

Selecting Biodiversity Indicator Species in Agricultural Heritage Sites

-A Case Study in the Gurye Sansuyu Agricultural Heritage Site-



Seungjoon Lee¹, Choong-Hyeon Oh²

1) Ph.D. Candidate, Dongguk University

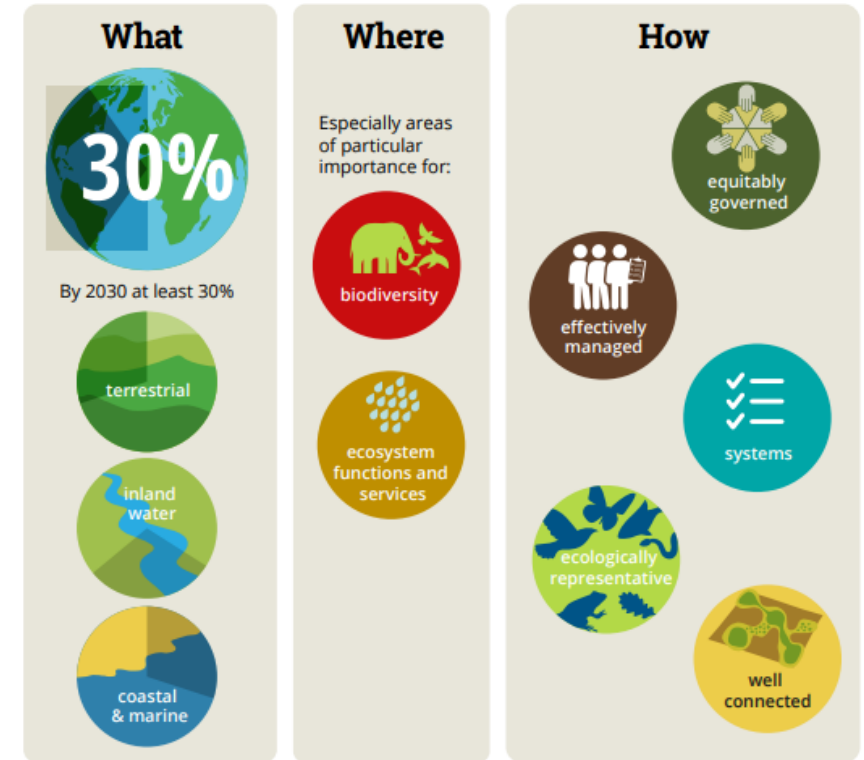
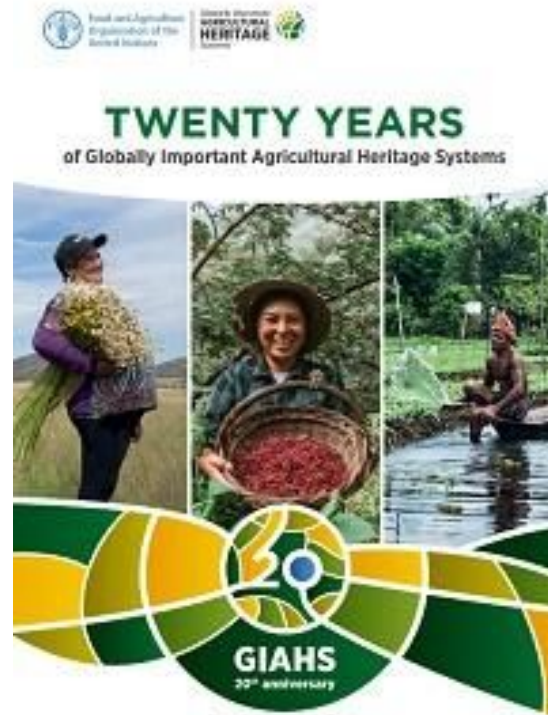
2) Professor, Department of Biological Environmental Studies, Dongguk University

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- V. Result: Rapid Assessment in Gurye Sansuyu Agricultural Heritage Site
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I. Introduction: Agricultural Heritage and its Relation to Biodiversity

1) Role of GIAHS on Biodiversity Conservation



<Rio(1992) and Johannesburg Summit(2002)>

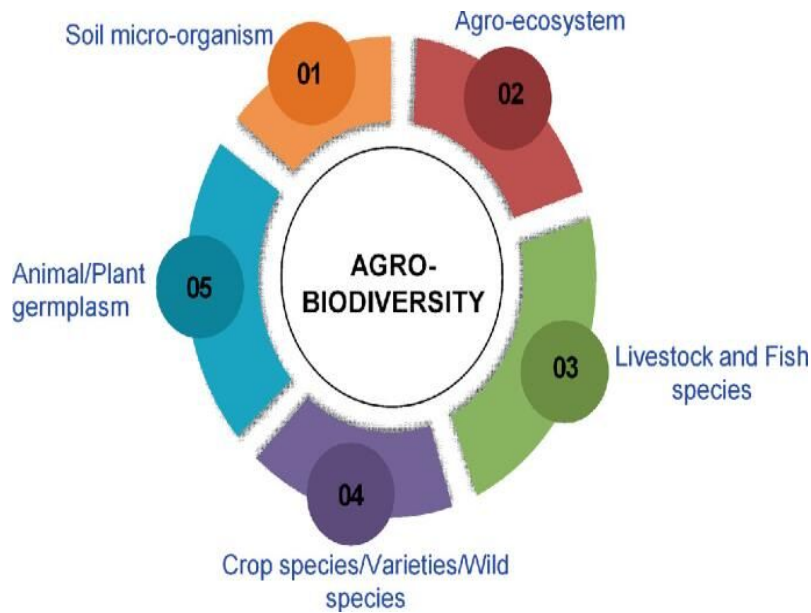
<20 Year Anniversary Booklet on GIAHS(2022)>

< Goals of Kunming Montreal GBF(2022) >

- Chronology: Rio Summit(1992) -> Johannesburg Summit & GIAHS(2002) -> 86 agricultural heritage systems in 26 countries designated(2024)
- The importance of agricultural heritage increased even more since the adoption of the Kunming Montreal GBF(2022)

I. Introduction: Agricultural Heritage and its Relation to Biodiversity

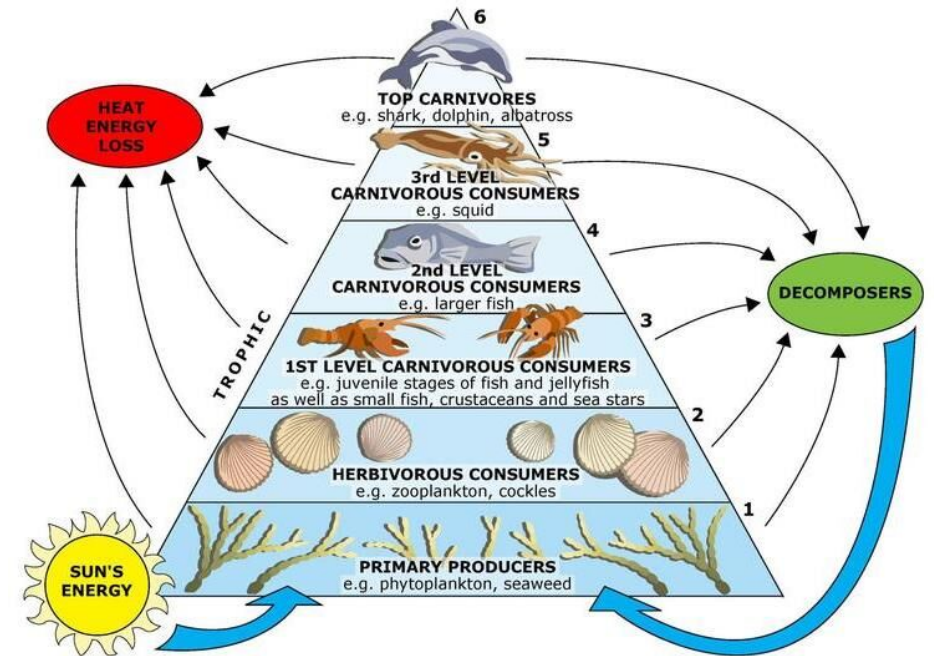
2) Definition and Significance of Agricultural Biodiversity in Agricultural Heritage Sites



< Components of agro-biodiversity(Singh, 2022)>



< Crane in a rice paddy field>



< Structure of food chain and nutrient cycling>

- Agricultural biodiversity: the variety of animals, plants, and micro-organisms which are necessary to sustain the agro-ecosystem.
- Crop/livestock species are integral to agro-biodiversity, but the other wild organisms also need to be considered.
- While its contribution to production may be minimal, its presence in the ecosystem is crucial for sustaining the agriculture.

I. Introduction: Agricultural Heritage and its Relation to Biodiversity

3) Categories of biodiversity in agro-ecosystems (Biala, 2005)



<Korean ginseng (agricultural biodiversity)>



< Honeybee (para-agricultural biodiversity)>




< Crested ibis (extra-agricultural biodiversity)>

Categories of agro-biodiversity	Definition	Example
Agricultural biodiversity	Consists of species and genetic diversity of crops, forage plants, and livestock	Cultivated crops/livestock breeds in agricultural heritage systems
Para-agricultural biodiversity	Consists of species which have a positive effect on agricultural production (decomposers, pollinators)	Shamrock (fodder, nitrogen fixation) Honeybee (pollinator), Earthworm (decomposer)
Extra-agricultural biodiversity	Consists of other organisms in the farming system, but with less contribution to the crop production	Keystone species Endangered plant/animal species

- Agro-biodiversity is divided into **planned biodiversity**(agricultural) and **associated biodiversity**(para-agricultural and extra-agricultural)
- A certain species that inhabits the agricultural heritage may fall into more than one category of agro-biodiversity indicator.

II. Objective: Selecting Indicator Species in Agricultural Heritage Sites

지정번호	명칭
1	Terraced Rice Fields, Cheongsando
2	Stone Walls Enclosing Fields, Jeju
3	Sansuyu Cultivation Field, Gurye
4	Bamboo Field, Damyang
5	Ginseng Cultivation Field, Geumsan
6	Traditional Tea Field, Hadong
7	Geumgang Pine Agroforestry, Uljin
8	Silkworm Farm, Buan
9	Volcanic Slope Field, Ulleungdo
10	Traditional Irrigated Field, Uiseong
11	Traditional Tea Field, Boseong
12	Fermented Tea Farming, Jangheung
13	Ginger Cultivation Field, Wanju
14	Rice Field with Small Reservoirs, Goseong
15	Dried Persimmon Farming, Sangju
16	Rice Field with Waterways, Gangjin
17	Persimmon Farming Hills, Changwon
18	Ramie Cultivation Field, Hansan



< Agricultural Heritage Systems in Korea >

Agricultural biodiversity types	Surrogate species	Definition
Agricultural Biodiversity Indicator	Crop/Livestock species	Species that is deliberately incorporated into the agricultural system by the farmer
Para-agricultural Biodiversity Indicator	Agricultural supporting species	Species that have beneficial roles in enhancing agricultural productivity
Extra-agricultural Biodiversity Indicator	Ecological Indicator species	Organism whose presence, abundance reflects a specific environmental condition
	Keystone species	Species that has an extremely high impact on a particular ecosystem relative to its population
	Flagship species	Species chosen to raise support for biodiversity conservation in a given place
	Threatened species	Species which is vulnerable to extinction in the near future

< Definitions of Different Conservation Surrogate Species >

- Korea's Important Agricultural Heritage System (KIAHS): 18 sites designated since 2013
- Issue: Lack of public awareness regarding the role of agricultural heritage sites in biodiversity conservation
- Objective: **to devise a method for selecting agro-biodiversity indicator species** using existing concepts (e.g., flagship species, keystone species)

III. Study Area: Gurye Sansuyu(*Cornus officinalis*) Agricultural Heritage Site



< Sansuyu fruit >



< Location of Sansuyu Agricultural Area >



< Sansuyu Agricultural Area Landscape >

- Sansuyu (山茱萸 in Chinese, さんしゅゆ in Japanese): A deciduous shrub that bears red oval fruit, primarily used for medicinal purposes
- Located in Sandong Village, Gurye, Jeollanam-do Province in South Korea
- A thousand-year-old agricultural heritage maintained by villagers who found a way to live in an area with limited arable land
- Designated as the 3rd KIAHS(Korea's Important Agricultural Heritage System) in 2014

IV. Study Method: Rapid Assessment of Agricultural Biodiversity Indicator Species

Name of Species	Agricultural Biodiversity Types	Surrogate Species Types	Describe Value/Significance	Value/Significance		
				High	Intermediate	Low
	Agricultural biodiversity indicator	Crop & livestock species				
	Para-agricultural biodiversity indicator	Agricultural supporting species				
	Extra-agricultural biodiversity indicator	Ecological Indicator species				
		Keystone species				
		Flagship species				
		Endangered species				

<Rapid Assessment Sheet for Agro-biodiversity Indicator Species>

- By adapting the Rapid Assessment of Wetland Ecosystem Services(Ramsar Convention on Wetlands, 2018), all inhabiting plant and animal species of a particular agricultural heritage site are assessed to determine their eligibility as indicator species
- A species must receive **at least one high or two intermediate ratings** to qualify as an indicator species
- The assessment should involve surveying all stakeholders of a heritage site to quickly and consensually select indicator species

IV. Study Method: Sample Application of Rapid Assessment Method



Name of Species	Agro-Biodiversity Indicator Types	Surrogate Species Types	Value/Significance			
			High	Intermediate	Low	
Eurasian eagle-owl (<i>Bubo bubo</i>)	Agricultural biodiversity Indicator	Crop & livestock species			✓	
	Para-agricultural biodiversity indicator	Agricultural supporting species		✓		
	Extra-agricultural biodiversity indicator	Ecological Indicator species			✓	
		Keystone species	✓			
		Flagship species	✓			
		Endangered species	✓			

< Rapid Assessment of Eurasian eagle-owl in Uljin Geumgangsong Pine Agricultural Heritage Site as an Indicator Species >

- Crop/livestock species: not incorporated into the agricultural system by human (Low)
- Agricultural supporting species: preys on agricultural pests to some extent (Intermediate)
- Indicator species: Its habitat overlaps the agricultural heritage area to a minor degree (Intermediate)
- Keystone & Flagship species: a very well-known apex-predator bird species of the Korean Peninsula (High)
- Endangered species: Eurasian eagle-owl is designated as the Threatened Species by the Korean government (High)

V. Study Result: Rapid Assessment in Gurye Sansuyu Agricultural Heritage Site



< Oriental scops owl (*Otus sunia*)>

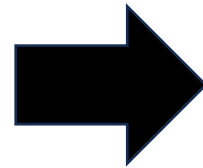
Name	Rapid Assessment Result		
	High	Intermediate	Low
Oriental scops owl (<i>Otus sunia</i>)	4	1	1
Siberian flying squirrel (<i>Pteromys volas</i>)	3	2	1
Yellow-throated marten (<i>Martes flavigula</i>)	3	2	1
Sansuyu (<i>Cornus officinalis</i>)	1	0	5
Azure-winged magpie (<i>Cyanopica cyanus</i>)	0	2	4
Komarowi earwig (<i>Timomenus komarowi</i>)	0	2	4

< Rapid Assessment Result of Biota in Gurye Sansuyu Agricultural Heritage Site>

- Out of 309 plant species and 171 animal species, 1 plant and 5 animals species qualified as agro-biodiversity indicators.
- The Oriental scops owl was rated highest and deemed the most suitable indicator species in Gurye Sansuyu Agricultural Heritage Site.

VI. Conclusion

Name	Agro-Biodiversity Indicator Types	Surrogate Species Types	Value/Significance		
			High	Intermediate	Low
	Agricultural biodiversity Indicator	Crop & livestock species			
	Para-agricultural biodiversity indicator	Agricultural supporting species			
	Extra-agricultural biodiversity indicator	Ecological Indicator species			
		Keystone species			
		Flagship species			
		Endangered species			



<Rapid Assessment Sheet for Agrobiodiversity Indicator Species>

< Raising public awareness through the use of indicator species>

- The agro-ecosystem is vital for providing ecosystem services to humans and other species
- To sustain it, conserving agro-biodiversity through the selection of indicator species for each site is essential
- **A more advanced, tested version of rapid assessment method to select indicator species** needs to be developed to sustainably maintain the agro-heritage systems and raise public awareness

Q&A:

“Which part of this study do you think could be revised or improved?”

For more information, email me at arkover@naver.com

(Seungjoon Lee)