

Table 1. Field observations

Definition	Field observation
	Gulhwa soil profile 1, GSA soil
Pre modern to modern soil	0cm-38cm; yellowish brown (7.5 YR 4/5, YR 4/6) silty loam, abundant oxidised Fe staining and nodules, abundant charcoal inclusions, plant roots (8-10% clay, 88-92 % silt, 0-8% sand)
Historical fields	38cm-45cm; dark gray (Gley; 1 4/N)?? silty loam, abundant Fe staining and Fe/Mn nodules, charcoal inclusions (7-9% clay, 83-88% silt, 5-8% sand),
Yellowish deposit	45cm-50cm; yellowish brown (10 YR 4/2) silty clay loam (10-13 % clay, 80-88% silt, 2-7 % sand), Fe staining, plant roots
Bronze Age	50cm-75cm; dark gray (2/N), silty clay (15% clay, 78% silt, 7% sand), large concentric oxidised Fe/Manganese nodules, abundant oxidised plant roots, bleached fabric adjacent to the pore voids aligned with roots
Alluvium substratum	76cm-; gravel bed infilled by gray (Gley; 1 2.5/N) silty loam, coarse (11% clay, 84% silt, 5 % sand)
	Gulhwa soil profile 2, GSC unit
Pre modern to modern soil	0cm –54cm; yellowish (10YR 3/6, 10 YR 4/6, 7.5 YR 2/2), sandy silt, very abundant Fe staining with low concentration (7-11% clay, 81-90% silt, 3-8% sand), plant roots present in large quantity,
Historical fields	55cm - 66cm; dark brown (7.5 YR 3/3) clayey organic rich soil- buried soil (8-11 % clay, 78-80 % silt, 8-16% sand), a large quantity of reddish and blackish oxidised Fe nodules
Yellowish deposit	66cm -77 cm; slightly grayish very dark brown (7.5 YR 2/2) clayey silt (10% clay, 75-8% silt, 1-16% sand)
Bronze Age Fields	78cm -90cm; very dark greyish brown (10 YR 3/2) silt clay loam/ organic rich, a large quantity of reddish and blackish oxidised Fe/Mn nodules-10 YR 4/2 (10% clay, 87% silt, 3% sand)
Alluvium substratum	92cm; Gravel bed, dark (10 YR 5/8) sandy loam (9% clay, 88% silt, 3 % sand)
	Pyunggeo soil profile

Modern cultivated soil	0-39cm; yellowish brown (7.5 YR 5/3) silt loam/ silty clay, apedal, oxidised plant roots
Iron pan	39-45cm; reddish brown (7.5 YR 7/8) silt loam, thick iron pan (12% clay, 60% silt, 18% sand), few iron nodules
Premodern-modern cultivated soil	45-70cm; reddish yellowish (7.5 YR 7/6, 5 YR 5/8) silt loam (12% clay, 75% silt, 13% sand) clayey downwards, apedal
Flood deposit	70-96cm; gray (10 YR) flood sandy deposit (4% clay, 33%, silt, 63% sand), homogeneous and porous a pedal
Medieval paddy field	95-123/130cm; dark yellowish brown (5 YR 4/6, 7.5 YR 4/4), silt loam (16% clay, 72% silt, 12 % sand), moist, charcoal fragments inclusions, Fe/Mn nodule
Bronze Age	120/-130cm; strong brown (7.5 YR 4/6) clay loam (17% clay, 77% silt, 6 % sand), moist, abundant Fe/Mn nodule
Alluvium substratum	150-170cm; Blackish brown (10 YR 2/1) clay loam (16% clay, 77% silt, 7 % sand), moist

Table 2. A summary of description on thin sections (note: the depths are remeasured from the surface from the original top of the A horizon where the A horizon was partially removed).

Thin section (Depth: cm)	Micro Structure #	Voids Channels	Groundmass Vughs ##	Iron/ depletion features c/f rati (100 μm)	Pedofeature Rel. Distr. ###
Gulhwa GSA unit					
GSA 6 (5-12)	pt		20% pl (horizontal)	25/ 75	p

GSA 6-1 (12-20)	pt	10%	5% pc 10%pl	25/ 75	p
GSA 5 (25-33)		5%	10% pc 5%pl	25/ 75	p
GSA 4 (35-44)	ms	10%	5% vs 10% pl 5% ㄹ 10% pl	25/ 75	p
GSA 3 (46-53)	ms	2-5%	10% pc	20/ 80	p
GSA 2 (54-64)	ms	2% (3.5cm)	10%bk 5%pl 15% pc	15/ 85	p
GSA 1 (72-81)	ms		10% pl , 5% pc	25/ 75	p
GSC 8 (7-14)	Gulhwa GSC unit				
	ms		10%pc 15%pl	10/ 90	p
GSC 7 (20-27)	ms		10% pc(1.4 cm) 5% cb 5% pl 5% vs	10/ 90	p
GSC 6 (32-39)	ms	4.5 cm crack	10% 5%vs	15/ 85	p
GSC 5	ms	5%	5% pl	25/	p

(46-54)				75	
GSC 4 (56-66)	ms		2% bk 5%cv-bk	25/ 75	p
GSC 3 (69-76)	ms		5% pc 10% cv	20/ 80	p
GSC 2 (80-90)	ms	5%	10% pc 5% pl	15/ 85	p
GSC 1 (93-100)	ms	2%	5% pl-bk (4cm) 5% pl 5% pc	20/ 80	p
	Pyunggeo				
PG 6 (32-40)	ms	5% (2.5cm)	5% pl 10% vs	20/ 80	p
PG 5 (46-54)	ms	10%	5% bl 10% pl 5% vs	15/ 85	p
PG 4u (85-89)	ms			75/ 25	en
PG 4l (89-98)	ms		5% pc 5%vs 2% pl	10/ 90	p
PG 3 (99-106)	ms		5% pc 10%vs <2%pl	15/ 85	p
PG 2 (117 -125)	ms		2% vs 2% cb 5% pl	10/ 90	p
PG1 upper (126-	ms	2%	10% pc 5%vs 2%	15/ 85	p

128)					
PG1 lower (129-134)	ms	2%	10% pc 5%vs 2%	15/ 85	p
Modern reference					
YG 2 (20-30)	ms		10% pl 10% pc	20 /10	p

#pt- platy; ms- massive

#pl- planar; bk-blocky; pc-polyconcave; vs-versicle; cv-closed vugh; cb-chamber

#p- porphyric; e- enaulic

#notable b-fabric; g-s-grano-striated; p-s- parallel-striated; r-s; random-striated

Degree of occurrence: * -rare; * * -occasional; * * * - many; * * * * -abundant

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Table 3. A summary of description on thin sections and pParticle size analysis (PSD) and pH (note: the depths are re-measured from the surface from where the original top of the A horizon was partially removed).

Thin section (Depth: cm)	Organic matters #	PSD	pH								
	Org. Tissues	Macro Charcoal (>50 μ m)	Micro charcoal	Humus	Bone fragment	Phyto - lith	clay	Fine silt	Coarse silt	sand	
Gulhwa GSA unit											
GSA 6 (5-12)	* *	* *	* *			* * *	7.9 -9.3	35.8 -39.6	50.8 -55.5	0.3 -0.9	7.0 -7.2
GSA 6-1 (12-20)	* *	* *	* *	*		* * *	9.3 -10	39.6 -42.6	50.8 -46.0	0.3 -1.9	7.1 -7.1
GSA 5 (25-33)	* *	* *	* * *	*	*	* * *	9.45 -10	42.60 - 37.92	46.00 -48.63	1.93 4.00	7.07 -7.18

GSA 4 (35-44)		* *	* * *	* *	*	* * *	7.32 -9.70	33.66 -38.67	44.15 -51.28	5.34 -8.39	6.88 -7.23
GSA 3 (46-53)		* *	* * *	* *	*	* * *	9.70 -13.84	38.67 -40.37	43.85 -44.15	1.94 -7.48	7.23 -7.31
GSA 2 (54-64)		* *	* * *	* * *	*	* * *	13.84 -15.70	35.57 -40.37	42.82 -43.85	1.94 -5.90	7.31 -7.27
GSA 1 (72-81)		*	* * *	* *	*	* *	11.12 -11.23	36.52 -38.77	44.81 -48.31	3.95 -5.24	7.26 -7.43
Gulhwa GSC unit											
GSC 8 (7-14)	* *	* *	* * *			* *	6.8 - 10.4	35.4 -38.6	48.0 -54.3	3.1 -3.5	5.7 -6.0
GSC 7 (20-27)	*	* *	* * *			* * *	10.3 -10.4	38.6 -40.4	41.7 -48.0	3.1 -7.6	6.0 -6.2
GSC 6 (32-39)	*	* * *	* * *	*	*	* * *	9.2 -10.3	36.1 -40.4	41.7 -48.9	5.8 -7.6	6.2 -6.5
GSC 5 (46-54)	* *	* * *	* *	*	*	* * *	9.2 -10.9	36.1 -37.6	43.00 -48.9	5.8 -8.5	6.5 -6.7
GSC 4 (56-66)		* *	* * *	* *	*	* * *	8.0 -10.9	30.5 -37.6	43 -47.8	8.5 -16.1	6.7 -6.7
GSC 3 (69-76)		* *	* * *	* *	*	* * *	8.0 -9.8	31.9 -40.4	44.1 -48.5	1.3 -16.1	6.7 -6.8
GSC 2 (80-90)		* *	* * *	* *	*	* * *	10.1	39.5	47.5	2.9	6.8
GSC 1 (93-100)		*	* * *	* *	*	* *	8.9 -10.1	34.3 -39.5	47.5 -49.7	2.9 -7.2	6.8
Pyunggeo											
PG 6		* * * *	* * *	*		* *	11.1	39.5	21.3	14.9	6.8

(32-40)							-12.3	-43.5	-29.3	-28.0	-6.9
PG 5 (46-54)		* *	* *	*		* *	10.3 -11.4	35.5 -35.8	27.9 -30.6	23.3 -25.2	7.2 -7.5
PG 4u (85-89)							4.0	11.50	21.9	62.6	7.7
PG 4l (89-98)		* *	* *	*		* *	15.0 -17.9	42.56- 44.59	29.5 -25.9	9.3 -13.3	7.1 -7.7
PG 3 (99-106)		* *	* *			* *	15.0 -17.9	42.2 -46.9	29.5 -25.9	9.3 -13.3	7.1 -7.7
PG 2 (117-125)		*	* *	* *		* *	17.1 -18.0	45.3 -50.5	26.0 -30.2	6.4 -6.5	7.3 -7.4
PG1 upper (126-128)			* *	* * *		*	15.8 -17.1	47.0 -50.2	26.0 -29.9	6.4 -7.31	7.4 -7.5
PG1 upper (129-133)		*	* *	* * * *		*					
Modern Reference											
YG 2 (20-30)	*	* *	* * *			* *	-	-	-	-	-

Table 4. The results of analyses on SCCF from thin section GSC7.

spectrum	Al	Si	K	Ti	Fe	O	Mg	P	Ca	Total (≡)
SCCF type X Average (n=3)	5.35	39.34	1.01	0.4	2.56	51.01	0.33	0	0	100
SCCF type X Max	8.28	43.72	1.81	0.9	3.8	52.32 7	0.75	0	0	
SCCF type X Min	2.04	34.85	0.32	0	1.35	49.62	0	0	0	
SCCF type Y average (n=6)	9.56	28.54 9	1.60	0.74	12.74	46.05	0.55	0.15	0.13	100
SCCF type Y Max	12.12	34.94	2.15	1	25.94	49.87 6	0.83	0.48	0.45	
SCCF type Y Min	6.76	24	0.57	0.43	3.93	41.82	0	0	0	
GSC 7 matrix average (n=2)	7.51	33.43	1.58	0.69	8.09	48.2	0.52	0	0	100
GSC 7 Max	8.61	34.76	1.63	0.77	12.07	49.62	0.67	0	0	
GSC 7 Min	6.4	32.1	1.53	0.61	4.11	46.78	0.36	0	0	