



Characteristics of the Flora of Geumsan Gingeng Field, a GIAHS Site

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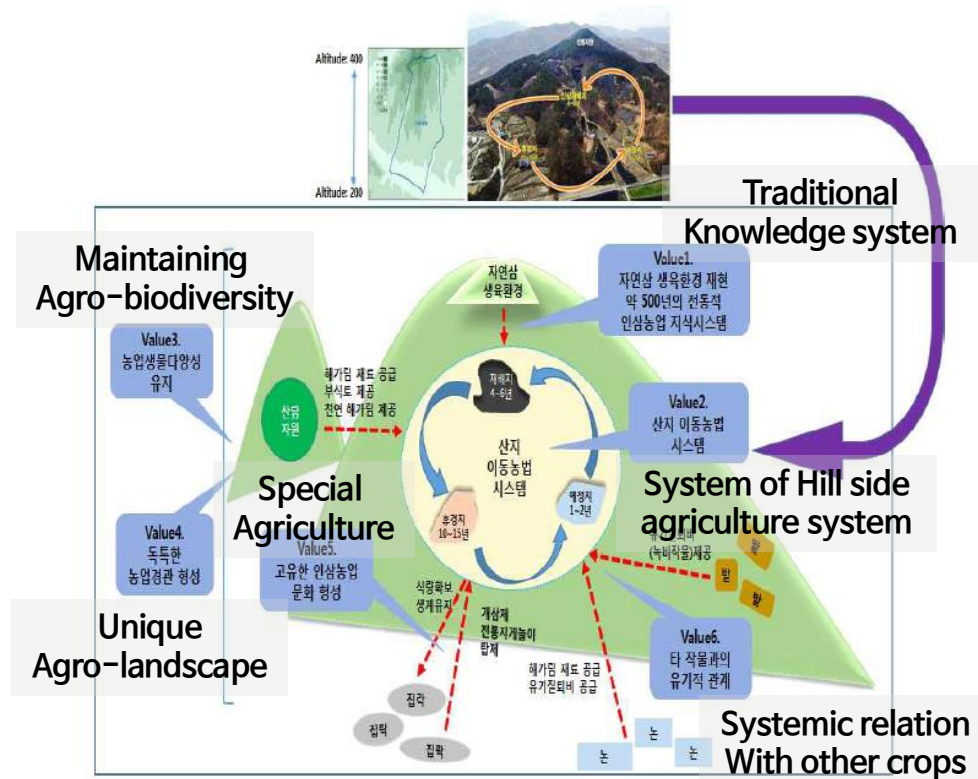
I . Background and purpose

- For a long time in history, Korea is a prime region for ginseng cultivation and the country's natural conditions such as climate, soil and topography are optimal for the cultivation of ginseng
- Geumsan is the largest local ginseng distribution ground with a history of over 1,500 years in ginseng cultivation
- The Geumsan ginseng field was designated as the 5th NIAHS site('2015) and the GIAHS site('2018) in recognition of its historical, ecological, cultural and unique attributes



I . Background and purpose

- With a high cold tolerance and a weak heat tolerance, ginseng is grown mainly in cool climates where summer temperatures are relatively low as well
- It is grown using a unique agricultural system that includes a regular non-cultivation rest period for soil fertility recovery
- A canopy is set up to block out the sun, forming a shaded microclimate which is different from other typical farmland
- The formation of this microclimate is expected to give rise to unique flora which can only survive in ginseng fields



I . Background and purpose

- Most ginseng fields are located in hilly areas, but in modern times, ginseng is also grown on flat lands in rotation with rice crops
- The purpose of this study is to investigate the characteristics of the flora of Geumsan ginseng field, a representative ginseng cultivation area in Korea, as well as to study the characteristics of biodiversity in this area



〈Flat land Ginseng field〉



〈Hilly area Ginseng field〉

II. Method

1. Research area

- The core of traditional ginseng farming techniques and knowledge systems is the reproduction of the natural environment of wild ginseng, which grew naturally deep in the mountains, on hills and slopes by human wisdom
- In 2015, the area of ginseng cultivation in Geumsan area was 1,319 ha, the largest in Korea, with 2,809 units

Classification	Cultivation area		Growing farm	
	ha	ratio(%)	No. farm	ratio(%)
Korea	14,213	100.0	21,087	100.0
Geumsan	1,319	9.3	2,809	13.3
Yeongju/Pungi	1,227	8.6	809	3.7
Jinan	850	6.0	950	4.5
Umseung	470	3.3	495	2.3

II. Method

1. Research area

- Traditional Geumsan ginseng field is located on hills and only recently started growing ginseng on plains
- The Geumsan ginseng field showed a linear land use type structure ranging from forests, ginseng fields, farms, and villages
- Recently rotation ginseng with rice is done in plains and called “rice paddy field ginseng”



〈Hilly area Ginseng field〉



〈Flat land Ginseng field〉

II. Method

2. Scope of the survey

- Temporal range

May , 2015 and April ~ September, 2017

- Contents range

Flora of each land use:

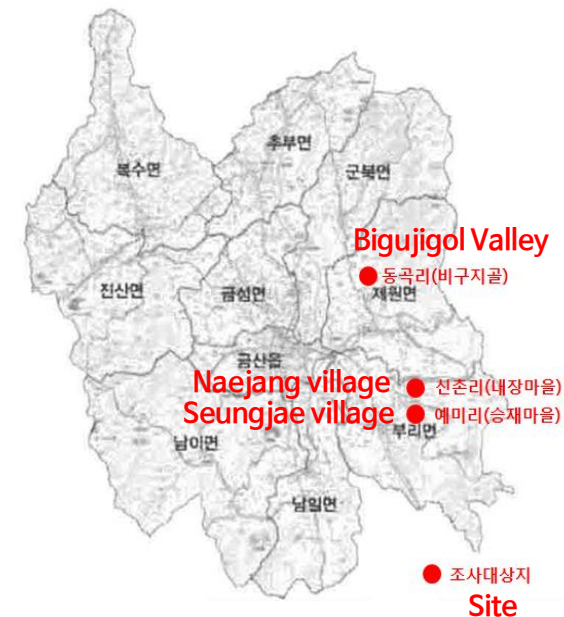
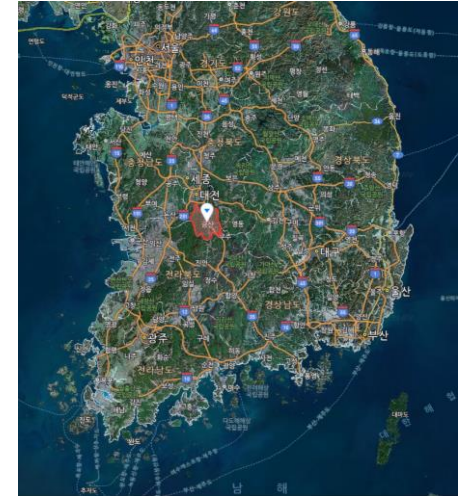
Understand the own feature of ginseng field and interaction between other land uses

Flora according to the type of ginseng field (hill side, flat land):

Understand the relationship between ginseng field and adjacent land use

- Spatial range

Classification	Site	
Flora of each land use	Bigujigol Valley	Donggok-ri, Jewon-myeon, Geumsan-gun, Chungcheongnam-do
	Naejang Village	Sinchon-ri, Buri-myeon, Geumsan-gun, Chungcheongnam-do
Flora according to the type of ginseng field	Bigujigol Valley	Donggok-ri, Jewon-myeon, Geumsan-gun, Chungcheongnam-do
	Naejang Village	Sinchon-ri, Buri-myeon, Geumsan-gun, Chungcheongnam-do
	Seungjae Village	Yemi-ri, Buri-myeon, Geumsan-gun, Chungcheongnam-do



3. Method

- The flora in the districts were studied by researchers walking the designated path, who investigated accessible areas from the path
- The investigation was conducted using Braun–Blanquet Method (Braun–Blanquet, 1913)
- When possible, plants were identified on site, and those that could not be identified were collected and later identified using literature by Lee Wu-cheol (1996), Lee Chang-bok (2003), and Lee Yeong-no (2006)
- The arrangement of the plants and the publishing of their academic names were done so in accordance with Korea Plant Names Index by the Korea National Arboretum and the Korean Society of Plant Taxonomists, as well as Engler System of Classification (Melchior, 1964)
- Naturalized plants were identified 321 Classification by Lee Yu-mi et al (2011), and naturalization rate (NR) was calculated by dividing the number of naturalized plant species by the number of total plant species found in the studied area
- Life form was analyzed with Numata and Asano (1969), which is a detailed expression of Raunkiaer (1934)'s life form
- Similarity of flora among land use types was studied using the Sørensen similarity coefficient (1948)

$$\text{Sørensen's } S = \frac{2c}{a+b}$$

III. Results

1. Flora of each land use type

1) Bigujigol Valley

- According this order Villages › Forests › Cemeteries › Fields › Flat land ginseng field › Hill side ginseng field, many plants appeared

Land use	Results
Forests	17 Families 23 Genus 25 Species 1 Subspecies 4 Varieties 1 Forma 31 Taxa
Hill side ginseng field	8 Families 11 Genus 8 Species 1 Subspecies 2 Varieties 11 Taxa
Cemeteries	16 Families 25 Genus 19 Species 6 Varieties 1 Forma 26 Taxa
Villages	21 Families 33 Genus 27 Species 5 Varieties 1 Forma 33 Taxa
Fields	15 Families 20 Genus 16 Species 5 Varieties 21 Taxa
Flat land ginseng field	9 Families 13 Genus 10 Species 3 Varieties 13 Taxa

- Both hill side and flat land ginseng fields had high frequency of Compositae (27.3%, 30.8%), Caryophyllacea (18.2%, 15.4%)
- In life forms results, all type of ginseng fields showed similar features with fields and villages
- Both type of ginseng fields had high frequency of therophytes, erect type plants, and single grained plants
- NR (the rate of naturalization) by land use was the highest in villages (21.2%). Hill side ginseng field was 18.2% and flat land field was 15.4%

III. Results

1. Flora of each land use type

1) Bigujigol Valley

- Similarity among land uses showed that both type of ginseng fields are close with fields
- *Erigeron annuus*, *Alopecurus aequalis*, *Stellaria alsine* var. *undulate*, *Equisetum arvense*, *Artemisia princeps*, *Cerastium holosteoides* var. *hallaisanense* and so on were common appearance
- Similarity among hill side and flat land ginseng fields was also high

		Similarity					
Dissimilarity	Classification	Forests	Hill side ginseng fields	Cemeteries	Villages	Fields	Flat land ginseng fields
	Forests	–	0.10	0.11	0.06	0.08	0.05
	Hill side ginseng fields	0.90	–	0.11	0.10	0.21	0.53
	Cemeteries	0.89	0.89	–	0.19	0.19	0.05
	Villages	0.94	0.90	0.81	–	0.25	0.19
	Fields	0.92	0.79	0.81	0.75	–	0.34
	Flat land ginseng fields	0.95	0.47	0.95	0.81	0.66	–

III. Results

1. Flora of each land use type

2) Naejang Village

- According this order Forest > Flat land ginseng field > Villages = Fields > Hill side ginseng field > Cemeteries, many plants appeared

Land use	Results
Forests	17 Families 24 Genus 22 Species 3 Varieties 1 Forma 26 Taxa
Hill side ginseng field	12 Families 16 Genus 11 Species 4 Varieties 1 Forma 16 Taxa
Cemeteries	10 Families 11 Genus 9 Species 2 Varieties 11 Taxa
Villages	11 Families 18 Genus 18 Species 1 Varieties 19 Taxa
Fields	15 Families 19 Genus 16 Species 3 Varieties 19 Taxa
Flat land ginseng field	13 Families 21 Genus 20 Species 2 Varieties 1 Forma 22 Taxa

- Both hill side and flat land ginseng fields had high frequency of Compositae (18.8%, 18.2%), Caryophyllacea (12.5%, 13.6%)
- In life forms results, all type of ginseng fields showed similar features with fields and villages
- Both type of ginseng fields had high frequency of therophytes, erect type plants, and single grained plants
- NR (the rate of naturalization) by land use was the highest in Hill side ginseng field (25.0%) and flat land field was 22.7%

III . Results

1. Flora of each land use type

2) Naejang Village

- Similarity among land uses showed that both type of ginseng fields are close with fields
- *Oxalis corniculata*, *Commelina communis*, *Alopecurus aequalis*, *Conyza Canadensis*, *Chenopodium album* var. *centrorubrum*, *Poa annua*, and so on were common appearance
- Similarity among hill side and flat land ginseng fields was also high

		Similarity					
Dissimilarity	Classification	Forests	Hill side ginseng fields	Cemeteries	Villages	Fields	Flat land ginseng fields
	Forests	–	0.15	0.00	0.05	0.14	0.09
	Hill side ginseng fields	0.85	–	0.25	0.26	0.59	0.45
	Cemeteries	1.00	0.75	–	0.14	0.22	0.20
	Villages	0.95	0.74	0.86	–	0.45	0.65
	Fields	0.86	0.41	0.78	0.55	–	0.34
	Flat land ginseng fields	0.91	0.55	0.80	0.35	0.66	–

III. Results

1. Flora of each land use type

3) Total

- Flora according to both type of ginseng field revealed that the ginseng field is greatly affected by surrounding land uses
- Not many species were observed due to continuous manmade management and installation of canopies, however, there were observations of the *Acer tataricum* subsp. *ginnala* and the *Populus tomentiglandulosa* found in the nearby forests of hillside ginseng fields, as well as *Stellaria alsine* var. *undulata* and *Veronica arvensis* that are mainly found in fields
- On the other hand, unlike typical cultivation fields with a sunny environment, the continually shaded environment of ginseng fields gave rise to increased bryophyte growth such as *Funaria hygrometrica*, *Marchantia polymorpha* and *Pogonatum neesii*
- Bryophytes are understory vegetation that constitutes an important part of the ecosystem



〈Furrow of ginseng field〉



〈*Pogonatum neesii*〉



〈*Marchantia polymorpha*〉



〈*Funaria hygrometrica*〉

III. Results

2. Flora according to the type of ginseng field

- Understand flora features according to the type of ginseng field (Hill side or flat land)
- Hill side ginseng field is adjacent with forests while flat land field is with fields and villages



〈Hill side ginseng field〉



〈Flat land ginseng field〉

III. Results

2. Flora according to the type of ginseng field

- Common species in both type of ginseng field



〈*Cerastium holosteoides* var. *hallaisanense*〉



〈*Erigeron annuus*〉



〈*Cardamine flexuosa*〉

- Only in hill side ginseng field



〈*Populus tomentiglandulosa*〉



〈*Acer tataricum* subsp. *ginnala*〉

- Only in flat land ginseng field



〈*Stellaria aquatica*〉



〈*Equisetum arvense*〉

III. Results

2. Flora according to the type of ginseng field

- Bryophytes grow in all type of ginseng field
- Only Biguji valley showed high dominance and sociability of bryophytes in hill side while others were high in flat land ginseng fields
- However artificial features like covering furrow with vinyl or environmental features like micro-climate by water way are more influential than the type of ginseng fields

Classification	Biguji valley		Naejang village		Saungjaevillage	
	Hill side	Flat land	Hill side	Flat land	Hill side	Flat land
<i>Pogonatum neesii</i>	1,1	1,1	1,1	1,1	1,1	1,1
<i>Funaria hygrometrica</i>				1,1		
<i>Marchantia polymorpha</i>	2,2	2,2	2,2	2,2	2,2	2,2



IV. Conclusions

- Hill side and flat land ginseng fields were similar to those found in villages and farmlands
- There were no big differences between hill side and flat land ginseng fields. But both field types are affected by surrounding land uses
- Unlike typical cultivation fields with a sunny environment, the continually shaded environment of ginseng fields gave rise to increased bryophyte
- Bryophytes are understory vegetation that constitutes an important part of the ecosystem
- It is known to play an important role as a pioneer species which promotes soil deposition.
- Geumsan ginseng field serves as a habitat for bryophytes and this is thought to have contributed to the prevention of soil loss in hillside ginseng fields
- In terms of biodiversity, such microclimate characteristics are considered to be greatly significant as they provide the foundation for various species to coexist with each other



V. References

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Thank You