Jeju Batdam Agricultural System (stone fences)

(GIAHS by FAO)

2024.8.8

Jeju Special Self-Governing Province, Republic of Korea

Seong-bo Ko / Jeju National University

Index

Summary information

Description of the Jeju Batdam Agricultural System

Ι

Characteristics of Jeju Batdam Agricultural System / 6

- 1. Global(or national) Importance
- 2. Jeju Batdam and securing food and livelihood
- 3. Biodiversity of *Batdam* and its ecological functions
- 4. Knowledge system and skills of the Jeju Batdam
- **II** Socio-cultural meanings of *Jeju Batdam* / 26
- III History of the *Jeju Batdam* / 27
- **IV** Contemporary meanings of the *Jeju Batdam* / 31
- V Threats and challenges *Jeju Batdam* faces/ 32
- VI Efforts to preserve the *Jeju Batdam* / 33

SUMMARY INFORMATION

1. GIAHS's name	Jeju Batdam Agricultural System	RUSSIA 비행가리 사건 이내에 있는 인구 500만 이상 도시 비행가리 사건 (10개 도시/용인구 7억명)			
2. Applicant	Jeju Special Self-Governing Province	more maren S			
3. Supporting organization	. Ministry of Agriculture & Livestock, 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, strategic position connecting the continent (Russia, China) and the ocean (Japan, South Asia) World-dass 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 - one hour flight from Seoul to Jeju - two-hour flight from Tokyo, Japan - one hour flight from Shanghai, China				
6. Area	. 541.9km²				
7. land use	. for citrus orchards and for growing upland crops (potatoes, carrots, garlic, white radish, cabbage, barley, beans and so on)				
8. Topography	. As a volcanic island with Mt. Halla in the center, the eastern and western sides have a gentle slope of 3°~5° and the southern and northern sides have a rather steep slope of 5°.				

9. Climate	. Warm temperate oceanic climate, sub-tropical, temperate, polar climate - precipitation (mm): Jeju city 1,075.8, Seogwipo city 1,561.3 - mean temperature (°C): Jeju city 17.0, Seogwipo city 17.2
10. Population	. 699,751(311,355households)
11. Livelihood	. tourism, retail industries, etc. (76.9%), . agriculture, forestry, livestock, and fisheries (11.1%)
12 . Summary of the Jeju Batdam Agricultural 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 the island barren for farming. Jeju is abundant with volcanic ash soil, rocks and winds. As farming started in Jeju, however, people on the island built more than 22,000 kilometer-long <i>Jeju Batdam</i> or stone fences with stones managed and collected during the cultivation, which were used to prevent winds and the loss of soil and also helped preserve biodiversity and agricultural culture of Jeju. <i>Jeju Batdam</i> Agricultural System offers an outstanding vista of agricultural culture in Jeju with beautiful natural landscape, representing aesthetics of Jeju. Protected by <i>Jeju Batdam</i> , 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 this 22,000km black dragon stone fences, which cannot be found easily in any other places in the world, on the GIAHS would provide an opportunity to find sustainability of the agricultural heritage <i>Batdam</i> and agriculture of Jeju through effective and efficient preservation and application of <i>Jeju Batdam</i> Agricultural System.

SUMMARY INFORMATION

■ Four seasons of *Jeju Batdam* Agricultural System



Description of Jeju Batdam Agricultural System



I. Characteristics of *Jeju Batdam* Agricultural System

- 1. Global(or national) Importance
- 2. Jeju Batdam and securing food and livelihood
- 3. Biodiversity of *Batdam* and its ecological functions
- 4. Knowledge system and skills of the Jeju Batdam

1. Importance at home and abroad

1-1. Jeju, a volcanic island, and the creation of 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 : lava plateau -> 300,000 years ago: shield volcano
 - -> 160,000 years ago : lava tubes around Mt. Halla -> 25,000 years ago : crater on Mt. Halla
 - -> 18,000 years ago (the last 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 of Jeju has retained its original topography and geology from its very beginning to the completion. => UNESCO Triple Crown designation in natural science

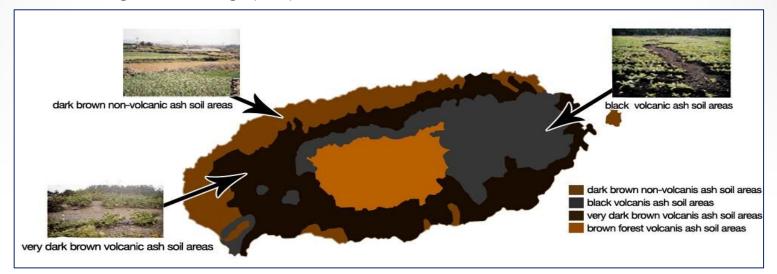


- UNESCO World Heritage (Jeju Volcanic Island and Lava Tubes), World Geopark, Biosphere Reserve
- In addition, Jeju has been designated with Ramsar Wetlands, making Jeju a pride for the whole world and valuable heritage for mankind.
- This backdrop of its birth has made the island of Jeju a country of stones and its location gave it a nickname a country of wind.

Characteristics of Jeju soil and its distribution pattern

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 it 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.
- => Conditions for farming in Jeju are so bad when you till the land, you can easily find stones there that it has mostly dry-field farming (99.9%).
- => How to preserve and manage this volcanic ash soil is a prerequisite for farming since Jeju island has strong winds and high precipitation.



The reasons why Jeju has mostly dry-field farming although it has much precipitation are ;

- Volcanic ash soil has high water permeability.
- Average depth of a rable land is very low at $18.3\,\mathrm{cm}$ (at the lowest
 - 7cm, at best 35cm).
- Most of soil has high content of gravel up to 40%. Even if some soil has less gravel, its depth is not enough for farming.
- Although some soil is not volcanic ash, there are many places with up to 15% of gravel content or places with less than 15cm depth.



Most of fields in Jeju, a volcanic island, are stone fields. Fields with much gravel are called *Jakjiwat* and ones with much bedrock are called *Billewat*.

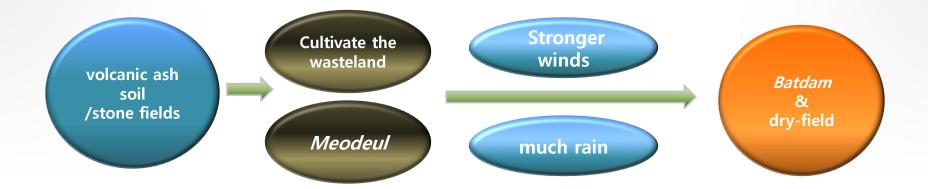


Beginning of farming and climate characteristics

Started in Jeju between A.D. 1 and 1105 when Jeju was Tamna State, an independent state from the Korean Peninsula.

 estimated based on excavated artifacts such as knives, sickles and charred crops from prehistoric times

- Jeju had relatively many days of strong storms with winds up 10 meters per second, 117 days, especially stronger in spring and fall.
 - Jeju is located in the path of a couple of typhoons per summer with 40 to 50 meter per second
 - ⇒ Stronger winds in Jeju than in any other place made people in the island create their own ways of living and farming.



Birth of Batdam

- They built *batdam* or stone fences with stones collected during the cultivation to manage both wind and soil.
 - -> Most arable land in Jeju is lava stone fields.
 - -> It was necessary for cultivation to remove stones and pile them aside..
 - -> As rain and winds continued to reveal stones in the lower layers of topsoil, stones had to be removed accordingly.
 - -> Batdam started to be built in order to manage strong winds and volcanic ash soil.
 - -> Batdam also served as borderlines between fields.
 - => Over the course of 1,000 years, black lave stones created very long stone fences which look like a black dragon, seen from the air, called the 22,000km black dragon stone fences of Jeju.
 - => It was like a revolution that drastically changed the agriculture in Jeju.



[piled-up stones collected during the cultivation, called meodeul]

Batdam and the agricultural system

• Lava plateau / Volcanic ash soil / strong winds / high precipitation

Volcanic island of Jeju

- → cultivation and expansion of farmland
 → Batdam → windbreak / prevention of soil loss / keeping horses and cows out of fields / conservation of species / demarcation
- agricultural heritage that brought about primitive revolution to the Jeju farming
- ⇒ cultural heritage containing wisdom and the will to live

 different crops (millet, barley, white radish, carrots, potatoes, etc.)

- birth of traditional way of farming (field treading, topdressing and so on)
- creation of unique agricultural landscape

■ Length of *Jeju Batdam*

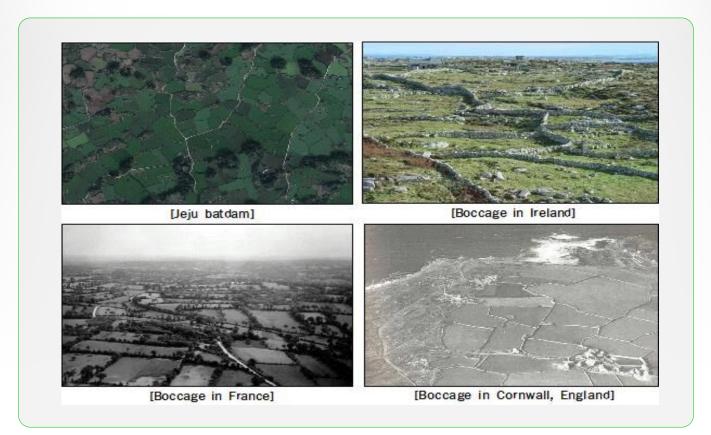
Total length : 22,108km

- calculation method : Total areas of arable land in Jeju 541.94km² × average length of field stone fences 40.796km/km²
- More than 60% of total stone fences 36,000km long are field stone fences
- **>** Jeju field stone fences which is longer than half the circumference of the earth is called black dragon stone fences

- Black lava stones stretch long, looking like a black dragon



- **I** Differences from similar cultures across the world
 - **Solution** Compared with boccage landscape in Europe



Compared with boccage landscape in Europe

< 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 >



Built by small groups such as individuals or families over a long period of time Built with only stones Enclosed land areas were used only for dry-field farming



Boccage landscape

Created over short periods of time through collective readjustment of land Used various materials such as wood, stones, boards and so on Grassland growing for livestock farming or mixed agriculture with the cattle put out to pasture

2. Jeju Batdam and securing food and livelihood

2-1. Current state of agriculture in Jeju

Industrial makeup of Jeju and farming houses

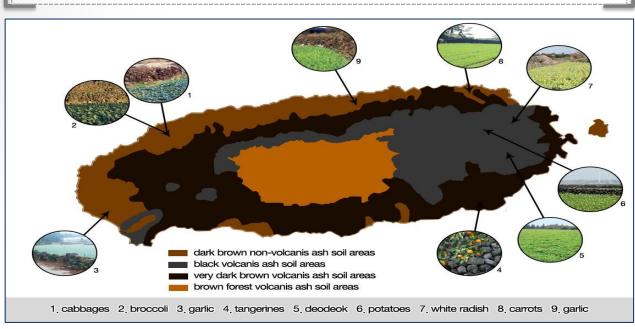
- Agriculture and fisheries in Jeju stand at 11.1% of gross regional product, ranking second, after the service industries of 76.9% such as the tourism industry.
- The proportion of agriculture, forestry and fisheries in Jeju's gross regional product is 5.45 times higher than the national proportion of 2.0%.
- **Natio of the agriculture, forestry and fisheries's population to the total population of Jeju stands at 10.4% as of 2023, 2.6 times higher than the national average of 4.0%.**

< Total Population and Agriculture Population of Jeju (2023)>				
	Total, Jeju		Agriculture	
	People	Households	People	Households
Total	699,751	311,355	72,985	30,357
%	100.0	100.0	10.4%	9.7%

■ Main crops by area

- Crops vary depending on soil characteristics and height of *Batdam* in different areas.
 - Crops have much to do with characteristics of soil.
 - . volcanic ash soil (*Tteunddang*) -> white radish, tangerines, etc
 - . non-volcanic ash soil(*Deonddang*) ->garlic, cabbages, etc
 - . sand soil -> mainly carrots

40.5% of farmland in Jeju is non-volcanic ash soil, and 59.5% volcanic ash soil.
 Non-volcanic ash soil per 100cc is 70g and volcanic ash soil is 50g
 Tteunddang or volcanic ash soil is unfavorable for farming.



[Main crops by area depending on characteristics of soil]



Garlic in non-volcanic ash soil



Radish in volcanic ash soil



Carrots in volcanic ash soil



Sand soil, carrots

3. Biodiversity of *Batdam* and its ecological functions

Biodiversity of *Batdam*

-> Biodiversity can be divided into ecological diversity, species diversity and genetic diversity, which have complementary relationships

Ecological diversity

- It is created by natural environment of surrounding areas including Oreum, Gotjawal forests, streams, wetland, Baengdui (or moor), and the intertidal zones.

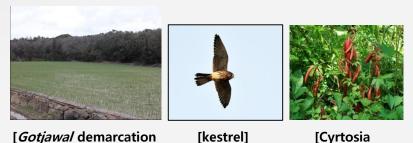


- · spread out across the island. Related to the ecological diversity originating from Oreum
- · crops that can grow well in volcanic ash soil such as carrots, beans, barley, rape seed flowers, buckwheat and so on

[Oreum demarcation Batdam 1

[bush warblers]

[a colony of Elsholtzia splendens]

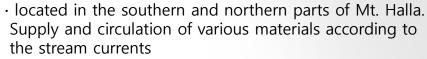


[Gotjawal demarcation Batdam]

[Cyrtosia septentrionalis 1

- · located in the eastern and western parts of the island. Unique ecology due to the microclimate of Gotjawal forests
- · Cotton, tobacco plants, barnyard millet, and sorghum used to grow. Recently garlic has been grown.





• white radish, vegetables, beans, water dropwort, deodeok or a mountain herb and balloon flowers.







Wetland demarcation Batdam]

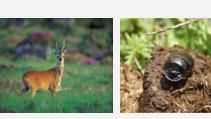
[moorhen]

[Jeju salamander]



[Mid-mountain baengdui demarcation Batdam]

batdam



[roe deer]

[scarab beetles]



[Jogandae demarcation [brown-eared bulbul]



[snails]

• 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

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

4. Knowledge system and skills 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.
 - Layers are formed by placing an upper stone called *Witdol* onto the space between two lower stones called *Mitdol*, making a stabilize structure.
 - When gaps are big between *Mitdol* and *Witdol*, gravel is inserted to make it stable.
 - => Jeju Batdam contains a power that has stood by itself for over one thousand years.
- Batdam was connected throughout different fields without stopping, maximizing the structural effects.
 - => creating 22,108km Black Dragon *Batdam*(stone fences)

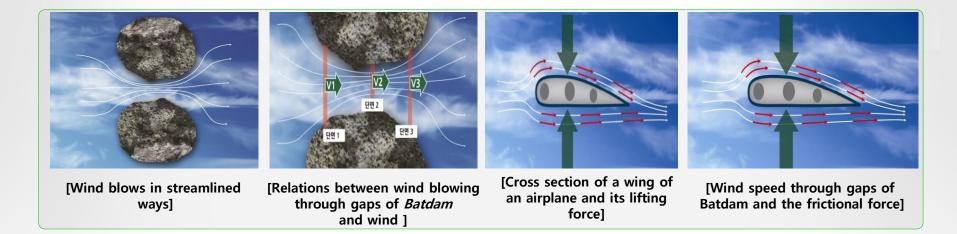


[Pores on lava stones]



[*Jeju Batdam* has many gaps]

I Jeju Batdam that can weather strong winds



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, which is good for resisting wind, and porous lava stones so it can increase frictional force.

I Types of Jeju Batdam

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Types are categorized according to the way a fence was built

- One-line fences are called Woedam and two-line fences Jeopdam.
- Stone filler called *Jatdam* is put between the outer fences.
- : People can walk on them, so they are called *Jatgil* or a path, a thoughtful way of helping neighbors come and go on land without 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



[*Woedam]*

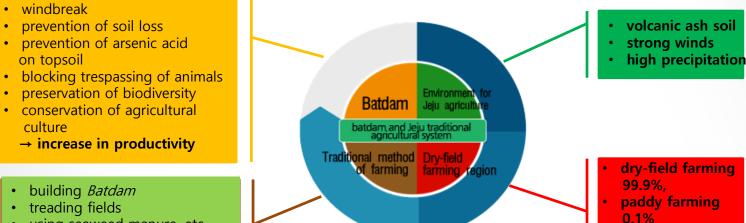


[*Jeopdam*]



Functions of *Jeju Batdam* and the traditional agricultural system

Batdam itself is one of the agricultural systems with many functions. N



using seaweed manure, etc

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Jeju Batdam itself is a unique agricultural system to overcome unfavorable environment for farming.



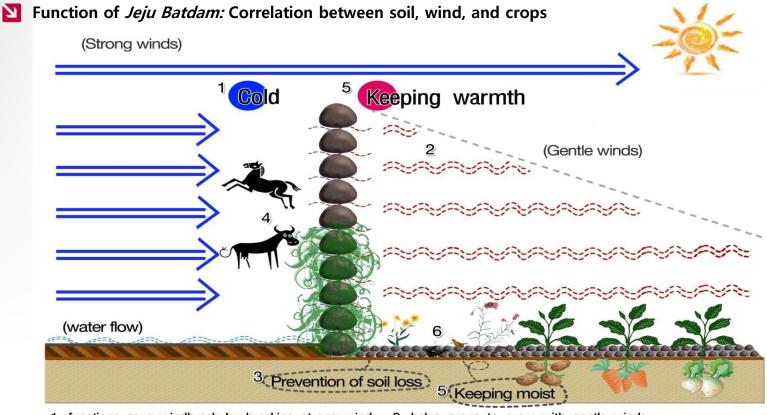
Dollengibat. In order to minimize the effects of wind, farmland is divided into small areas by surrounding it with batdam

Jeju batdam itself is a unique agricultural system to overcome unfavorable environment for farming

Batdam and crops

-In order to decide on types of crops to grow, they had to consider the height of a *Batdam*, which helps subdue winds and retain water.

- : When a *Batdam* is low, short plants like bulbs and root vegetables such as potatoes, carrots, sweet potatoes, white radish, Chinese cabbage and garlic can grow.
- : If a *Batdam* is rather high, crops like millet, barley and rape seed flowers can be raised, though not the same in all cases



1. functions as a windbreak by breaking strong winds

- 3. prevents the loss of soil and helps conservation
- 5. keeps soil warm and moist

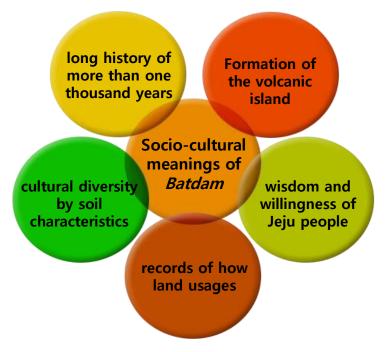
2. helps crops to grow with gentle winds

- 4. protects crops by stopping horses and cows from entering
- 6. species diversity

II. Socio-cultural meanings of *Jeju Batdam*

Socio-cultural meanings of *Batdam*

- **Batdam** can help understand how the volcanic island of Jeju was formed.
- **Batdam** can show the wisdom and willingness of people of Jeju, cultivating farmland fighting against strong winds on the island.
- Batdam has a long history of more than one thousand years and is a cultural heritage serving its purposes.
- **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.



III. History of *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)

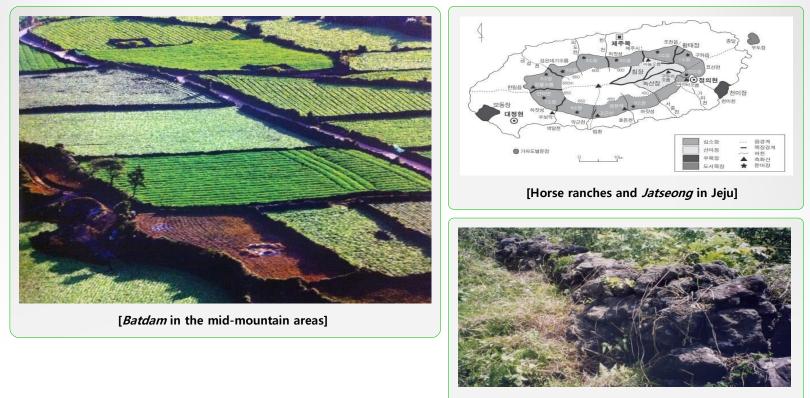
- In the book, he described the difficulties of farming in the stone-rich barren field and said that batdam was an eyesore because it was not built in an organized way.
- The very way of building *Batdam* in a naturally disorganized manner has been one of its characteristics and a source of its vitality in the country of wind.



III. History of *Jeju Batdam*

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.



[Hajatseong in Sumang-ri, Namwon-eup]

III. History of *Jeju Batdam*

■ *Jeju Batdam* described in ancient literature.

Necords about *Batdam* in ancient literature

	Author(s)	Record Time	Origins	Building Method	Functions of <i>Doldam</i>		
Title					Demar -cation	Animal blockage	Soil & crops protection
Sinjeungdongdukyeojiseungra m	Lee Haeng, Hong Eonpil	1530	0		0		
Nammyeongsoseung	Lim Je	1577-78				0	
Namcharok	Kim Sangheon	1601		0			
Tamraji	Lee Wonjin	1653	0		0		
Namcheonrok	Kim Seonggu	1676		0		0	
Namchailrok	Lee Jeung	1679				0	
Namhwanbakmul	Lee Hyeongsang	1704	0		0	0	
Tamrajichobon	Lee Wonjo	Mid 19 th century	0	0		0	
KOREA	Hermann Lautensach	1945		0		0	0
Jeungbotamraji	Damsugye	1954	0		0	0	0

According to the oldest record, *Batdam* started to built as a demarcation at the order of the then judge 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]

Ecological values	Heritage values	Agricultural values	
maintaining and expanding ecology, species, gene diversity	valuable as unique agricultural heritage in the world	maintaining and expanding various agricultural functions	
Scenic values • scenic elements unique in Jeju • representatives of Jeju aesthetics • attractions of Jeju tourism	Cultural values • symbol of spirits of Jeju people (spirits of pioneers / coexistence with nature) • unique ways of life with various stone cultures	Artistic & academic values • academic values in terms of archeology, socio-economics and geology • artistic values of literature, arts and photographs, etc	

Future values

- expansion of different values of Jeju Batdam through registration as Agriculture & Fisheries Heritage
- foundation for developing Jeju style future-oriented agriculture focusing on environmentally friendly farming and tourism farming, etc.
- leading the sustainable tourism in Jeju such as cultural tourism and rural area tourism.
- value to pass down the ancestors' spirit of pioneering and wisdom to the next generations

V. Threats *Jeju Batdam* faces

Threats

Mechanization of agriculture

 \rightarrow 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 grew, the *Batdam* was rebuilt and its original shape was 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.

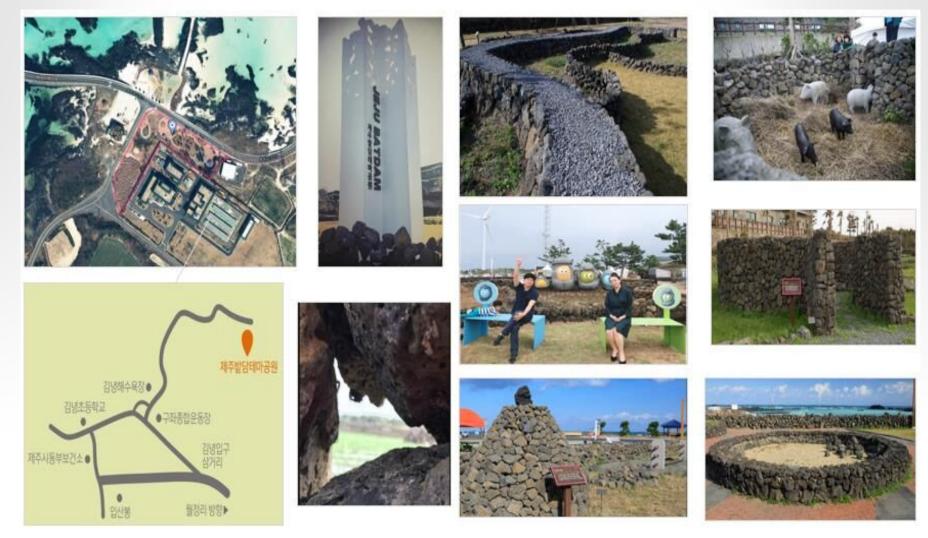
Various efforts related to preserving *Jeju Batdam*

Creating Jeju Batdam Trail with stories in eight villages



I Various efforts related to preserving *Jeju Batdam*

Creating Jeju Batdam Theme Park in Woljeong-ri, Gujwa-eup, Jeju-city



I Various efforts related to preserving *Jeju Batdam*

Y Jeju Batdam Academy operation and souvenir production













I Various efforts related to preserving *Jeju Batdam*

Creating Jeju Batdam CI and Character



JEJU BATDAM'S COLOR















I Various efforts related to preserving *Jeju Batdam*

Creating Jeju Batdam shop and photo zone



< photo zone at Batdam tail, Woljeong-ri, Gujwa-eup >





<Batdam shop, Dongmyeong-ri, Hallim-eup (left)



photo zone, Sinpung-ri, Seongsan-eup (middle)



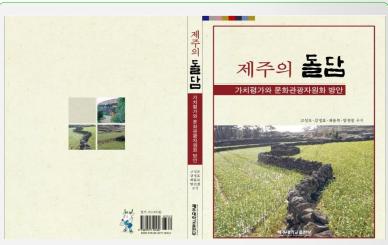
Batdam shop, Sinpung-ri (right)>

I Various efforts related to preserving *Jeju Batdam*

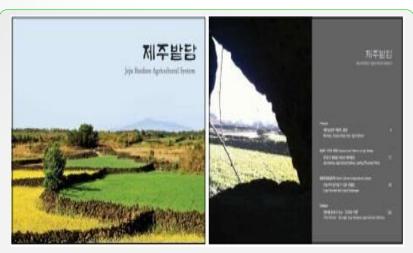
Conducting various researches to preserve *Jeju Batdam*



[Seminar on the value of Jeju Batdam]



[Book on Jeju Batdam]



[Promotional Brochure on Jeju Batdam Agricultural System]



[Children's Books on Jeju Batdam]

I Various efforts related to preserving *Jeju Batdam*

A total of 7 *Jeju Batdam* Festivals have been held since 2015, (1st ~ 7th, 2015~2023).



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I Website of Jeju Batdam Agricultural System and promotional videos

FAO's website of Jeju Batdam Agricultural System(GIAHS) <u>https://www.fao.org/giahs/giahsaroundtheworld/designated-sites/asia-and-the-pacific/jeju-batdam-agricultural-system/en/</u>

Promotional video website for *Jeju Batdam* Agricultural System(GIAHS) <u>https://youtu.be/EE0GKqCPH0w</u>



Korea's Globally Important Agricultural Heritage Systems - JEJUBADAM(제주 밭담 편)



Thank you for your attention.