

Soil properties of Hwaong reclaimed polder soil and its management

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Abstract

This soil survey was performed to produce basic data for developing techniques of environment-friendly agriculture utilization system for soil resources on the Hwaong reclaimed polder soil (HRPS, 4,380ha) that is located between Hwasung and Ansan in Kyeonggi province. Eight soil series were classified on the HRPS – Munpo, Bogcheon, Yeosu, Buyong, Yeompo, Mangyeong, Pori, Taeon. The Munpo series was the largest among them at 1,616ha. The sequence of soil type distribution were salty paddy field 1,887ha > normal paddy field 1,309ha > ill-drained paddy field 1,018ha > sandy paddy field 86ha. The sequence of land suitability classification were fourth grade 1,935ha > first grade 1,390ha > second grade 970ha > third grade 86ha. pH, EC, Ex.K, Mg, Na of soil in HRPS were high but OM, Av.P₂O₅, Ex.Ca were low. Meanwhile, to extend agricultural use of HRPS, a soil salinity map was plotted using a Geonics EM38 instrument.

Key Words

Reclaimed land, soil series, soil chemical properties.

Introduction

There are 1,641 reclaimed areas in South Korea including Seosan, Hwaong, Siwha, Yeongsangang, Saemangeum and the total size is 135,100ha. Among them Hwaong reclaimed polder soil (HRPS) has been constructed since 1990 and its total size is 6,212ha. Some early developed parts of HRPS are used as paddy field because of high percentage of clay, silt loam and bad vertical drainage due to high watertable. For general use of reclaimed land, it is developed into upland that is more economical. So to determine environment-friendly upland agriculture in HRPS, a detailed soil survey and classification were conducted, and soil salinity maps were plotted.

Methods

Detail soil survey, soil classification and analysis of soil physio-chemical properties of HRPS were conducted using 1:25,000 topographic maps and aerial photographs. The survey followed the Korea RDA (Rural Development Administration) soil survey handbook and recorded soil texture and drainage grade. The soil chemical properties pH, EC, OM, Av.P₂O₅, Ex. K, Ca, Mg, Na – were analysed by the Korea RDA standard analysis method and the soil salinity map was made by using a Geonics EM38 instrument.

Results

The sequence of eight soil series in HRPS were Munpo > Bogcheon > Yeosu > Buyong > Yeompo > Mangyeong > Pori > Taeon. The size of main soil series were Munpo 1,616ha > Bogcheon 978ha > Yeosu 970ha, respectively. The Munpo Series, the most largest series in HRPS, was fine silt loam with no soil structure containing low soil organic matter, available phosphorus, exchangeable calcium. To use this soil as upland, control of subsurface drainage, increase of organic matter and addition of lime should be considered firstly. As the sequence of soil type distributions were salty paddy field 1,887ha > normal paddy field 1,390ha > ill-drained paddy field 1,018ha > sandy paddy field 86ha, HRPS is more adaptable for using lowland than upland agriculture. Suitability grade four in HRPS is 1,935 ha that should need particular soil management. Physical properties of surface soil are sand 71.8%, silt 20.7%, clay 7.5%. Due to large portion of sand and silt, early desalination is thought to be easy. Soil chemical properties like pH, EC, Ex.K, Mg, Na are high but contents of OM, Av.P₂O₅, Ex.Ca are low. To extend the agricultural use of HRPS, a soil salinity map was plotted.

Table 1. Size of soil series in the Hwaong reclaimed polder soil.

Soil series	Munpo	Bogcheon	Yeosu	Buyong	Yeompo	Mankyoeng	Pori	Taeon	sum
size(ha)	1,616	978	970	326	271	86	85	48	4382

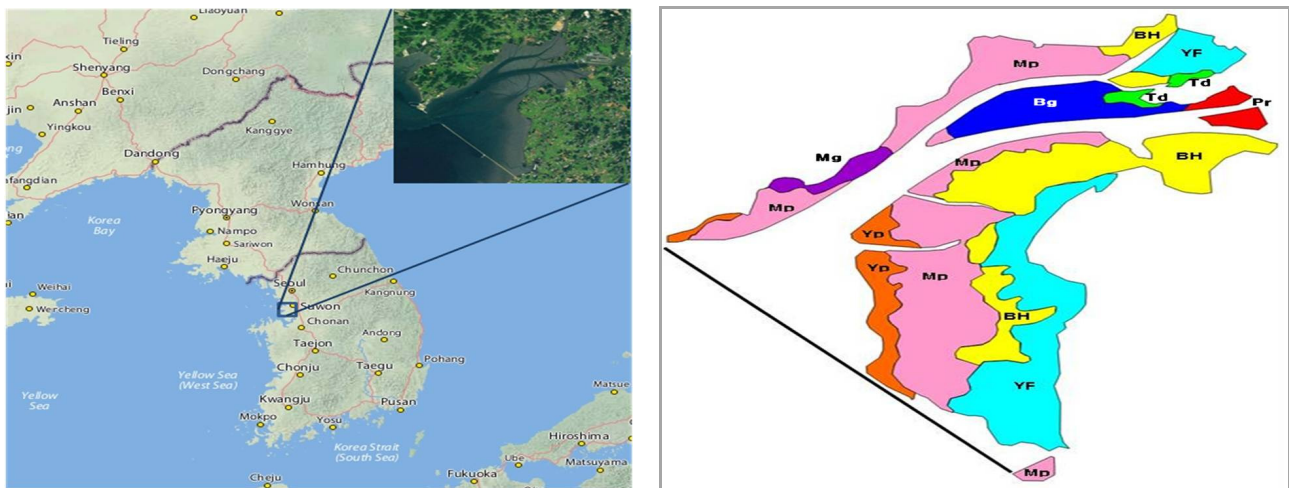


Figure 1. Location and soil series of the Hwaong reclaimed polder land.

Table 2. Classification of Hwaong reclaimed polder soils by paddy soil type.

Classification	Normal paddy field	Salt affected paddy field	Sandy paddy field	Ill-drained paddy field	sum
size(ha)	1,390	1,887	86	1,018	4,382
Soil series	Buyong, Pori, Bogcheon	Munpo, Yeompo	Mankyeong	Yeosu, Taean	

Table 3. Physical and chemical properties of soils of the Hwaong reclaimed polder land.

Soil texture	Bulk density (Mg/m ³)	pH (1:5)	EC (dS/m)	OM (g/kg)	Av.P ₂ O ₅ (mg/kg)	Ex. Cations(cmol _c /kg)			
						K	Ca	Mg	Na
Fi/SL	1.60	8.4	16.7	6.3	53	1.66	2.8	6.5	18.3

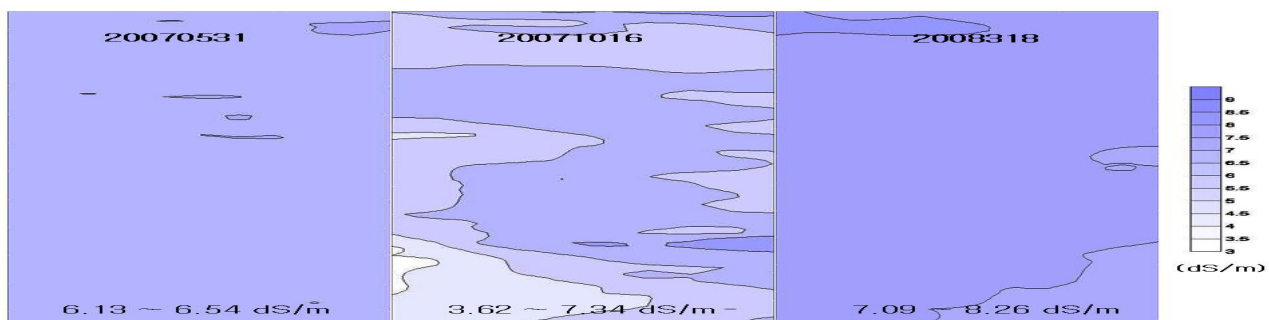


Figure 2. Soil salinity map of the Hwaong reclaimed polder soil.

Table 4. Problems and managements of the Hwaong reclaimed polder land.

Problem of Soil management	Soil series	Soil management recommendation
Salt affected soil	Munpo, Yeompo	groundwater level below 1m by subsurface drain, tube well, drainage canal
Weak foundation soil	Munpo, bogcheon, Yeosu, Yeompo,	permeability increase by gypsum, organic matter application
Sandy soil	Mankyeong, Taean, Munpo, Yeompo	Soil texture amelioration by soil dressing

Conclusion

Eight soil series were classified in the Hwaong reclaimed polder land, the largest soil series was the Munpo at 1,616 ha. Soil texture was sandy loam soil, soil bulk density was 1.60Mg/m³. Due to the large percentage of silt in soil, early desalination was expected as rapid. Soil amelioration was thought to be difficult because of bad soil structure and high groundwater level.

References

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