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HORIZON NOTATION FOR POLISH SOILS

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INTRODUCTION

Soil horizons were defined in Poland from genetic point of view with the capital letters A, B, C, D and R used as depth sequences. In 1974, soil horizon symbols were unified in "Polish Soil Systematic" (Polish Society of Soil Science 1974), however it was only of local importance. In the fourth edition of the "Polish Soil Systematic" (Polish Society of Soil Science 1989) the symbols suggested by Commission V of the International Society of Soil Science [1967] were accepted with introduction some modifications. Finally, the system of soil diagnostic horizons defined in Soil Taxonomy [Soil Survey Staff, 1975] was accepted in the fourth edition of the Polish Soil Systematic with many modifications according to the geographical conditions of Poland [Cieśla et al. 1972]. Epipedons such as mollic, anthropic, umbric, plaggen and ochric were accepted with minor modifications. New horizons such as melanic (mucky) horizon, separated from histic epipedon were defined. Endopedons such as agric, argillic, cambic, placic, natric, salic, fragipan were also accepted, but new horizons such as sideric, albic, luvic and gleyo-spodic were redefined.

The actual state of soil horizon designation used in Poland as well as their basic characteristics are presented in this paper.

SOIL HORIZON DESIGNATIONS

A soil horizon may be defined as a layer within a soil profile approximately parallel to the soil surface with a set of properties formed by soil forming processes. A soil horizon has a unique set of feature which horizons or layers above or below do not possess. It differs from neighbouring horizons in properties, which can be easily discerned, identified, measured in the field, e.g.

colour, structure, texture, consistence, absence or presence of organic matter, carbonate, soluble salts and others. For a full identification of a soil horizon laboratory analyses are necessary.

MASTER HORIZONS AND LAYERS

O – Organic horizon contains more than 20% organic matter. In mineral and organo-mineral soil this horizon is formed at the surface of mineral stratum. In mineral semi- and hydrogenic soils this horizon, if present, usually has a thickness less than 10 cm. If the thickness is 10–30 cm, then the soil is determined as an organo-mineral soil. If it is over 30 cm it is regarded as an organic soil.

A – Humouse horizon is formed at or near the surface of the soil due to humification of organic matter and contains varying amounts of mineral soil constituents; it is dark coloured, darker than the horizon below.

E – Eluvial horizon, occurring directly under O or A (if horizon A is present), contains less organic matter than horizon A or O (if A horizon is not present) and less sesquioxides and clay fraction than the horizon below. It is characterized by lighter colours than the neighbouring horizons and by a higher amount of quartz and silica and other minerals resistant to weathering.

B – Enrichment horizon occurring beneath A and E (if E is present) and above C,G or R horizons. The structure of parent material is not visible in this horizon and is characterized by the accumulation of sesquioxide, humus, clay as result of illuviation or residual accumulation. Horizon B may display a secondary accumulation of carbonates, gypsum or other salts.

C – Horizons or layers consist of unconsolidated mineral material that are little affected by pedogenic processes and lack properties of the other soil horizons (O, A, E or B). They may display the presence of carbonates, salts, silica, iron oxides and possible existence of gleying features.

G – Gley horizon is a mineral horizon with indications of strong reduction under anaerobic conditions. It is usually bluish, greenish or greyish (colour features are not applicable in materials that remain brown or red under reductional conditions) and does not display features of diagnostic horizons A, E or B. Gleying may be caused by ground water or freatic water.

P – Boggy horizon is a part of the organic soil profile under the decay process and humification of plant materials under full anaerobiotic conditions (H_2S, CH_4 or FeS emission may occur).

M – Mucky horizon is characterized by full humification of the initial plant remains. It has a crumb or granular structure and high porosity. Contain no more than 15% initial organic material and more than 15 cm thick.

D – Unconsolidated mineral substratum of organic soils.

R – Massive or cracked rock (igneous, sedimentary, metamorphic) occurring within the soil profile.

Commonly a horizon or a layer designated by a single combination of letters needs to be subdivided. The Arabic numerals used for this purpose always follow letters, for example: B1, B2, B3 etc.

Apart from the above mentioned major horizons, two kinds of transitional horizons are distinguished. In one, the properties of an underlying or overlying horizon are superimposed on properties of the other horizon throughout the transition zone and two capital letters are used, as AE, AB, EB, BC. In the other, parts that are characteristic of an overlying or underlying horizon are enclosed by parts that are characteristic for the other horizon. Two capital letters are separated by solidus, as A/E, A/B, E/B. In the case of lithological discontinuity within the profile, each following layer is marked by Roman numeral, for example IIBt, IIIC1.

SUBORDINATE DISTINCTIONS (SUFFIXES)

Features of importance from the genetical point of view and morphology of soil profile are indicated by small letters.

a – fully humified organic matter accumulated in the mineral part of soil under hydromorphic conditions;

an – horizon or layer formed by man's activity excluding normal agricultural cultivation;

b – buried horizon;

br – residual accumulation typical for B horizon of brown soils;

ca – secondary carbonate accumulation;

cn – sesquioxide and carbonate accumulation in form of concentrations or grains;

cs – gypsum accumulation;

es – eluvial outwash of iron and aluminium compounds (is applied for the basic horizon E, albic);

et – eluvial outwash of clay fraction (is applied for the basic horizon E, luvic);

f – subhorizon of forest litter partially decomposed;

fe – illuvial accumulation of iron compounds (is applied to the basic horizon B, spodic);

g – gley mottling caused by seasonal surplus of freatic water (pseudogley);

gg – gley mottling caused by ground water;

h – fully humified organic matter under aerobic conditions;

k – relict contact layer with frozen ground in periglacial period;

l – subhorizon of forest litter on the surface of horizon O;

na – horizon enriched in exchangeable sodium;

ox – sesquioxide accumulation in cemented subhorizons for example iron pan, meadow ore (orstein);

p – horizon transformed by agricultural transformation like ploughing, digging, etc;

re – relict horizon occurring in contemporary soil of secondary genesis;

sa – salts accumulation more soluble than gypsum;

t – illuvial accumulation of clay fraction in mineral soils;

v – nonilluvial accumulation of iron, aluminium, manganese, humus and sometimes clay fraction in periglacial period;
x – cemented horizon (fragipan).

ADDITIONAL DIAGNOSTIC HORIZONS USED IN POLAND

Melanic epipedon is a humouse surface mineral horizon called in Poland a mucky-like horizon. It is similar to mollic epipedon as far as colour, structure and the consistence of organic matter is concerned. It differs from mollic horizon concerning thickness, humus complexes and saturated by bases. It is over 15 cm thick and has sand texture. Because of the complete absence of clay fraction the humus does not form humus-clay complexes. They have a form of medium fraction grains of sand and silt within this horizon and are of light colours (eliminated iron in anaerobic conditions). Black humuous grains and light sand and silt grains result eventually in hue of 10 YR to 7.5 Y, value ≤ 3.5 (moist) and ≤ 5.5 (dry) and chrome ≤ 3. Residual peat and gytia often occur in this horizon. Because of reaction and saturation with exchangeable bases (usually 30–80%) it fulfils criteria of both mollic and umbric horizons.

Sideric horizon has similar features to the cambic horizon, except for the fact that it originated from sand materials with abundant of coarse sand. Above there is an ochric epipedon, while below gradually grades into the parent material. It is 30 cm minimally and maximum 100 cm thick. Its hue ranges from 7.5 YR to 10 YR, value ≥ 4, chroma ≥ 3. Sand grain are surrounded by iron oxides films, aluminium oxide and humuous compounds. Sesquioxides liberated in the process of weathering in situ combine together with humus insoluble complexes that have: $[C_{org.}/(Al+Fe) \leq 25]$, where $C_{org.}$, Al and Fe are expressed in percentage the extract of the 0.1 M sodium pyrophosphate solution. This horizon has acid reaction (pH 3–5) and base saturation is 30% or less by the NH_4 OAc method (pH 8.2). This horizon differs from cambic horizon in that it contains humuous clay complexes, from argillic and spodic horizon differs in that it lacks visible remarks of illuviation.

Albic horizon is an eluvial horizon from which the products of chemical weathering have been washed out, especially iron and aluminium. Its colour is usually light grey or white. It has sand texture with quartz is the dominate one. The albic horizon is usually from several to several tens centimetres thick. Above is the forest litter or it may be separated from the litter by a thin humouse horizon.

Luvic horizon is an eluvial Alfisols horizon, from which carbonates first, next clay fraction have been washed out. Clay minerals have been translocated (without decay) to argillic horizon. It is poor in clay fractions. Its colour ranges from light grey to white. In spring freatic water accumulate above the argillic horizon and causes temporary reduction of iron compounds in albic horizon. This process makes the colour of the luvic horizon lighter.

Gleyo-spodic horizon is similar to the spodic horizon, but differs in that it has a platy structure, a higher amount of iron oxides that dominates over

aluminium, simultaneously, sand grains are cemented by sesquioxides and humuous (iron pan).

SAMPLE HORIZON SEQUENCES

The examples written below illustrate the use of horizon symbols on the selected soil units.

Humouse Rendzinas	Rendolls	A-Cca-R
Charnozems	Hapludolls	A-ABbr-C
Typic Brown Forest	Eutrochrepts	Ap-Bbr-Cca-(C)
Brown Forest Podzolic	Hapludalfs	Ap-Eet-Bt-C
Brown Forest Podzolic	Ferrudalfs	Ap-Eet-Btfe-C
Brown-Rusty	Udipsamments	O-ABv-Bv-C
Podzolic	Haplohumods	O-A-Ees-Bhfe-C
Black Earths	Haplaquolls	Ap-Aa-Cca-G
Muck Soils	Haplaquepts	M-AC-G
Alluvial	Udifluvents	A-C-IIC1-IIC2-IIIC3
Alluvial	Fluvaquents	A-G-IIG2-IIIG3ca

CONCLUSION

A new system of soil horizon notation has been developed in Poland in concert with a more detailed and quantitative system for describing soil pedons and a new soil classification. It offers considerably more precision and objectivity than the system used previously and should lead to more compatibility with the international systems taking into account local Polish soil conditions.

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STRESZCZENIE

Nad oznakowaniem poziomów genetycznych dla gleb Polski pracowano od wielu lat. Aczkolwiek od dawna stosowano symbole A, B, C, D w ciągłej sekwencji głębokości (Przyrodniczo-genetyczna klasyfikacja gleb Polski 1956, Genetyczna klasyfikacja gleb Polski 1959), to szerszy wykaz symboliki wprowadzono dopiero do "Systematyki gleb Polski" [1974], ale bez podania jej definicji. Szersze prace nad adaptacją poziomów diagnostycznych z Soil Taxonomy [1975] i FAO [1977] do gleb Polski rozpoczęto w latach osiemdziesiątych. W pracy niniejszej przedstawiono system oznakowania poziomów glebowych oraz charakterystykę (tych dodatkowych poza FAO i Soil Taxonomy) poziomów diagnostycznych, które zostały wprowadzone do systematyki gleb Polski [1989], tj: epipedon melanic (Marcinek), endopedon sideric (Kowalkowski, Kuźnicki, Marcinek, Prusinkiewicz) oraz endopedon gleyo-spodic (Prusinkiewicz). Ponadto rozdzielono poziomy wymycia na albic i luvic. Podano także przykłady opisu symbolami profili niektórych typów glebowych z systematyki gleb Polski [1989].

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