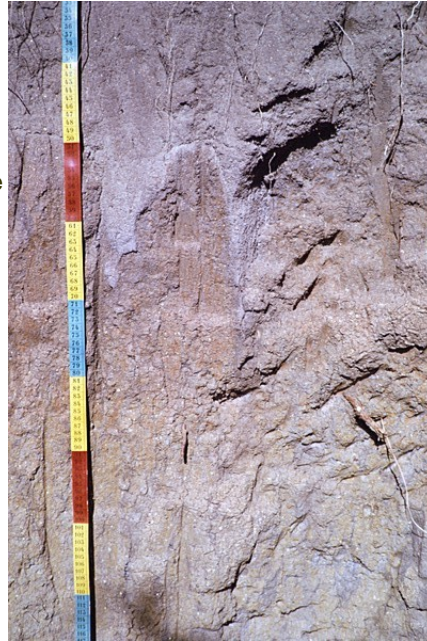


## Reference soil Botswana 5: Solonetz

### Description

VEGETATION: Acacia karroo, A.Nilotica, Dichrostachys cenerea MORPHOLOGY: B2g 91-127 also few small prominent bluish black mottles B3 few yellowish and greyish mottling C strongly decomposed granite rock of sandy clay texture with prominent small dark bluish mottles BRIEF PROFILE DESCRIPTION: A deep, poorly drained, alkaline gley soil of a fine texture and with moderate coarse columnar structure from 43-69 cm (B2g); horizonation is clear to gradual, strongly decomposed granite is encountered at 158.



### Classification

#### WRB 2006:

Stagnic Mollic Vertic Solonetz  
0-43 cm mollic horizon  
69-127 cm natric horizon  
91-127 cm vertic horizon  
reducing conditions  
stagnic colour pattern

#### FAO-UNESCO-ISRIC 1988:

Molli-Stagnic Solonetz  
0-43 cm mollic A horizon  
69-127 cm natric B horizon  
stagnic properties  
vertic properties

#### WRB 1998:

Molli- Vertic Solonetz (Stagnic)  
0-43 cm mollic horizon  
69-127 cm nitic horizon  
91-127 cm vertic horizon  
stagnic properties

#### FAO-UNESCO 1974:

Gleyic Solonetz  
0-43 cm mollic A horizon  
69-158 cm natric B horizon  
hydromorphic properties

## Site description

### General information:

Names of person(s) who described the profile : Siderius W  
General description of location of profile (e.g., town, province) : 22km NE of Mahalapye  
Climate classification according to Köppen : BSh  
Date : February 1970  
Latitude / Longitude : S -23.066666° / E 26.8°

### Parent material:

The main parent rock/ material over which the soil has been formed (1st entry) : igneous rock  
Mode of Accumulation or deposition of parent material (1st entry) : solid rock  
Texture of parent material (1st entry) :  
Resistance against weathering (solid rock) (1st entry) : high  
Depth1 of lithological boundary : cm  
The main parent rock/ material over which the soil has been formed (2nd entry) :  
Texture of parent material (2nd entry) : loamy  
Resistance against weathering (solid rock) (2nd entry) :  
Soil Depth; depth to which roots can easily penetrate throughout the year : cm

### Physiography:

The altitude of the soil profile relative to mean sea level, specified in meters : 1172 m asl  
Regional landform : valley  
Topography of the surrounding country : flat or almost flat  
Physiographic Unit in the immediate surrounding of the site : valley bottom  
The slope refers to the inclination of the land immediately surrounding the site. The measured or estimated slope angle is specified to the nearest per cent : 2 %  
The physiographic position of the site where the profile is located :  
Form of the slope surrounding the site :  
Slope Aspect of the site :

### Hydrology and drainage:

Depth of groundwater table : cm  
Groundwater Top : cm  
Groundwater Bottom : cm  
Kind of groundwater table :  
Top Stagnating Layer : cm  
Bottom Stagnating Layer : cm  
Estimated permeability (class) of least permeable part of the profile :  
Drainage Class : imperfect  
To Drainage Class :  
Moisture conditions of the profile: dry from -to : cm  
Moisture conditions of the profile: moist from -to : 0-180 cm  
Wet From - To : cm

## Land use / vegetation:

Current land use at the site : woodland, grazed  
Major crops :  
Main type of irrigation :  
Rotation scheme :  
Vegetation Type;The natural vegetation at the site : semi-deciduous woodland  
Status of vegetation : modified  
Remarks on Land Use : Savanna, Acacia Mixed Woodland / Vegetation

## Erosion and aggradation:

Soil erosion type (1st : sheet entry)  
Intensity of the soil erosion type (1st entry) : moderate  
Occurrence of soil aggradation :  
Slope Stability :

## Surface characteristics:

Microrelief type: small-scale : differences in relief in the direct vicinity of the site  
Microrelief Pattern : none  
Microrelief Height :  
Rockiness : none  
Stoniness :  
Average size of stones :  
Shape of stones (on average) :  
Slaking of aggregates by tillage, rainfall or frost :  
Evidence of salt :  
Evidence of alkali : strongly alkaline

## Nearest climate station:

Station : No representative climate station available for this site

## Profile description:

Ah1 0-2 : black (10YR 2/1, moist) greyish brown (10YR 5/2, dry), clay loam, weak medium platy, very hard firm cm slightly sticky plastic, common (5-15%) medium distinct mottles (7.5YR 4/4), common very fine pores, slightly calcareous (0-2%), abrupt wavy boundary to,  
Ah2 2- : (7.5YR 3/1, moist) dark greyish brown (10YR 4/2, dry), coarse sandy loam, structureless massive, hard 43 cm friable slightly sticky plastic, common medium tubular pores, common fine and few coarse roots, few fine gravel fragments, slightly calcareous (0-2%), clear wavy boundary to,  
Btg 43- : very dark grey (10YR 3/1, moist) greyish brown (10YR 5/2, dry), sandy clay loam, moderate coarse 69 cm columnar, hard friable slightly sticky plastic, many fine prominent mottles (2.5YR 3/6) and few fine faint mottles (10YR 5/3), continuous thin clay and humus cutans, few fine pores, common fine few medium roots, slightly calcareous (0-2%), clear wavy boundary to,  
Btng1 : dark grey (10YR 4/1, moist) dark grey (10YR 4/1, dry), sandy clay slightly gravelly, moderate medium 69-91 cm prismatic), hard friable slightly sticky plastic, common (5-15%) fine distinct mottles (2.5YR 3/6) and common (5-15%) fine distinct mottles (7.5YR 5/6), continuous thick clay and humus cutans, few fine and medium roots, non calcareous, gradual wavy boundary to,  
Btng2 : grey (10YR 5/1, moist) (light) grey (10YR 6/1, dry), sandy clay slightly gravelly, moderate medium 91-127 cm prismatic, very hard firm slightly sticky plastic, few (2-5%) medium prominent mottles (10YR 6/6) and common (5-15%) coarse prominent mottles (10YR 6/6), continuous moderately thick clay and humus cutans, few very fine roots, non calcareous, gradual wavy,  
BC 127- : greyish brown (10YR 5/2, moist) brown (10YR 5/3, dry), sandy clay loam slightly gravelly, structureless 158 cm massive, few (2-5%) mottles, continuous thin clay and humus cutans, few fine roots, non calcareous, gradual wavy boundary to,  
C 158- : greyish brown (10YR 5/2, moist), sandy clay, common (515%) prominent mottles, non calcareous, 180 cm

## Physical

### Particle size distribution:

Depth (cm)	Gravel (%)	Very Coarse Sand (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Very Fine Sand (%)	Total Sand (%)	Coarse Silt (%)	Fine Silt (%)	Total Silt (%)	Clay (%)
0-2	1	-	-	-	-	-	39.8	11.7	19.4	31.1	29.4
2-43	4	-	-	-	-	-	71.1	4.4	8.9	13.3	15.6
43-69	6	-	-	-	-	-	69.5	3.1	5.9	9	21.6
69-91	10	-	-	-	-	-	56.6	4.4	4.0	8.4	35
91-127	10	-	-	-	-	-	55.7	4.6	4.2	8.8	35.5
127-158	10	-	-	-	-	-	56.8	4.8	4.4	9.2	34
158-180	33	-	-	-	-	-	51.3	5.9	3.5	9.4	39.2

### Other physical data

Depth (cm)	Bulk Density (kg/dm³)	Spec. Surf. Area (m²/g)	COLE (cm/cm)	Water Disp. Clay (%)	Clay (%)
0-2	-	-	-	-	29.4
2-43	-	-	-	-	15.6
43-69	-	-	-	-	21.6
69-91	-	-	-	-	35
91-127	-	-	-	-	35.5
127-158	-	-	-	-	34
158-180	-	-	-	-	39.2

### Chemical characteristics:

Depth (cm)	pH H <sub>2</sub> O	pH KCl	EC 1:2.5 (mS/cm)	CaCO <sub>3</sub> (%)	Org. C (%)	Org. N (%)	C/N	Exch. Acid (cmol/kg)	Exch. Al (cmol/kg)	Ca (cmol/kg)	Mg (cmol/kg)	K (cmol/kg)	Na (cmol/kg)	Sum Cations (cmol/kg)
0-2	6.5	5.2	0.2	0.7	1.84	0.17	11	-	-	7.7	2.4	1.3	0.2	11.6
2-43	6.2	4.6	0.11	0.3	0.80	0.05	16	-	-	2.8	1.0	0.4	0.2	4.4
43-69	7.2	5.3	0.36	0.4	0.35	-	-	-	-	3.8	2.2	0.2	0.7	6.9
69-91	8.5	6.6	-	-	0.17	-	-	-	-	7.0	4.6	0.4	3.1	15.1
91-127	8.8	6.8	-	-	0.17	-	-	-	-	7.3	4.2	0.5	3.7	15.7
127-158	8.7	6.8	-	-	0.11	-	-	-	-	7.3	4.8	0.5	4.2	16.8
158-180	8.8	6.6	-	-	0.15	-	-	-	-	7.0	5.8	0.6	5.2	18.6

Depth (cm)	CEC Soil (cmol/kg)	CEC Clay (cmol/kg)	CEC Org (cmol/kg)	ECEC (cmol/kg)	Base sat. (%)	Al sat. (%)	ESP (%)
0-2	15.7	53	6.4	-	74	-	1
2-43	7.2	46	2.8	-	61	-	3
43-69	9	42	1.2	-	77	-	8
69-91	15.3	44	0.6	-	99	-	20
91-127	15.8	45	0.6	-	99	-	23
127-158	16.1	47	0.4	-	104	-	26
158-180	18.8	48	0.5	-	99	-	28

## Elemental composition of the soil:

Depth (cm)	SiO2 (wt%)	Al2O3 (wt%)	Fe2O3 (wt%)	CaO (wt%)	MgO (wt%)	K2O (wt%)	Na2O (wt%)	TiO2 (wt%)
0-2	68.0	14.9	7.5	1.71	2.55	1.49	-	0.91
2-43	71.0	16.3	8.5	1.93	2.27	1.66	-	0.99
43-69	72.4	15.1	6.8	1.46	3.91	2.18	-	0.64
69-91	77.4	11.0	4.2	0.99	0.43	-	-	0.63
91-127	75.7	14.2	4.2	0.38	0.56	3.87	-	0.54
127-158	69.9	20.1	5.6	0.71	1.84	2.53	-	0.47
158-180	79.5	6.9	1.4	0.22	0.80	3.34	-	0.40

## Elemental composition of the soil:

Depth (cm)	MnO2 (wt%)	P2O5 (wt%)	LOI (wt%)	SiO2 / Al2O3 (mol/mol)	SiO2 / Fe2O3 (mol/mol)	SiO2 / R (mol/mol)	Al2O3 / Fe2O3 (mol/mol)
0-2	0.04	0.11	9.4	7.7	24.1	5.9	3.1
2-43	0.03	0.04	4.3	7.4	22.2	5.5	3
43-69	0.02	0.07	5.5	8.1	28.3	6.3	3.5
69-91	0.02	0.04	10.3	11.9	49	9.6	4.1
91-127	0.01	0.05	7.4	9	47.9	7.6	5.3
127-158	0.02	0.08	4.2	5.9	33.2	5	5.6
158-180	0.03	0.13	7.7	19.5	150.9	17.3	7.7

## Source of analyzing procedures:

Laboratory Attribute	Description	Proc. ref
ISRIC Al2O3	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li2B4O7	15-4
ISRIC Al2O3 / Fe2O3	Calculation; molar ratio Al / Fe	15-1
ISRIC C / N	Calculation; Organic Carbon / Organic Nitrogen	labmanual
ISRIC CaO	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li2B4O7	15-4
ISRIC Clay; < 0.002 mm	Fraction by Pipette analysis; after removal CaCO3 and organic matter, dispersion and sedimentation	3-4.7
ISRIC Fe2O3	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li2B4O7	15-4
ISRIC Gravel	Fraction from field sample, after drying, crushing, sieving	1-1
ISRIC Ign. loss fine earth	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius.	15-5.1 and 15-5.3(18)
ISRIC K2O	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li2B4O7	15-4
ISRIC MgO	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li2B4O7	15-4
ISRIC MnO2	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li2B4O7	15-4
ISRIC P2O5	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li2B4O7	15-4
ISRIC Sand; 2.0 - 0.05 mm	Total sand fractions by sieving; after removal CaCO3 and organic matter	3-5
ISRIC Silt; 0.02 - 0.002 mm	Fraction by Pipette analysis ; after removal CaCO3 and organic matter, dispersion and sedimentation	3-4.7
ISRIC Silt; 0.05 - 0.002 mm	Calculation; Sum fractions Silt 0.05 - 0.02 mm	3-4.7
ISRIC Silt; 0.05 - 0.02 mm	Fraction by Pipette analysis ; after removal CaCO3 and organic matter, dispersion and sedimentation	3-4.7
ISRIC SiO2	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius;	15-4

		fused with Li <sub>2</sub> B <sub>4</sub> O <sub>7</sub>	
ISRIC	SiO <sub>2</sub> / (Al <sub>2</sub> O <sub>3</sub> +Fe <sub>2</sub> O <sub>3</sub> )	Calculation; molar ratio (Si) / (Al + Fe)	15-1
ISRIC	SiO <sub>2</sub> / Al <sub>2</sub> O <sub>3</sub>	Calculation; molar ratio Si / Al	15-1
ISRIC	SiO <sub>2</sub> / Fe <sub>2</sub> O <sub>3</sub>	Calculation; molar ratio Si / Fe	15-1
ISRIC	Sum cations	Sum of Exchangeable Cations (Ca, Mg, Na, K) with 1 M ammonium acetate at pH 7	9-
ISRIC	TiO <sub>2</sub>	Fine earth pretreatment; dried at 105, ignited at 900 degree Celcius; fused with Li <sub>2</sub> B <sub>4</sub> O <sub>7</sub>	15-4
ISRIC	Total fine earth	Calculation; correction only if sum fractions is >95 and < 108%	3-5 (Note)
KIT	Base sat.	Calculation; Sum of Exchangeable Cations (Na, K, Ca, Mg) / CEC soil	9-1
KIT	Ca	Exchangeable bases with 1 M ammonium acetate at pH 7; Ca by atomic absorption spectrometry	9-1-II
KIT	CaCO <sub>3</sub> eq.	Carbonates are dissolved with dilute HCl. Residual acid is titrated. Carbonates expressed as CaCO <sub>3</sub>	6
KIT	CEC Clay	Calculation; ((CEC soil - CEC org.m.)/ clay %)*100	*ref
KIT	CEC Org	CEC organic matter; expert estimate for charge per unit C	*ref
KIT	CEC Soil	CEC; with index cation in buffered solution pH7	9-1-III
KIT	EC 1 : 2.5	Electro Conductivity of a soil / water (1:2.5) suspension	3
KIT	ESP	Calculation; (Exchangeable Na / CEC soil) * 100	9-1
KIT	K	Exchangeable bases with 1 M ammonium acetate at pH 7; K by flame atomic emission spectrometry	9-1-II
KIT	Mg	Exchangeable bases with 1 M ammonium acetate at pH 7; Mg by atomic absorption spectrometry	9-1-II
KIT	Na	Exchangeable bases with 1 M ammonium acetate at pH 7; Na by flame atomic emission spectrometry	9-1-II
KIT	Organic Carbon	Wet combustion of organic matter by potassium dichromate and sulphuric acid at about 125 degrees Celcius. Residual dichromate is back titrated against ferrous sulphate. To compensate for incomplete destruction an empirical correction factor of 1.3 is applied	10
KIT	Organic Nitrogen	Organic Matter is digested in sulphuric acid (and hydrogen peroxide) with selenium as catalyst. Nitrogen is converted to ammonium sulphate. The solution is made alkaline and ammonia is distilled off. The evolved ammonia is trapped in boric acid and titrated with standardized acid solution	11
KIT	pH H <sub>2</sub> O	pH electrode; in supernatant suspension	4
KIT	pH KCl	In supernatant suspension; potentiometrically	*ref

\*ref: no labmanual available, link to presumable used analytical methode

## Other classification

**USDA-NRCS (1999)** : Albic Natraqualf siliceous hyperthermic fine-loamy

**USDA-SCS (1975)** : Albic Natraqualf fine-loamy siliceous hyperthermic

Please report suggestions for improvement to the [webmaster](#)

**Data usage and citation //Disclaimer**