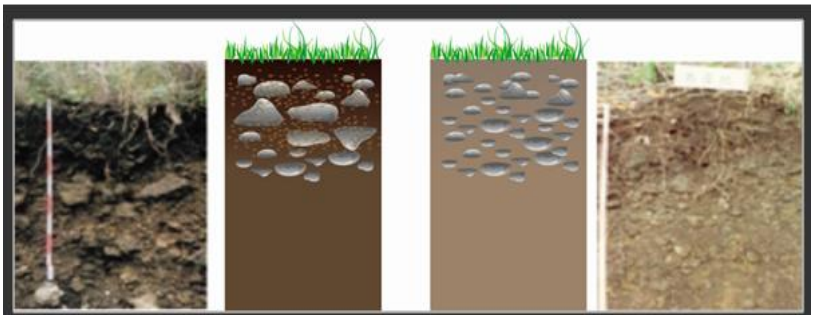
winds. Farmers also minimized wind damage by selecting the more effective non-cropping period, considering each crop's specifics and controling the seeding period.

< Correlation between *Jeju Batdam* and winds >



Correlation between *Jeju Batdam* and soil

- *Batdam* prevents loss of topsoil and soil caused by winds and rains.
- *Batdam* keeps farmland warmer by the gentle winds subdued by the windbreak,
- Gravel scattered around farmland helps keep a field moist by stopping evaporation.



Examples of soil unfavorable of farming due to much gravel from loss of soil without Batdam

Examples of soil favorable for farming thanks to piled up soil with Batdam

Batdam, preventing loss of soil

- *Batdam* protects fields against winds and soil loss by rain.

- For larger fields, another *Batdam* is built in the middle of the field to slow down the loss of soil.
- Tall crops called *meodeure* like corn are planted to help *Batdam* to reduce the loss of soil and protect fields from winds and rain.

[farmland suffering from soil runoff due to rain]

[*Batdam* in the middle of the field to block winds]

[stone fences to reduce soil run off]

[*meodeure* planted along the *Batdam*]

[stone fences in the middle of the field to prevent loss of soil]

Traditional methods, maintaining soil in *dolbat* (or stony field)

- batbolligi (or treading fields): helping germination of seeds in infertile land
- leaving fields fallow: fields idle and soil quality improvement
- topdressing: pig and livestock manure, seaweed, fish meal, jangkong (or white soybean) green manure, etc

[*Namte*, farming tool for treading fields]

[treading fields, called *batbolligi*] [*Baryeong-chigi* : used to collect livestock manure] [treading fields by *Namte* and hours]

5. Culture and value systems related to the*Jeju Batdam*

5-1. Stone culture in Jeju

It's only fair to say that life was almost impossible in Jeju without those sufficient stone resources with traditional life style before modern Jeju time. Specially for the people of the marginal island Jeju, utilizing firm rock resources over other ingredients was an outcome of their wisdom. Fortunately, isolated Jeju had overflowing amount of rocks as results of volcanic activities. How to process or transport the rock resources was a key for Jeju people.

The background of the development of Jeju's stone culture is based on how Jeju people understood the natural environment and practiced their wisdom to overcome the challenges.

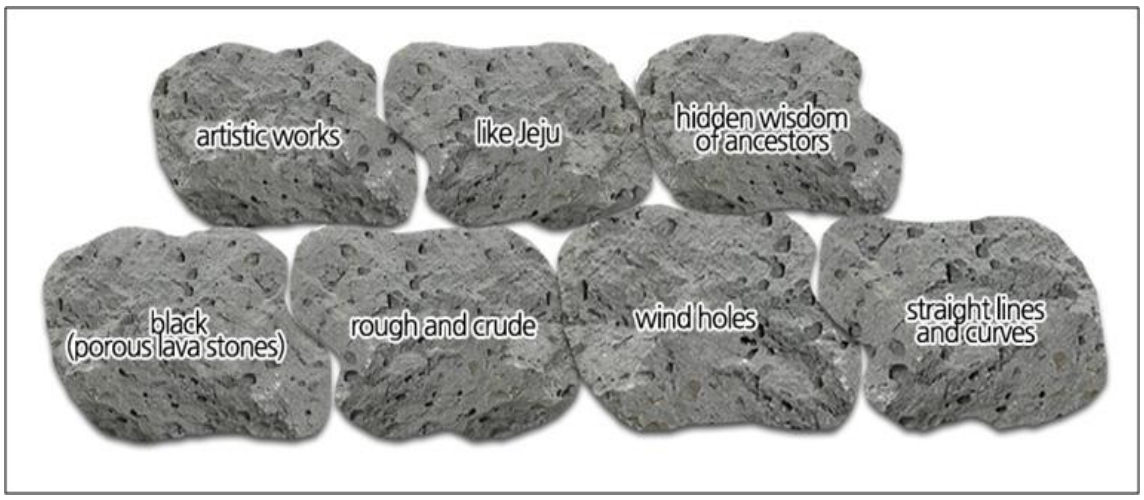
▌Symbolic images of stone culture in Jeju

☞ 7 Keyword of stone culture in Jeju

① black (porous lava stones) ② rough and crude ③ wind holes

④ straight lines and curves ⑤ artistic works ⑥ like Jeju

⑦ hidden wisdom of ancestors



▌Stones in Jeju, Usages of lava stones

Basaltic rock can be used for general use and special use.

The general use includes construction, production, everyday lives, religion, tombstones and play while special use include communication, defense and demarcation.

<Usages and examples of stones in Jeju>

usages		examples
General use	**construction**	uldam, olletdam, uyeungdam, chukdam, tongsitdam, shimpang, mulpang, nulgup, janghanggup, gudeuldol, bulteokdam(dressing place for woman divers), jeongjuseok, etc
	production	batdam, jatdam, wondam, dotdogori, dolte, bongdol(fishing plumbs), datdol, yeonjamae, etc
	everyday lives	dolhwaro(stone brazier), bongdeok, sojutdol, galdol, sotdeok, doldeungjan, Mulhwak(laundry basin), dolsemyeongi(stone basin), didilpang, jeonggore·pulgore(millstone), dolbanga(stone mill), etc
	religion	Jiseokmyo(dolmen), stone tower, sandam(fence surrounding a tombs), dongjaseok(stone child), muninseok, mangjuseok, bangsatap, dolhareubang, chilseongdol, doldam to protect a shrine, etc
	tombstones	commemorative monument, memorial stone, remembrance monument, monument for virtuous women, monument for filial sons & daughters, monument for establishment, etc

	leisure	Gonggi dol, deum dol (tteung dol), sabangchigi dol, biseokchigi dol, etc
Special use	**Communication, defense**	bangmunseok, dodaebul(stone lighthouse), yeondae(beacon fire place), seongdam(three eup-seong, 9 jinseong, hwanhaejangseong, 4·3 seongdam), etc
	demarcation	doldam for ranch demarcation (jatseong, hajatseong, jungjatseong, sangjatseong), doldam in borders between cities or counties (Jeju city - Jocheon-eup county in the past) , doldam in borders between villages (Gasi-ri, Seongeup-ri village), etc

▌Doldam or stone fences, embodiment of stone culture of Jeju

Doldam represents stone culture of Jeju.

→ Jeju Island, the world's one and only place with various types of stone walls in groups

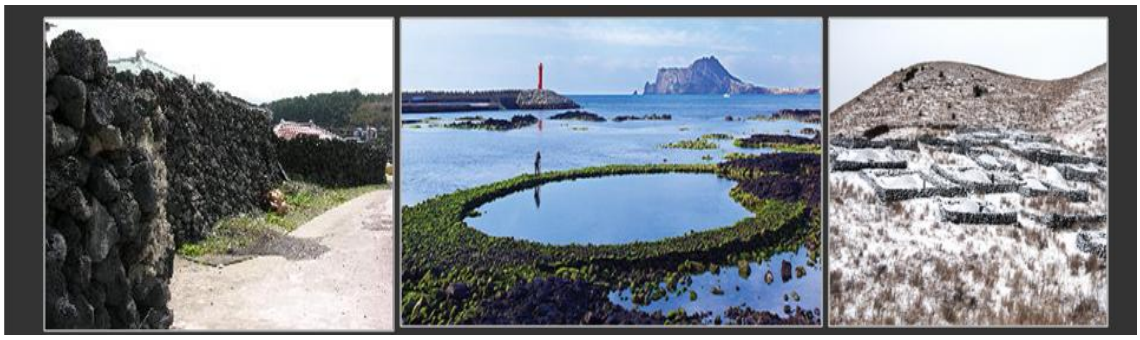
→ *Batdam* is a sub-element of doldam in its nature, yet still represents the doldam culture.

<Kinds of Major doldam and their Functions>

Type		**Location**	**Function**	**Type**
Inside building lots and the entrance	ul(jip)dam	edges of a building site	windbreak, privacy protection	oedam
	Olletdam	entrance of a village	windbreak, privacy protection	oedam
	uyeongdam	edges of vegetable gardens	demarcation, windbreak	oedam
	tongsitdam	edges of a toilet	Privacy protection, protection for pigs, prevention of waste leakage	oedam
Outside building sites **Inside and outside of villages**	batdam	edges of farmland	Demarcation, blockage of animals, windbreak (crop protection, prevention of erosion)	oedam (some jyeopdam)

		sandam	edges of tombs	Demarcation, animal blockage, prevention of wild fire	oedam, jyeopdam
		seongdam	edges of castles, coastal areas	Administrative effectiveness, defense	jyeopdam
		jatseong	Within ranch areas in mid-mountain region / edges	Borderlines between ranches, prevention of losses of horses and cattle	oedam, jyeopdam
	waterfront	bulteokdam	Edges of the past dressing rooms for woman divers	Privacy protection, windbreak	oedam (some jyeopdam)
		wondam	shores	Fishing	oedam, jyeopdam
		yongcheonsu doldam	edges of yongcheonsu water (spring water)	Water protection, privacy protection	oedam, jyeopdam
		Bongcheonsu doldam	edges of bongcheonsu water	Water protection, privacy protection	oedam, jyeopdam
		harbor doldam	inside and edges of harbors	Partition & windbreak, fishing activities	oedam, jyeopdam

☞ **Major doldam (or stony fences)**

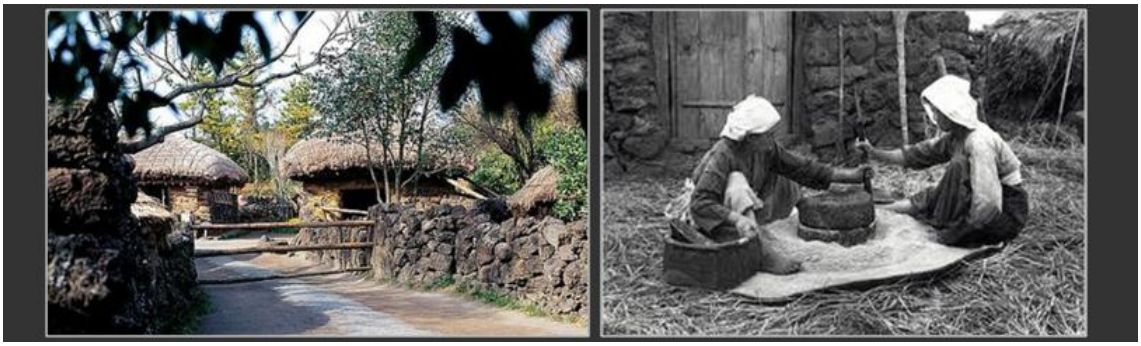


[*Uldam*] [*Wondam*] [*Sandam*]

[*Hwanhaejangseong*] [*Bulteok*]

☞ **Housing lifestyle & stone culture in Jeju**

[traditional thatched house – *Uldam & olletdam*] :
Jeju *Doldam* is one of 'the top 100 Korean folk culture symbols]



[*Jeongnang*] [*Maetdol*-millstione]

▌ Contemporary applications of stone culture

There are many places where traditional stone culture has been reproduced and displayed to the public.

[*Tongsi*(or traditional toilet with pigs in it) at Jeju Stone Park]

[Dolhareubang or stone grandfather sculpture in Bukchon Daolhareubang Park] [Jeju Geumneung Stone Park]

[Jeju Stone Village] [Stone Maze Park]

5-2. Cultural system related to Jeju Batdam

▌ Socio-cultural meanings of *Jeju Batdam*

People can see how the volcanic island, Jeju was formed with *Batdam*.

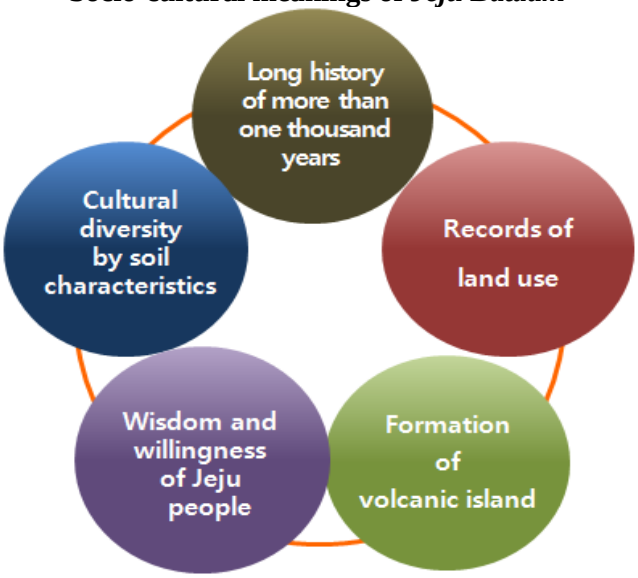
Batdam can show the wisdom and willingness of people of Jeju, cultivating farmland fighting against strong winds on the island.

With over one thousand years of history, *Batdam* itself is a cultural heritage.

Batdam has cultural diversity by soil characteristics according to its altitude and location, and shows the way of living of people.

Batdam, as demarcation of farmland, contain records of how land usages have changed within specific areas.

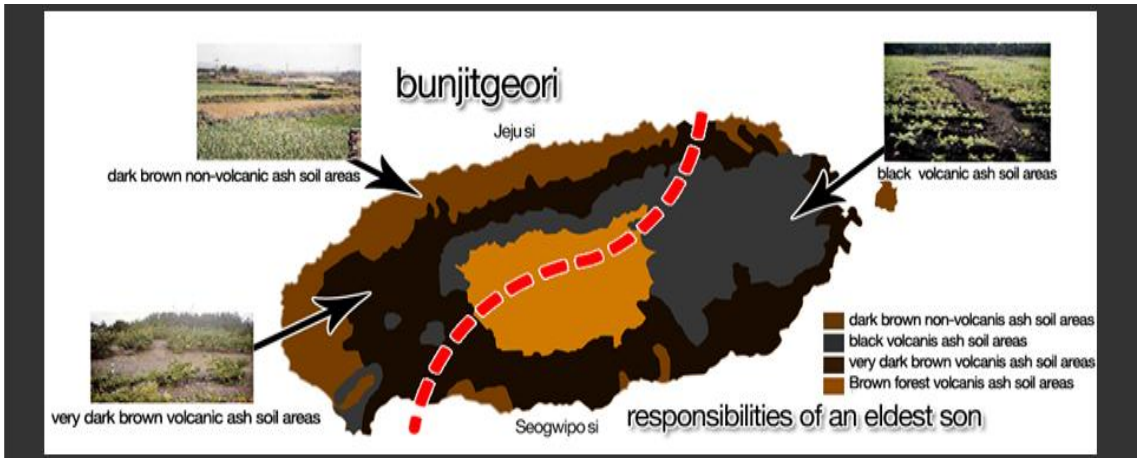
< Socio-cultural meanings of *Jeju Batdam* >



▌Examples of cultural types based on soil characteristics

	Non-volcanic ash soil areas	Volcanic ash soil areas	note
songs for weeding fields	jjolreun sadaetsori	jin sadaetsori	In areas of non-volcanic ash soil with high productivity of produce, a cheerful folksong of jjolreun sadaetsori was sung. In areas of volcanic ash soil, a sad and incantational song of jinsadaetsori with a long refrain was sung while weeding fields.
Memorial ritual	bunjitgeori (division of memorial services)	responsibilities of an eldest son	In areas of non-volcanic ash soil, wealth was shared and memorial services were shared responsibility among siblings. In areas of volcanic ash soil, all the wealth went to an eldest son along with the responsibility for memorial services since not sharing wealth would make everyone better off.
dolmen, ruins	found	not found	In areas of volcanic ash soil with low productivity, neither dolmen nor ruins was found.

ways of sowing	furrow sowing	sowing scattered around	In volcanic ash soil, furrows would collapse when it rained, so seeds were sown scattered around, whereas seeds were sown in furrows in non-volcanic ash soil



[Example of cultural types based on soil characteristics]

Unique traditional culture of Jeju

- *Sunuleum*: Jeju people call helping neighbors' hard-work 'Suneleum'. Jeju's agricultural background was poor and farming was impossible without communal culture of helping others. Three of four times of weeding in each season was one of the most hard chores of Jeju farming which required many people at the same time. The communal weeding still is practiced in Jeju. The communal thatched roof setting and family event helping for weddings and funerals are still practiced, offering hands for neighbors.

- *Uyeongpat*: Uyeongpat is a vegetable garden with lower fence and located at the side, front or back of a house. Seasonal vegetables are grown here. Jeju people divided Uyeongpat for vegetable garden and bat for main crop.Uyeong saved unnecessary activity, providing ingredients from far distanced fields. Seasonal vegetables, including radish, cabbage, lettuce, perilla leaf, cucumber, garlic, green onion, peppers and chives were cultivated and utilized for soup, kimchi, mix, salad and seasoning.

- *Kemaegi*: Areas without Batdam formed kemaegi to protect crops against horses and cattle.

- *Jatgil*: a path on stone walls for neighbors to move around in the fields without a path

[*Uyengvat* is a kitchen garden near a house surrounded by *Batdam*, a unique aspect of agricultural culture in Jeju]

[Uyeong and nul]

[*Jatgil*represents thoughtfulness and friend lines for neighbors who had fields without a path.]

Nature-friendly food culture

Jeju food ingredients reflect the natural environment and four seasons and trade means over long time. Jeju food culture is unique and diverse, holding 500 traditional dishes.

The advantage of Jeju food is an exquisite combination of ingredients. The main rice is served in the forms of grains (barley, millet, beans, rice), grains/roots (sweet potato/potato), grains/vegetables (radish, mugwort, pumpkin) and grains/seaweed (Sea weed fusiforme, Ecklonia kurome Okamura, green algae). Porridge has mixture of grains and fish & shell. Porridge variation includes abalone porridge, tile fish porridge, crab porridge and blue-abalone porridge. Soups, including tile fish soup with radish, hairtail fish shoup with pumpkin, sea urchin seaweed soup, mom seaweed soup with pork, spicy beef soup with bracken and horse-meat radish soup are all well suited with minor ingredients for batter taste and nutrition.

Jeju's nature-friendly food life has maximised its nutritional efficiency by complementing the laking nutrients from each ingredient.

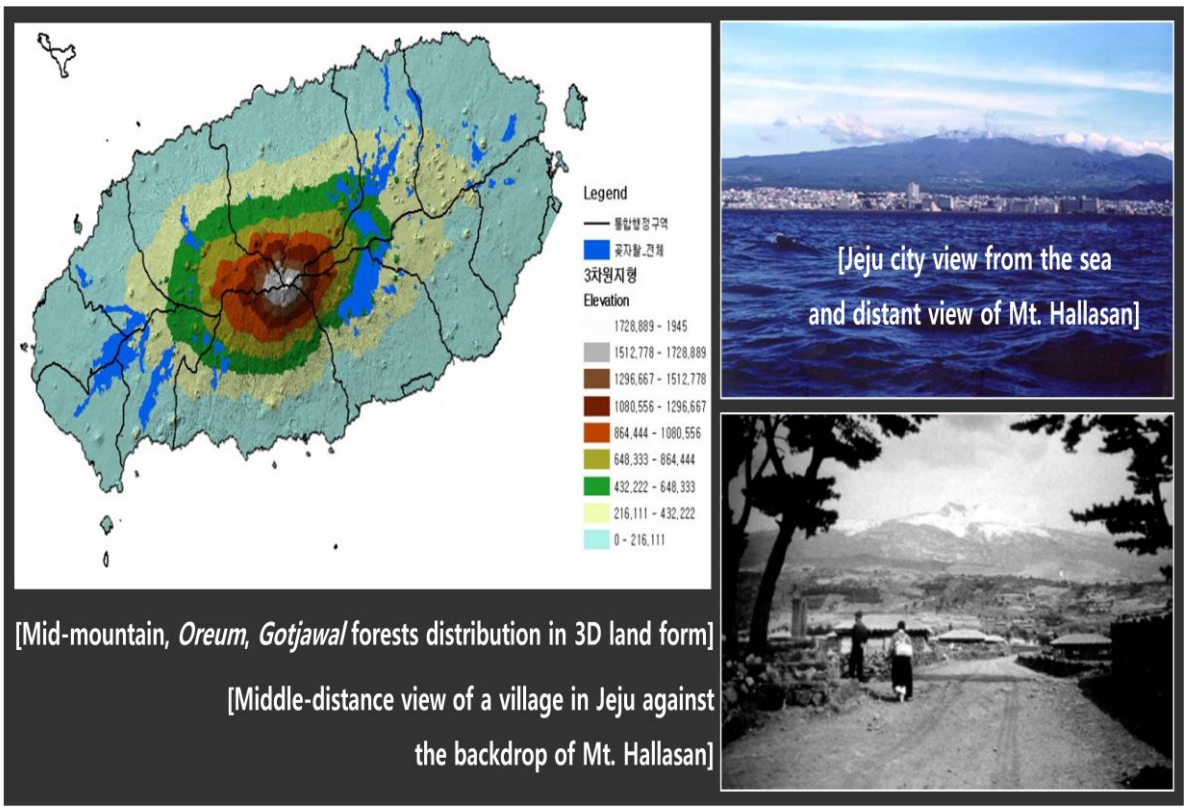
1. Traditional Jeju food table with natural food, including grains from farmland, vegetables from Uyeongpat and fish from the nearby sea. 2-3. Sea urchin soup & hairtail fish soup with pumpkin. Made with seaweeds and fish. 4. Bingddeok is made with traditional crop millet with radish inside. 5-6. Beer and Kosorisul liquor. Beer with Jeju barley is being produced and Kosorisul liquor is traditional distilled spirits, using raw millet rice wine distiller.

6. Remarkable landscapes of the *Jeju Batdam*

▌Cultural landscape of Jeju and its forming elements

Unique cultural landscape of Jeju Island created by geological nature of the volcanic island.

☞ Jeju Island has an oval shape of land and gentle slope from Mt. Hallasan to the sea. It has infertile soil and its own climatic characteristics with strong winds, which created oreum and dry streams over hundreds of years. Adding the areas in the middle of the mountain to the list, all of these constitute significant elements of cultural landscape of Jeju.

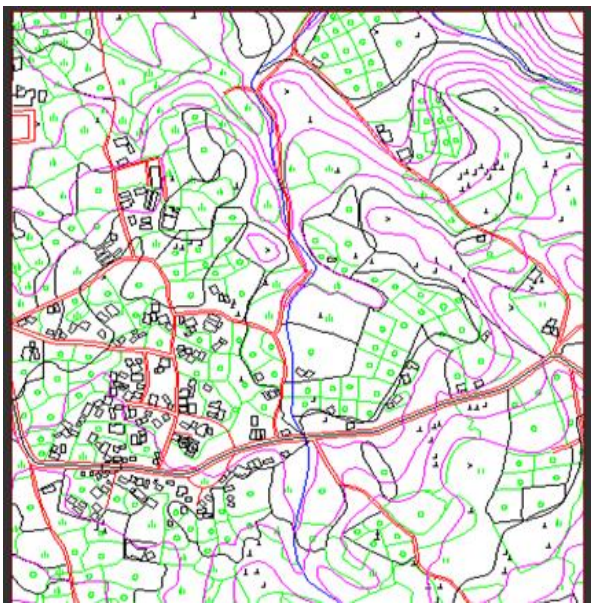


▌Scenic characteristics of *Jeju Batdam*

A mosaic of *Batda*m spreads out across the island, creating more refined and unique cultural landscape of Jeju.

☞ *Jeju Batdams* connected in a gentle curve and some are terraced fences, making the landscape of Jeju more unique.

☞ Along with *Batdam* of black lava stones, sandam, choga or thatched houses and uldam form the unique landscape of a country of stones.



[Villages in the mid-mountain areas and *Batdam* distribution around them]

[A mosaic of *Batdam* is an artistic work laid out across the island.]

▮ Four seasons of *Jeju Batdam*

Ⅱ. Socio-cultural characteristics related to the *Jeju Batdam*

- Jeju is also called *a home to 18,000 gods.*

☞ Rich stories about a variety of gods from gods of the creation of the world to the god of farming, the god of the sea have been passed on, forming different kinds of folk beliefs.

[Songdang Bonhyangdang Gut, or Ritual]

[Yeongdeung Gut Farewell Ritual]

[Dolhareubang]

[Jongdal-ri Haesindang]

[Sagaeil-ri Bonhayngdang]

- Conditions of living in Jeju, called a land of stones or a land of winds, have also produced unique folklore.

☞ Building systems of Jeju such as low roof, jipjul or ropes that fix the roof, pungchae or a windbreak, and uldam and olletdam to subdue winds are ways of living in harmony with the environment of Jeju.

☞ There are various structures, tools for everyday lives and entertain culture that use stones, forming unique agricultural and fishery culture.

[traditional thatched house and *olletdam*]

[Blowing using winds]

[Fishing festival around *wondam*]

[Lifting stone, *deumdol*]

- *Haenyeo* or woman divers culture, a symbol of strong women in Jeju
  - ☞ Livelihood was so heavily dependent on the sea that the sea surrounding the island was called the sea field.
  - ☞ Woman divers of Jeju have adopted to the marine ecology using their own hands, own body and breathing without any help of machine and developed skills and knowledge of *muljil* or work of collecting seafood under the sea.
  - ☞ *Jamaekjil* or going underwater requires *haenyeo* to hold their breath for more than one minute as deep as 15 meters under the sea, the most difficult skill.
  - ☞ Some of divers went to Japan, China and Russia as well as other regions in Korea for work.

[*Mujil* of Jeju *haenyeo*]

[*Bulteok* or a dressing place of *haenyeo*]

[Regions where *haenyeo* went to work in the 1930s]

- Livestock farming taking advantage of a vast expanse of grassland in the mid-mountain area
  - ☞ The Yuan Dynasty established the Tamna Ranch in Susanpyeong, Susan-ri, Seongsan-eup county at the end of the Goryeo Dynasty. The national ranches were set up from 1400s, boosting livestock farming.
  - ☞ In the mid-mountain area, sipsojang or ten state ranches was set up and jatseong for managing horses was built.
  - ☞ Afterwards, every household raised cows and horses for farming and put them out to the village pasture, creating unique ranching culture.

Unique culture of burial and beolcho or tidying up the grave site

☞ The culture of livestock farming had an influence on unique burial culture where grave was surrounded by stone fences called sandam.

☞ Sandam at the foot of oreum or within farmland is another element of the Jeju landscape.

☞ The culture of visiting their ancestral graves and cutting the weeds (or beolcho) around them every year still exist.

[colony of *sandam*]

[sandam within farmland]

[beolcho, cutting the weeds]

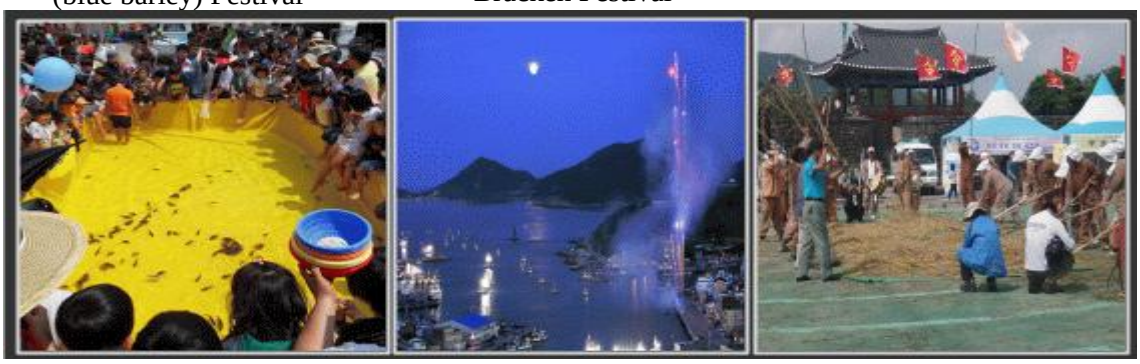
▮ Various festivals, celebrating agriculture take place in Jeju.

☞ Tamnaguk Ibchungutnori: Originated from when the king of Tamnaguk wished for a rich harvest by pulling a plough and offered an agricultural ceremony himself. The old custom once was stopped in 1914 but restored in 1998 and offered jointly between the government and the people.

Tamnaguk Ibchungutnori is full of activities like gut-ritual exorcism, geolgul, nangswegosa and parades

- ☞ Regional agricultural specialty oriented festivals, including Gapado Cheongbori(blue barley) Festival, Mt. Hallasan Clean Bracken Festival, Jeju Canola Grand Festival and Seogwipo Canola Walking Contest take place every year and Seogwipo International Tangerine Pre-EXPO will be introduced this year for the first time.
- ☞ Regional culture oriented festivals, including Jeongeuigoeul Town Traditional Folklore Reproducing Festival, Deoksuri Town Traditional Folklore Festival, Iiho Tewu Festival, Jeju Traditional Culture EXPO take place annually.
- ☞ Seafood oriented festivals, including Bomok Jaridom(Whitesaddled reeffish) Grand Festival, Chujado Island Original Dried Yellow Corvina Grand Festival and The Southernmost Yellow Tail Festival and further various festivals based on landscape and leisure and sport take place in Jeju.

Gapado Cheongbori (blue barley) Festival | Mt. Hallasan Clean Bracken Festival | Canola Walking Contest



Bomok Jaridom(Whitesaddled reeffish) Grand Festival	Chujado Island Original Dried Yellow Corvina Grand Festival	Jeongeuigoeul Town Traditional Folklore Reproducing Festival

Ⅲ. History of the *Jeju Batdam*

History of *Batdam* and agriculture in Jeju

History of *Batdam* goes hand-in-hand with that of Jeju agriculture.

☞ Built with stones removed from fields after cultivation in order to protect fields against winds and loss of soil, *Batdam* can be considered revolutionary in Jeju agriculture.

☞ For over one thousand years, *Batdam* has been a keeper for Jeju agriculture, serving as a long-standing guardian for dry-field farming.

Batdam in the eyes of non-Jeju people

☞ "There are so many stones in dry fields, and fewer than half of fields have leveled ground. Cultivating a field is like boning fish … even if there are many stones piled up, they are not considered out of place with untidy and disorganized looks. All the stones are blunt, crude and black ore, becoming an eyesore." (from Jejupungtorok, a travel essay, written by Kim Jeong exiled to Jeju in the Joseon Dynasty)

☞ In the book, he described the difficulties of farming in the stone-rich barren field and said that *Batdam* was an eyesore because it was not built in an organized way.

☞ The very way of building *Batdam* in ‘a naturally disorganized manner’ has been one of its Characteristics and a source of its vitality in the country of wind

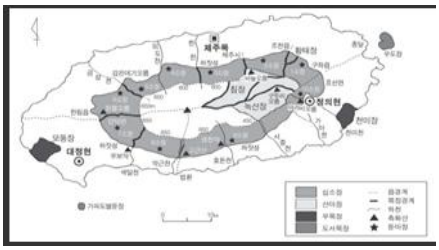
- *Batdam* made its way to the mid-mountain areas from the coastal areas.

☞ Farmland was expanded into the mid-mountain areas with barren fields from the coastal areas.

☞ *Batdam* demonstrates that the agricultural culture met with the stock-farming culture.

- As farming had expanded into the mid-mountain areas where people were mostly engaged in the stock-farming, *Batdam* became widely spread out across the whole island of Jeju.

[Batdam in the mid-mountain areas]



[Horse ranches and jatseong in Jeju]

[Ha-jatseong in the mid-mountain areas]

▌*Jeju Batdam* described in ancient literature

- Records about *Batdam* in ancient literature

Title	Author(s)	Record Time	Origins	Building Mthod	Functions of Doldam		
					Demar -cation	Animal blockage	Soil & crops protection
Sinjeungdongduk-yeojiseungram	Lee Haeng, Hong Eonpil	1530	○		○		
Nammyeongsoseung	Lim Je	1577-78				○	
Namcharok	Kim Sangheon	1601		○			
Tamraji	Lee Wonjin	1653	○		○		
Namcheonrok	Kim Seonggu	1676		○		○	
Namchailrok	Lee Jeung	1679				○	
Namhwanbakmul	Lee Hyeongsang	1704	○		○	○	
Tamrajichobon	Lee Wonjo	Mid 19th century	○	○		○	
KOREA	Hermann Lautensach	1945		○		○	○
Jeungbotamraji	Damsugye	1954	○		○	○	○

☞ According to the oldest record, *Batdam* started to built as a demarcation at the order of the then administrative officer Kim Gu, who came to Jeju 1234.

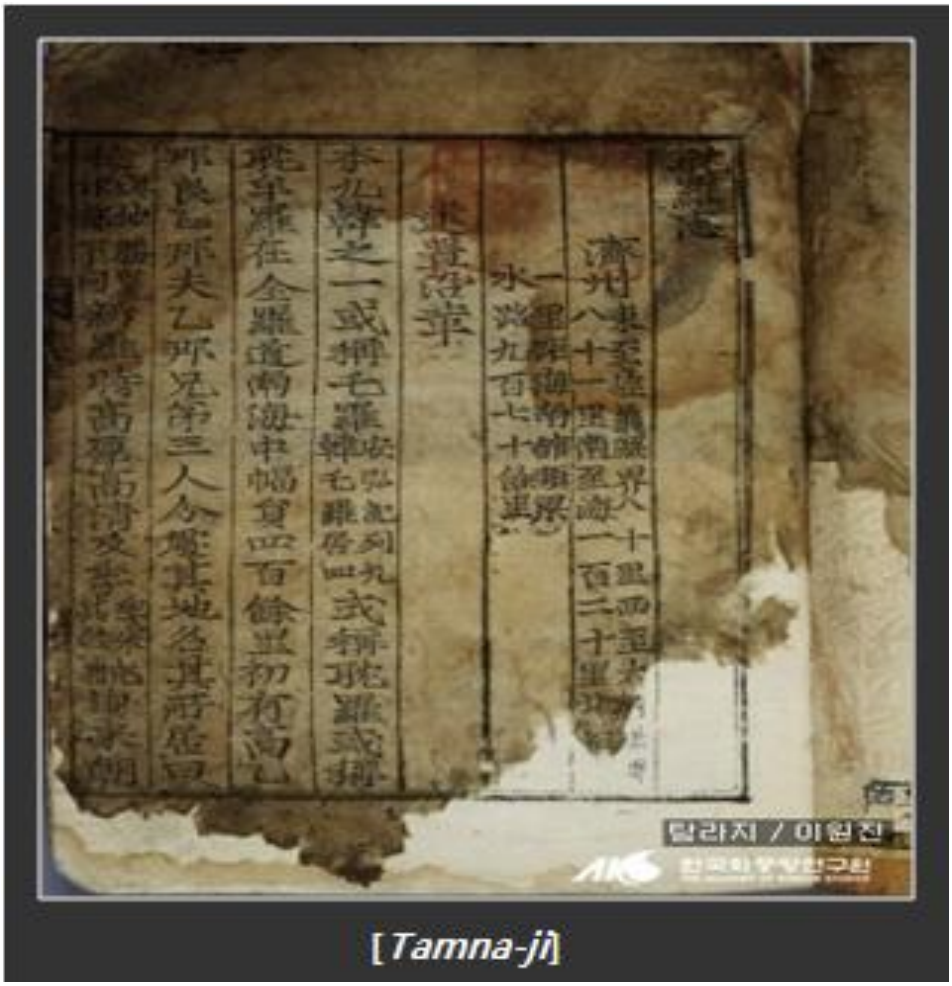
- It suggests that *Batdam* was used for demarcating land ownership from 800 years ago, but its actual origin is thought to have gone back to much earlier time.

☞ Ancient literature provides clues to better understand the Jeju agriculture at the time.

☞ Records show the natural way of building *Batdam* while people in Jeju cultivated farmland.

☞ It verifies that *Batdam* has multiple functions such as to block winds, prevent horses and cattle from entering fields, protect soil and crops and demarcate ownership.

☞ It also demonstrates that people in Jeju were wise enough to overcome unfavorable environment and continue to do farming with *Batdam* for hundreds of years.



[Tamna-ji]

Ⅳ. Contemporary meanings of the *Jeju Batdam*

Contemporary meanings of *Jeju Batdam*

☞ *Jeju Batdam* has been the support of Jeju agriculture, easing farm soil loss from arsenic acid and rain while helping growth of crop by filtering the gush winds. Such functions of *Batdam* are still valid and will continue as long as any formation of agriculture exist in Jeju.

☞ *Jeju Batdam* offers significance as Jeju's outstanding cultural landscapes, too. *Jeju Batdam* in windingly curves represents Jeju's beauty with its various curves.

☞ *Jeju Batdam* represents its significance in conserving bio-diversity. Jeju is one of the core area from Korea as well as the world for the bio-diversity conservation. *Jeju Batdam* has

served its duty in preserving Jeju Island's bio-diversity by conserving bio-diversity of farmlands and preventing the scope of development toward mid mountain area.

☞ *Jeju Batdam* also holds the equal significance in social and cultural aspects. *Jeju Batdam* in dark basaltic rock totals to 39,300km and being called Sibmanri(39,300km) Black Dragon. The Great Wall of China objects for military purpose while Jeju Batdam is a history of human life against the barren environment and a support for human survival. With that background, it's easy to see Jeju pioneer spirit and wisdom from *Jeju Batdam* while bearing its significance, reflecting the coexistence of human and nature highly. Also, the withstanding pasture of *Jeju Batdam* represents the people of Jeju who survived the barren environment with patience and everlasting efforts.

▮ Future significance of *Jeju Batdam*

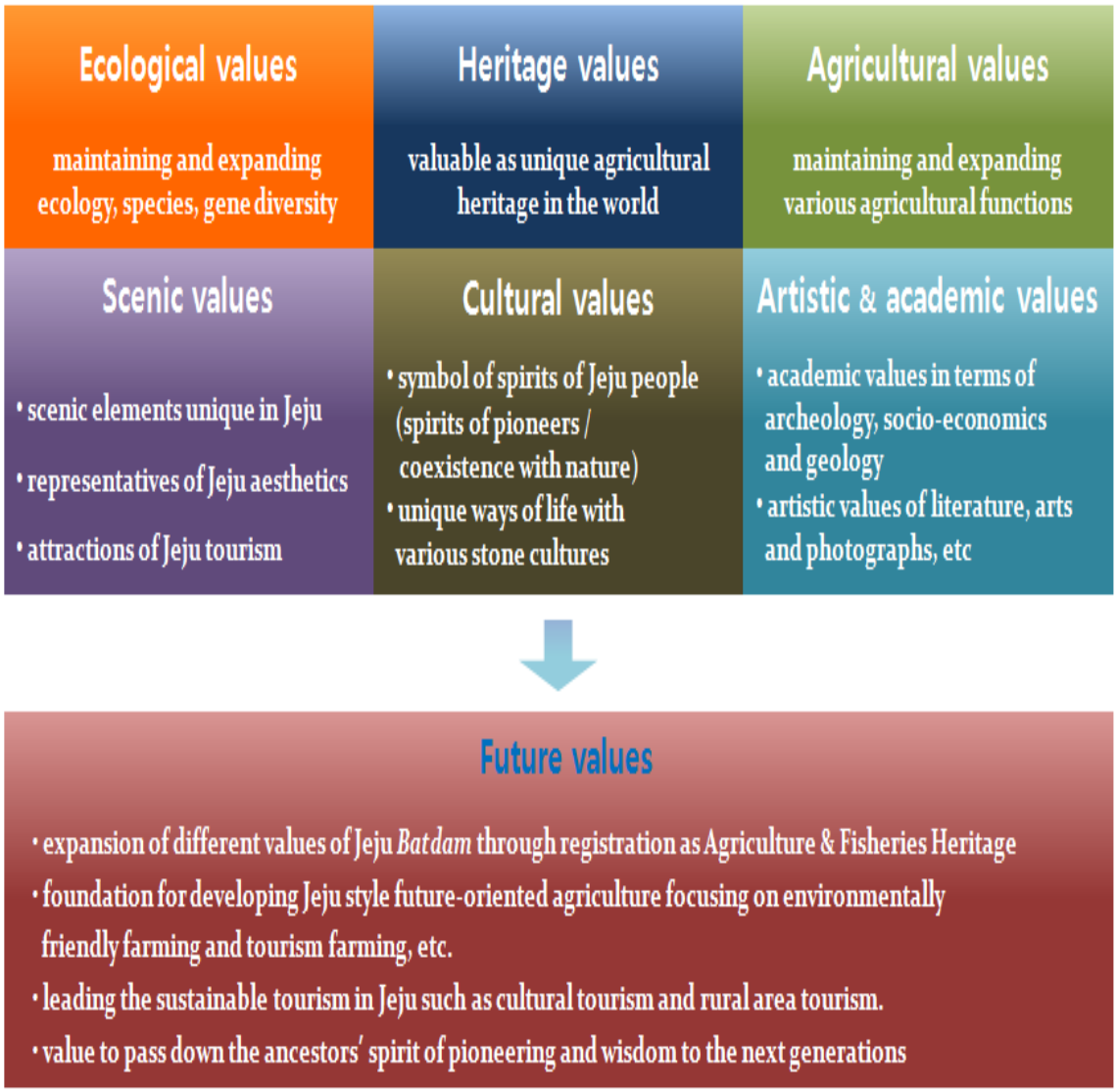
☞ Jeju honours 3 designations of UNESCO Science, including Biosphere Reserve, World Natural Heritage and Global Geoparks Network. Jeju also has been designated as Ramsar Wetland and as one of the New7Wonders of Nature.

☞ Jeju's successful designation as one of Globally Important Agricultural Heritage Site(GIAHS), Jeju will surely become a repository place of Korea and escalate its global brand power, inviting more global visitors.

☞ Despite Jeju's bread and butter are concentrated between the primary and the tertiary industry of tourism, the improvement of the brand value will contribute greatly in bringing the 6th industry, tying the primary industry, secondary industry(process with stone resources) and tertiary industry and develop various income resources with process goods, hands-on tourism and direct trade dealing with stones and further contribute to make rich farming and fishing counties.

☞ *Jeju Batdam* can function as a core code of Jeju's future tourism. Those popular cultural tourism, farmland tourism and hands-on tourism are main themes of self-experience tourism, setting *Jeju Batdam* securely and lead the sustainability of Jeju tourism on the other hand. The educational value in Jeju ancestors' pioneer spirits and wisdom of coexistence also is another important significance of *Jeju Batdam*.

<Contemporary meanings of *Jeju Batdam*>



V. Threats and challenges *Jeju Batdam* faces

▌Threats

- Modernized machinery

→ Difficulty in operating machinery within *Batdam* due to its curving boundary.

- Introduction of high-tech farming and diversified crops

→ More dependency on greenhouse facilities and fertilizers *Batdam* has declined in importance.

- Land readjustment project

→ Urban sprawl, and road constructions have damaged *Batdam*.

- Settlement of Jeju tangerine industry

→ Windbreak trees replace *Batdam*, later *Batdams* are built on more modernized ways.

- Stone processing techniques

→ *Batdam* were rebuilt due to land readjustment projects and modern-styled *Batdams* with no spaces among bricks have taken the place of traditional ones.

⇒ increase in cases where *Batdams* were removed and original shapes were destroyed

As the citrus industry has grown and *Batdam* has been readjusted, its original form has been damaged.

A picture showing *Batdams* where their heights got lowered after land consolidation projects, which resulted in damaging crops due to influx of sea waters.

☞ Various challenges of social and economic factors will threat the existence of *Jeju Batdam* in future, and designation *of Jeju Batdam* as one of GIAHS will play a key factor, preserving *Jeju Batdam*.

Well detailed preserving plans and appropriate usages of *Jeju Batdam*, following the designation will support *Jeju Batdam* and live forever with those Jeju farmers.

Ⅵ. Efforts to preserve the *Jeju Batdam*

1. Various efforts related to preserving *Batdam*

▌Registration of *Jeju Batdam* as a Nationally Important Agricultural and Fishery Heritage

→ Recognizing its value, the central government registered *Jeju Batdam* as a Nationally Important Agricultural and Fishery Heritage in 2013, and various follow-up projects have been developed to preserve *Batdam*.

▌Plans from Jeju Special Self-Governing Province

→ Establishment and implementation of the Soil Management & Preservation Plan, the Mid-term Plan for Preserving the Landscape and the Landscape Management Plan have had a positive influence on preserving the *Batdam* landscape directly and indirectly.

▌Declaration "Jeju, Pilot Island for Environment Friendly Agriculture"

→ The International Crop Science Congress Jeju(2008), hosted by The International Society of Crop Science

→ Promoting Jeju's safe and high quality produce and the sustainable agriculture, preserving environment, and thus eventually enhance the sustainability of *Jeju Batdam.*

[News article on *Jeju Batdam's* registration of a Nationally Important Agricultural and Fishery Heritage(Halla Daily, Jan. 21, 2103)]

[Plan for Landscape Management and Plan for Soil Preservation]

▌Implementing policies related to preserving *Batdam*

→ The direct payment systems for the Jeju-style dry-field farming, the eco-friendly farming, the landscape preservation, and the less favored areas have been affecting the efforts to preserve *Batdam* based on the sustainability of agriculture in Jeju.

→ In particular, with the *Jeju Batdam* registered as a Nationally Important Agricultural and Fishery Heritage, various and specific projects will be further developed to preserve *Batdam.*

▌Various researches to preserve *Batdam*

→ Many researches, objecting *Batdam* preserves are ongoing by various scholars and institutes.

[Seminar on the value of *Jeju Batdam*]

[Books on *Jeju doldam*]

▌The walking trails along *Batdam* scenery, etc

2. Designation of *Jeju Batdam* Heritage

▌Strategic plans for designation of *Jeju Batdam* Heritage

☞ Criteria for designation

① *Jeju Batdam* must be concentrated in certain areas.

② Diversified species must be present in the vicinity of *Batdam* (especially, proximity with Gotjawal (forest) will be considered)

③ The areas should be protected under the provisional law or needs to be systematically managed under the supervision of local authorities.

④ The areas close with UNESCO World Heritage Sites, Biosphere Reserves, and Global Geoparks Network.

⑤ The areas should have an affordable access for the perspective of future usages, some of which will be designated and managed under the title of core areas (World Natural Heritage Sites), buffer areas (Halla mid-mountain areas), and others.

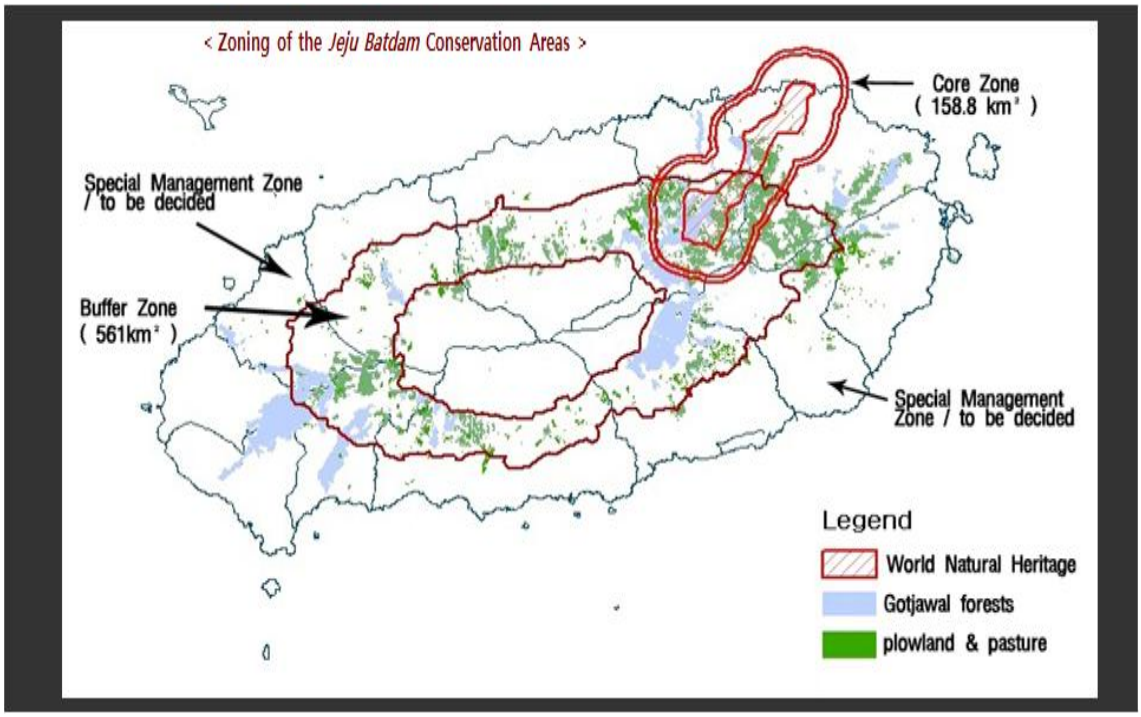
<Various efforts are being delivered to protect the significance and landscape of *Jeju Batdam*.>

▌Zoning of the *Jeju Batdam* Conservation Areas

☞ Core zone: areas, meeting the guidelines and World Natural Heritage by UNESCO (*Batdam*, as a public land and eco-friendly farming methods are practiced under the Land Management Schemes is easy to manage.)

☞ Buffer zone: mid-mountainous area (*Batdam* maintains its original form)

☞ Special management zone: other areas (Some well-preserved *Batdam* will be designated)



▌Establishment of *Batdam* Management Index

It is designed to assess how *Batdams* are preserved. Based upon the results, detailed measures will be drawn.

→ It will be judged under the criteria of

① originality ② scenic value ③ uniqueness ④ possibility of being conserved

Each will be graded as A, B or C.

→ Customized measures for each *Batdam* will be put in place based on the assessment.

Index	Criteria	Rating
Originality	When it was built / How well it maintains its original shape, etc	A-B-C
Scenic value	How well it fits with surroundings / the extent of concentration in a certain area, etc	A-B-C
Uniqueness	Characteristics including pattern and functions	A-B-C
Possibility of conservation	Location, distance from roads and villages / Whether agricultural activities are present and who is in charge of managing Batdam, etc	A-B-C
total		12 ratings

3. Establishment of *Jeju Batdam* Management Plans

Appropriate management plans for *Batdam* are necessary for usages of future generations.

→ Vision

- Establishing sustainable management system for *Batdam*

→ Goals

- Improve income for farming households and boost local economy

→ 3 challenges

① Spread awareness on importance of *Batdam*

② Encourage Active Participation with Incentives

③ Administrative support

→ 6 Strategies

① Public Relations

② Developing bases for preserving *Batdam*

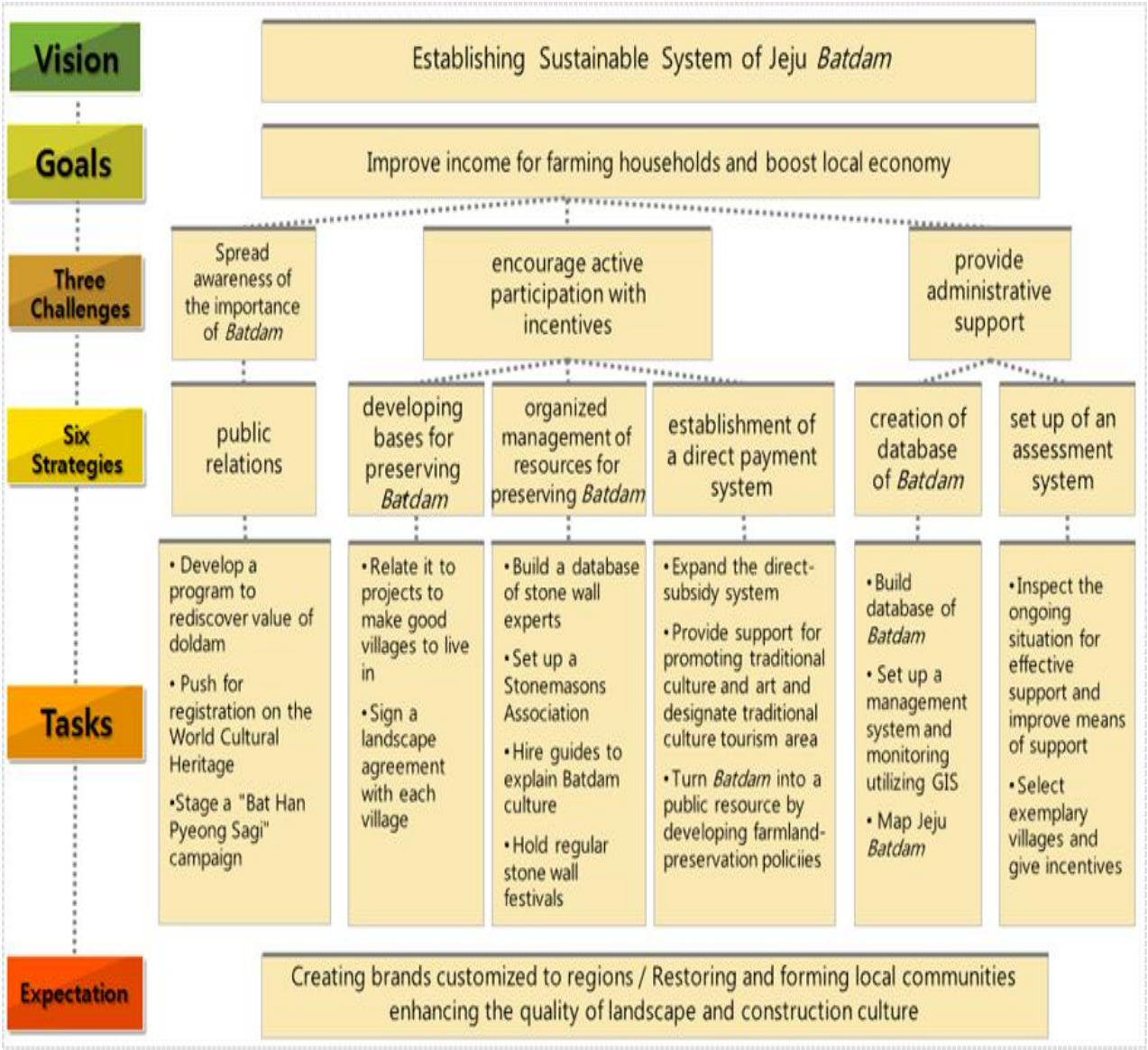
③ Organized management of resources for preserving *Batdam*

④ Establishment of a direct payment system

⑤ Creation of database of *Batdam*

⑥ Setting up assessment system of *Batdam*

▌*Jeju Batdam* Conservation and Management Plans



Ⅶ. Action plans to preserve and utilize the *Jeju Batdam*

▌Tasks of *Jeju Batdam* Management Plans

↘ Action programs per each strategy

① Active Public Relations

• Promoting a campaign of 'Bat Han Pyung Sagi', purchasing a land of one pyung (or 0.000817 acre) as a type of national trust.

• Creating programs to find values in *Batdam* and doldam.

→Domestic/International research projects &*Batdam* & stone culture academy operation

→ Efficient management through Jeju Agricultural Heritage Center

→ Develope and operate a promoting program for stone culture with well developed tourist destination like Jeju Stone Cultural Park.

• Making efforts to designate *Batdam* as a World Natural Heritage

→Early designation through active cooperation with FAO and joint program operation, regarding agricultural heritage.

② Selecting bases for conserving *Jeju Batdam*

• Joining the activities for making communities better places to live

→Brand the local specialty of GIAHS and develop/trade the processed food

→ Develop and operate various program related with rural tourism

• Adopting a joint management system among rural communities

→ As more need of an effective and income oriented site management plan becomes grater, we'll establish the development of Jeju landscape management scheme based on human, institutional and social capacity of the management plan.

③ Putting all available resources for conserving *Jeju Batdam* in organized ways

• Supporting a schematic organization, 'Association of Stonemasons in Jeju Special Self-Governing Province'

→ A systematic supporting frame is urgently required to vitalize the techniques of *Batdam* building for the professional *Batdam* stonemasons are aging rapidly. The unique techniques

of each stonemason' *Batdam* building differs from each and every region with limited technical exchange and a system for exchanges and practices of them is urgently required.

• Holding annual events under a theme of *Jeju Batdam* and doldam

→ Through *Jeju Batdam* and doldam festivals, tourists are exposed to the significance & beauty of unique *Jeju Batdam* and doldam.

[*Jeju Batdam* Building]

[Training Program for stone wall managers in the Northumberland National Park]

[Guidebook on stone walling, England]

④ Building a direct support system

• Widening the accessibility to the subsidy for conserving *Jeju Batdam*

→ Scope of the direct payment program to expand to *Batdam* from current short-lived crop, including canola.

→ Promotion introduce 'Jeju GIAHS Direct Payment System'

• Designating Protected Areas of *Jeju Batdam* as tourist attractions

→ Propel, tying with "Jeju Special Self-Governing Province Special Law”

• Utilizing *Jeju Batdam* as public resources

→ For better investment attraction plan, establish 'Land Reserve System' with a set budget

⑤ Establishing database for *Jeju Batdam*

• Mapping *Jeju Batdam* using GIS

→ Secure an entire map *Jeju Batdam* for sustainable conservation, management and applications.

• Monitoring the extent of damage every 3~5 years

→ Provide plans of preserving, management & inspection and backup measure of *Jeju Batdam* through regular monitoring among local farmers and experts.

⑥ Annual assessment

• Thorough assessment of *Jeju Batdam* for better management

→ Incentive offered for the outstanding management area per detailed index

→ Such drive will lead competitions among villages, bringing changes in local residents' perception and systematic management of *Batdam* .

▌Expected Contribution of *Jeju Batdam* for Global Agriculture

Develop data sharing technology on *Jeju Batdam* Agricultural System

→ Share our successful know-how with worldwide agricultural countries

Establish Jeju Agriculture Heritage Center, exchanging idea, train skills & manage *Jeju Batdam*, thus secure the world's sustainable heritage

→ Establish Global Agriculture Exchange System

Designation of *Jeju Batdam* Agricultural System on GIAHS

→ Promote the significance of Agricultural Heritage

→ Introduce the necessity of Agricultural Heritage protection

< People of Jeju are determined to acknowledge the significance of *Jeju Batdam* hence preserve and practice *Batdam* soundly.>

Annex

☐ List of Important Species

1. Plant

NO.	Common Name in Korean	Scientific Name	Remark*
1	돌매화나무(암매)	*Diapensia lapponica var. obovata* Fr. Schm.	TS
2	나도풍란	*Aerides japonicum* Lindenb. et Reichb. fil.	TS
3	한란	*Cymbidium kanran* Makino	TS
4	매화마름	*Ranunculus kazusensis* Makino	TS
5	죽절초	*Chloranthus glaber* (Thunb.) Makino	CS
6	개가시나무	*Quercus gilva* Bl.	CS
7	산작약	*Paeonia obovata* Max.	CS
8	연잎꿩의다리	*Thalictrum coreanum* Lev.	CS
9	대흥란	*Cymbidium nipponicum* (Franch. et Savat) Makino	CS
10	죽백란	*Cymbidium lancifolium* Hooker.	CS
11	풍란	*Neofinetia falcata* (Thunb.) Hu.	CS
12	으름난초	*Galeola septentrionalis* Reichb. fil.	CS
13	천마	*Gastrodia elata* Bl.	CS
14	지네발란	*Sarcanthus scolopendrifolius* Makino	CS
15	백운란	*Vexillabium yakusimense* F. Maekawa	CS
16	솔잎란	*Psilotum nudum* (L.)Griseb.	CS
17	파초일엽	*Asplenium antiquum* Makino	CS
18	고란초	*Crypsinus hastatus* (Thunb.) Copel.	CS
19	물부추	*Isoetes japonica* A. Braun	CS
20	섬천남성	*Arisaema negishii* Makino	CS
21	솜다리	*Leontopodium coreanum* Nakai	CS
22	솔나리	*Lilium cernuum* Kom	CS
23	삼백초	*Saururus chinensis* (Lour.) Baill.	CS
24	순채	*Brasenia schreberi* J. F. Gmel.	CS
25	만년콩	*Euchresta japonica Benth.*	CS
26	황기	*Astragalus membranaceus* (Fischer) Bunge	CS
27	갯대추	*Paliurus ramosissimus* (Lour.) Poir	CS
28	황근	*Hibiscus hamabo* Sieb. et Zucc.	CS
29	박달목서	*Osmanthus insularis* Koidz.	CS
30	무주나무	*Lasianthus japonicus* Miquel	CS

	Common Name in Korean	Scientific Name	Remark
31	구상나무	*Abies koreana* Wilson	ES
32	푸른구상나무	*Abies koreana for. Chlorocarpa* T. Lee	ES
33	검은구상나무	*Abies koreana for. Nigrocarpa* Hatus.	ES
34	붉은구상나무	*Abies koreana for. Rubrocarpa* T. Lee	ES
35	구름체꽃	*Scabiosa mansenensis for. Alpina* Nakai	ES
36	섬잔대	*Adenophora taquetii* Lev.	ES
37	한라구절초	*Chrysanthemum zawadskii* subsp. *coreanum* (Nakai) Y. Lee	ES
38	흰바늘엉겅퀴	*Cirsium rhinoceros* for. *Albiflorum* Sataka et Nakai	ES
39	한라고들빼기	*Lactuca hallaisanensis* Lev.	ES
40	좀민들레	*Taraxacum hallaisanensis* Nakai	ES
41	뽕잎피나무	*Tilia taquetii* Schneid	ES
42	좀향유	*Elsholtzia minima* Nakai	ES
43	한라송이풀	*Pedicularis hallaisanensis* Hurusawa	ES
44	한라부추	*Allium taquetii* Lev. et Vnt.	ES
45	한라돌창포	*Tofieldia fauriei* Lev. et Vnt.	ES
46	제주산버들	*Salix blinii* Lev.	ES
47	한라장구채	*Silene fasciculata* Nakai	ES
48	섬바위장대	*Arabis serrata* var. *hallaisanensis* (Nakai) Ohwi	ES
49	한라개승마	*Aruncus aethusifolius* Nakai	ES
50	사옥	*Prunus serrulata* var. *quelpaertensis* Uyeki	ES
51	제주황기	*Astragalus membranaceus* var. *alpinus* Nakai	ES
52	제주달구지풀	*Trifolium lupinaster* var. *alpinum* Nakai	ES
53	두메대극	*Euphorbia fauriei* Lev. et Vnt.	ES
54	좀갈매나무	*Rhamnus taquetii* Lev.	ES

* TS(Threatened Species), CS(Conservation Species), ES(Endemic Species) designated by Ministry of Environment, Republic of Korea

2. Animal

2-1. Birds

NO.	Common Name in Korean	Scientific Name	The present condition of preservation		
			Red List*	CITES**	Designation by ME***
1	원앙	*Aix galericulata*	LR/nt		(327)
2	소쩍새	*Otus scops*		II	(324)
3	큰소쩍새	*Otus bakkamoena*		II	(324)
4	올빼미	*Strix aluco*		II	PS(324)
5	칡부엉이	*Asio otus*		II	(324)
6	쇠부엉이	*Asio flammeus*		II	(324)
7	뜸부기	*Gallicrex cinerea*			PS
8	솔개	*Milvus migrans*		II	PS
9	참수리	*Haliaeetus pelagicus*	VU	II	TS(243)
10	개구리매	*Circus aeruginosus*		II	PS(323)
11	잿빛개구리매	*Circus cyaneus*		II	PS(323)
12	붉은배새매	*Accipiter soloensis*		II	(323)
13	조롱이	*Accipiter gularis*		II	PS
14	새매	*Accipiter nisus*		II	(323)
15	참매	*Accipiter gentilis*		II	PS(323)
16	왕새매	*Butastur indicus*		II	
17	말똥가리	*Buteo buteo*		II	PS
18	흰죽지수리	*Aquila heliaca*		I	PS
19	검독수리	*Aquila chrysaetos*		II	TS(243)
20	황조롱이	*Falco tinnunculus*		II	(323)
21	쇠황조롱이	*Falco columbarius*		II	PS
22	새홀리기	*Falco subbuteo*		II	PS
23	매	*Falco peregrinus*		I	TS(323)
24	팔색조	*Pitta nympha*	VU	II	PS(204)
25	홍여새	*Bombycilla japonica*	LR/nt		
26	삼광조	*Terpsiphone trocaudata*	LR/nt		PS
27	뿔종다리	*Galerida cristata*			PS
28	쇠검은머리쑥새	*Emberiza yessoensis*	LR/nt		

* Red List from Red Data Book : LR/nt(Lower Risk near threatened), VU(Vulnerable)
** CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora
** Wild birds designated by ME(Ministry of Environment in Korea) : PS(Preservation Species), TS(Threatened Species), (Number) which is the designated number of Natural Monument in Korea

2-2. Mammals

NO.	Common Name in Korean	Scientific Name
1	제주뒤쥐	*Sorex caecutiens*(*shinto*) *chenjuensis*
2	제주땃쥐	*Crocidura dsinezumi*
3	작은땃쥐	*Crocidura suaveolens coreae*
4	관박쥐	*Rhinolophus ferrumequinum*
5	집박쥐	*Pipistrelus javanicus*
6	큰집작쥐	*Pipistrelus coreensis*
7	긴가락박쥐	*Miniopterus schreibersi*
8	붉은박쥐	*Myotis formosus*
9	큰발윗수염박쥐	*Myotis macrodactylus*
10	흰배윗수염박쥐	*Myotis nattereri*
11	제주족제비	*Mustela sibirica quelpartis*
12	오소리	*Meles meles*
13	노루	*Capreolus pygargus tianschanicus*
14	다람쥐	*Tamias sibiricus*
15	집쥐(시궁쥐)	*Rattus norvegicus*
16	애굽쥐(곰쥐)	*Rattus rattus*
17	제주생쥐	*Mus musculus mollosinus*
18	제주등줄쥐	*Apodemus Jejuensis*
19	제주멧밭쥐	*Micromys minutus hertigi*

2-3. Amphibia

NO.	Common Name in Korean	Scientific Name
1	제주도룡뇽	*Hynobius leechii quelpartensis* Mori
2	무당개구리	*Bombina orientalis* Boulenger
4	두꺼비	*Bufo bufo gaugauizans* Cantor
3	청개구리	*Hyla japonica* Gunther
5	맹꽁이	*Kaloula borealis*(Barbour)
6	참개구리	*Rana nigromaculata* Hallowell
7	북방산개구리	*Rana dybowskii* Gunther

2-4. Reptiles

NO.	Common Name in Korean	Scientific Name
1	도마뱀	*Scinella laterale laterale* Say
2	줄장지뱀	*Takydromus wolteri* Fischer
3	아무르장지뱀	*Takydromus amurensis* Peters
4	대륙유혈목이	*Amphiesma vibakari* Denburgh
5	누룩뱀	*Elaphe dione* Pallas
6	유혈목이	*Rhabdophis tigrinus* (Boie)
7	실뱀	*Coluber spinalis* Peters
8	비바리뱀	*Sibynophis chinensis* (Gray)
9	쇠살모사	*Agkistrodon ussuriensis* (Emelianov)

2-5. Insects

Endemic Insects in Jeju Island, Republic of Korea		
NO.	**Common Name in Korean**	**Scientific Name**
1	제주집게벌레	*Anechura quelparta* Okamoto
2	제주보날개풀잠자리	*Spilosmylus saishiuensis* Okamato
3	제주밑드리	*Panorpa approximata* Esben-Petersen
4	제주박각시	*Marumba saishiuana* Okamato
5	제주공단딱정벌레	*Carabus smaragdinus* monilifer Tatum
6	금가슴딱정벌레	*Carabus fiduciarius kirinicus* Csiki
7	제주양코스키딱정벌레	*Carabus jankowskii quelpartianus* Breuning
8	제주호랑하늘소	*Xylotrechus atronotatus* Pic
9	제주그물눈풍뎅이	*Holotrichia recticulata* Murayama
10	제주풍뎅이	*Anomala quelparata* Okamoto
11	제주은주둥이벌	*Paralus variegatus varius* Sickmann
Polar Insects		
NO.	**Common Name in Korean**	**Scientific Name**
1	여치	*Gampsocleis sedakovi obscura* Walker
2	긴날개여치	*Gampsocleis ussuriensis* Adelung
3	잔날개여치	*Metrioptera bonneti* Bolivar

4	노랑띠좀잠바리	*Sympetrum pedemontanum alatum* Selys
5	알락수염노린재	*Dolycoris baccarum* Linne
6	홍보라노린재	*Carpocoris purpereipennis* De Geer
7	장흙노린재	*Pentatoma semiannulata* Motschulsky
8	아무르밑드리	*Panorpa amurensis* Maclachlan
9	줄날도래	*Macronema radiatum* Maclachlan
10	산누에나방	*Antheraea pernyi* Guerin
11	붉은날개애기자나방	*Calothysanis amata recompta* Prout
12	꽃무늬하늘나방	*Stauropus basalis* Moore
13	점박이뾰족날개나방	*Parapsetis argenteopicta* Oberthur
14	독나방	*Euproctis flava* Bremer
15	쌍검은밤나방	*Sineugraphe exusta* Butler
16	검은다리밤나방	*Parallelia obscura* Bremer et Grey
17	푸른줄애기밤나방	*Bena prasinana* Linne
18	넉점박이불나방	*Lithosia quaddra* Linne
19	제주왕자팔랑나비	*Daimio thethys felderi* Butler
20	멧노랑나비	*Gonepteryx rhamni* Linne
21	푸른부전나비	*Calastrina argiolus* Linne
22	번개오색나비	*Apatura iris* Linne
23	공작나비	*Inachis io* Linne
24	작은멋장이나비	*Cyntia cardui* Linne
25	흰뱀눈나비	*Melanargia halimede* Menetries
26	가락지나비	*Aphantopus hyperantus* Linne
27	시골처녀나비	*Coenonympha amaryllis* Cramer
28	산굴뚝나비	Satyrus antonae sibirica Staudinger
29	참산뱀눈나비	*Oeneis nanna* Menetries
30	눈많은그늘나비	*Pararge achine* Scopoli
31	깔따구길앞잡이	*Cicindela gracilis* Pallas
32	아이누길앞잡이	*Cicindela gemmata* Feldermann
33	버섯벌레	Aulacochilus decoratus Reitter
34	진거저리	*Opatrum sabulosum* Linne
35	좀남가래	*Meloe lobatus* Gebler
36	열점박이가래	*Mylabris calida* Pallas
37	별박이가래	*Eppicauta megalocephala* Gebler

38	노란띠하늘소	*Polyzonus fasciatus* Fabricius
39	검정무늬쇠주홍하늘소	*Amarysinus altajensia* Lazmann
40	떡갈나무하늘소	*Lamia gottsche*i Kolbe
41	자분비수염치레하늘소	*Monochamus urussovii* Fischer
42	산사슴벌레	*Prismognathus suaeneus* Motschulsy
43	소똥구리	*Gymnopleurus mopsus* Pallas
44	참검정풍뎅이	*Holotrichia dimorphalia* Bates
45	큰다색풍뎅이	*Holotrichia titanis* Reitter
46	밤꽃무지	*Lasiotrichius succinctus* Pallas
47	깨다시등에	*Chrysozona trisi* Bigot

Subtropical Insects		
NO.	**Common Name** in Korean	**Scientific Name**
1	콩중이	*Gastrimargus transversus* Thunberg
2	남쪽풀색노린재	*Nezara viridula* Linne
3	노랑침노린재	*Sirthenea flavipes* Stal
4	말멸구	*Cicadella ferrunginea* Fabricius
5	선녀벌레	*Geisha distinctissima* Walker
6	루비깍지벌레	*Ceroplastes rubens* Maskell
7	세줄박각시	*Theretra oldenlandiae* Fabricius
8	벌꼬리박각시	*Macroglossum pyrrhostictum* Butler
9	벼밤나방	*Sesamia inferens* Walker
10	구름무늬큰밤나방	*Mocis undata* Fabricius
11	청띠제비나비	*Graphium sarpedon* Linne
12	남방노랑나비	*Eurema hecabe* Linne
13	먹그림나비	*Dichorragia neimachus* Boisduval
14	암붉은오색나비	*Hypolimnas misippis* Linne
15	남방공작나비	*Precis almana* Linne
16	남색남방공작나비	*Precis arithya* Linne
17	줄물방개	*Hydaticus vittatus* Fabricius
18	뱀허물쌍살벌	*Parapolybia varia* Fabricius
19	청줄벌	*MAnthophora zonata* Linne

20	어리줄배벌	*Scolia nobilis* Saussure
21	요코하마고치벌	*Tropobracon jokohamensis* Cameron
22	검정날개재니등에	*Hyperalonia tantalus* Fabricius