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# Bulgarian soil classification issues of correlation and harmonization with the international soil classification systems

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## Abstract

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The paper presents the establishment of the Bulgarian soil classification and the outcomes of large scale mapping services for arable land in the country at scale 1:10 000 and to outline the correlation and harmonization issues with the international soil classification systems. The latest WRB edition (IUSS Working Group WRB, 2015) aiming at the guidance of the newest issue with the diagnostic assessment in broader aspect covers not only Europe. In this paper, we present the drafting of the soil classification issues including objectives towards the national implementation of the international soil classification systems, outlining the correlation and harmonization including WRB (2006), WRB (2015), Soil Taxonomy (Soil Survey Staff, 2014) and FAO-UNESCO (Revised Legend of the World Soils, 1990) as well as basic steps to be taken, to achieve decision making on the basis of soil quality maintenance and enhancement. It will also serve as a call for action to encourage more EC assessments at the national level, but also as a primer for the inclusion of new suggestions.

*Keywords:* soil classification; mapping units; Bulgaria; diagnostic horizons; WRB; Soil Taxonomy; FAO-UNESCO

## Introduction

The Bulgarian soil classification (Yolevski & Hadzhiyanakiev, 1976) was developed for the purpose of lands inventarization at the Institute of soil science „Nikola Poushkarov" authorized in 1976 to carry our large scale soil survey of lands in whole country territory. The profile data was provided according to the methodology of field survey used at the Institute for decades up to the final survey in 1990. Later, it was adopted by the former Executive National Soil Agency respectively Ministry of Agriculture and Forestry.

National soil classification system aims to: a) coordinate knowledge of soil mapping units assessment and efforts under a shared framework of soil classification; b) promote the large scale field survey approach for arable lands in Bulgaria to achieve decision making; c) support the European implementation of WRB at the national level (mapping and assessment of soil units polygons and their services initiative), and d) fulfill priority actions regarding implementation and the obligations derived.

In classifying a soil unit according to the Bulgarian soil classification (Yolevski & Hadzhiyanakiev, 1976) is based on the criteria of taxon hierarchy. It comprised the principles of genetic soil diagnostic horizons, starting from taxonomic level soil type as basic unit, followed by subtype, genuses, unit, subunit and variety. The approach is based on the criteria established similar genesis and geographic dislocation, similar sequence of genetic horizons and relief occupation, similar air, water and temperature regimes. Meteorological data on precipitation and air temperatures provides information on local conditions, however daily soil moisture and temperature regimes were not applied in classification. Soil units according to the Bulgarian soil classification include soils with evidence of both – shallow soils on hard rock and with erosion on other parent materials. Eroded soils are referred as slightly, moderately or severely eroded within the same soil type and could be plough. Shallow soils on hard rock commonly are pastures and not plough.

## Materials and Methods

The presented soil units are the most representative and correlations could be used for general description of soil cover throughout the country (Table 1). The flexibility in qualifier use lands themselves admirably to characterize, and classify the fuzzy complexity of natural soilscapes (Duchafour, 2001). The primary soil mapping unit at scale 1:10 000 consists of a single Soil Typological Unit (STU). The large scale soil survey represents the polypedons at a particular polygon with soil mapping units after the Bulgarian soil classification (Yolevski & Hadzhiyanakiev, 1976). The principal approach is a soil spatial inference system which characterized not only particular profile, but the spatial prediction of soil variables for example spatially predicted soil properties (pH, textures, organic carbon, horizons, N,P,K) and the basic important spatially predicted soil classes (soil types, texture classes, soil colours). For this reason there is no fixed diagnostic parameters applied to the genetic horizons in the national soil classification which differs to the WRB and Soil Taxonomy where pedon is evaluated.

The collected soil information was coded (in Cyrillic letters) which includes soil nomenclature, depth of profile, degree of erosion (after Bulgarian criteria), classes of soil texture (after criteria of Kachinskii method at surface horizon and transformation between soil texture) (Rousseva, 1997), stoniness (after Bulgarian criteria at surface horizon), parent rock (list of main parent materials), slope, and land evaluation (bonity after Bulgarian methodology) (Petrov, 1988).

The formula of soil codes is, as follows:

$$N^{a} \frac{L_{1,2,3}}{N_{1,2,3}} N^{b},$$

where $N^{a}$ is a category of land (after Bulgarian criteria from 1 to 10),

$N^{b}$ is an average mark of land evaluation for some crops (not irrigated),

$L_{1,2,3}$ .. where: $L_1$ – a code for soil nomenclature in Bulgarian; $L_2$ – a code for soil depth, $L_3$ – a code for degree of erosion (after the Bulgarian criteria)

$N_{1,2,3}$ ... where: $N_1$ – a code of texture class after system of Kachinskii method, $N_2$ – a code of stoniness, $N_3$ – a code for parent rock.

## Results and Discussion

The future belongs to classifications that are subject to computerization without overlap of polygons. Nachtergaele et al. (2000) point out much confusion exists about the requirements that soil classification and map legends must meet.

The base information system of Bulgaria for GIS consists of digital terrain models (DGM), digital soil maps (DTK) as well as digital ortho-photos (DOP). The scope of information of the basic soil map unit is oriented according to the contents of soil maps 1:10 000. Generalized object types have been used for the polygons drawing shown in schemes of soil varieties distribution in the country for further information. These were harmonized according to the main principles of WRB (2006), (IUSS Working Group WRB, 2015), Soil Taxonomy (Soil Survey Staff, 2014) and FAO-UNESCO (Revised Legend of the World Soils, 1990). The scheme describes the nomenclature of the soil units based on the concept of causality between interacting components of natural object, an ambient environment, as well as analyzes complex and complicated information by highlighting the fiction trends in different WRB versions of classification.

**Table 1. Bulgarian soil classification and correlation with the international soil classification systems**

| Soil group after Extended Systematic List, 1976 | WRB 2006, (Name) | WRB 2015, (Name) | Soil Taxonomy USDA 2014, (Name) | Revised Legend of the World Soils FAO-UNESCO, 1990 |
|---|---|---|---|---|
| Calcareous and Typical chernozems | Epicalcic Kastanozem<br>Epicalcic Chernozem<br>Epicalcic Vermic Chernozem (Pachic) | Epiprotocalcic Kastano-zem (Siltic) Epiprotocalcic Chernozem (Pachic, Siltic) | Calcic Haploxerepts<br>Typic Calcixerolls<br><br>Pachic Calcixerolls | Calcic Chernozems |
| Slightly leached and Medium leached chernozems | Epicalcic Chernozem<br>Endocalcic Chernozem | Endoprotocalcic Chernozem (Siltic) | Calcic Haploxerolls<br>Typic Haplustolls | Haplic Chernozems |
| Strongly leached chernozems | Bathycalcic Chernozem | Haplic Chernozem (Bathyprotocalcic, Siltic) | Typic Haplustolls | Haplic Chernozems |

**Table 1. Continued**

| | | | | |
|---|---|---|---|---|
| Leached chernozem karasolutcy | Endocalcic Vertic Chernozem (Clayic) | Endoprotocalcic Vertic Chernozem (Clayic) | Vertic Haplustolls | Verti-Haplic Chernozem |
| Podzolized (degraded) chermozems | Luvic Chernozem Greyic | Luvic Greyzemic Chernozem (Bathyprotocalcic, Siltic) | Typic Argialbolls | Luvic Chernozems |
| Dark grey-brown forest soils | Luvic Greyic Phaeozem | Luvic Greyzemic Phaeozems (Bathyprotocalcic, Siltic) | Typic Argiudolls | Luvic Phaeozems |
| Grey-brown forest soils | Cutanic Luvisol | Haplic Luvisol (Proto-stagnic, Cutanic, Differentic, Ochric) | Typic Hapludalfs | Haplic Luvisols |
| Light grey forest soils pseudopodzolic | Luvic Endogleyic Planosol (Albic, Dystric) (Eutric) | Luvic Albic Oxygleyic Planosol (Clayic) | Typic Albaqualfs | Verti-Eutric (Distric) Planosol |
| Cinnamonic podzolic, pseudopodzolic | Luvic Endogleyic Planosol (Albic, Dystric, Chromic) | Dystric Luvic Oxygleyic Planosol(Clayic,Chromic)<br>Luvic Albic Oxygleyic Planosol(Clayic,Chromic) | Chromic Vertic Albaqualfs | Verti-Eutric (Distric) Planosols |
| Zheltozem pseudo-podzolic | Cutanic Alisol | Stagnic Alisol Cutanic | Typic Albaquults | Stagnic Alisols |
| Calcareous and Typical Smolnitsa | Epicalcic Mollic Grumic Vertisol Calcaric | Epiprotocalcic Vertisol (Mollic) | Typic Calcixererts | Calcic Vertisols |
| Slightly and Medium leached smolnitsa | Epicalcic Mollic Grumic Vertisol Calcaric | Pellic Endoprotocalcic Vertisol (Grumic) | Typic Calciusterts | Haplic Vertisols |
| Strongly leached smolnitsa | Bathycalcic Mollic Grumic Vertisol Pellic | Pellic Vertisol (Bathy-protocalcic, Grumic) | Pachic Vertic Haplustolls | Haplic Vertisols |
| Typical and Slightly leached cinnamonic forest | Epicalcic LuvisolChromic | Epiprocalcic Chromic Luvisol (Cutanic) | Typic Palexeralfs | Chromic Luvisols |
| Medium leached cinnamonic forest | Endocalcic Cutanic Luvisol (Chromic) | Endoprocalcic Chromic Luvisol (Cutanic, Differentic) | Typic Paleustalfs | Chromic Luvisols |
| Strongly leached cinnamonic forest | Bathycalcic Cutanic Luvisol (Chromic) | Chromic Luvisol (Proto-stagnic, Cutanic, Differentic) | Typic Paleustalfs | Chromic Luvisols |
| Brown forest soils | Haplic Cambisol (Dystric)<br>Haplic Cambisol (Eutric) | Dystric or Eutric Cambi-sol (Humic or Ochric) | Typic Dystrudepts | Eutric (Dystric) Cambisols |
| Dark mountainous forest soils | Cambic Umbrisol | Cambic Umbrisol | Humic Dystrudepts | Dystric (Humic) Cambisols |
| Mountainous meadow soils | Haplic Umbrisol | Haplic Umbrisol (Hyperhumic) | Typic Humicryepts | Dystric (Umbric) Leptosols |
| Alluvial soils | Haplic Fluvisol | Eutric Fluvisol (Ochric) | Typic Ustifluvents | Eutric Fluvisols |
| Alluvial meadow soils | Haplic Fluvisol (Humic) | Eutric Fluvisol (Humic) | Oxyaquic Ustifluvents | Eutric Fluvisols |
| Colluvial soils | Colluvic Regosols | Eutric Colluvic Regosols | Typic Ustorthents | Eutric Cambisols |
| Colluvial meadow soils | Haplic Cambisol (Colluvic) | Eutric Cambisols (Collu-vic, Humic) | Typic Haplustepts | Eutric Cambisols |
| Meadow soils swampy | Haplic Gleysol | Eutric Oxygleyic Fluvisol<br>Eutric Oxygleyic Gleysol (Colluvic)<br>Eurtic Stagnic Gleysol (Luvic)<br>Eutric Endoprotocalcic Gleysol (Humic)<br>Eutric Endocalcic Mollic Gleysol (Clayic) | Typic Humaquepts | Gleysols |
| Boggy soils | Rheic Sapric Histosols | Rheic Sapric Histosol | Typic Haplofibrists | Histosols |
| Peat-boggy soils | Rheic Hemic Histosols | Rheic Hemic Histosol | Typic Haplohemists | Histosols |
| Peats | Rheic Fibric Histosols | Rheic Fibric Histosol | Typic Haplosaprists | |
| Rendzinas | Rendzic Leptosols | Rendzic Leptosols | Typic Haprendolls | Rendzic Leptosol |

National soil data are less harmonised and different classification systems of different properties of the soils are represented in various ways according to national and regional characteristics (Terres et al., 2016). In accordance with the requirements of FAO-UNESCO (1974, 1990) and World Reference Base for Soil Resources the system of national initial harmonization for Bulgaria was developed and qualificators allows an overview and guarantees reporting (e.g. to the EU) and the use of first results for different purposes. However, this does not yet fulfil the intention of the WRB (2006) concept to serve as an operative instrument for international correlation. The establishment and legitimation of the WRB (2015) qualificators is still at an early stage in the long and medium term therefore recommend from a scientific perspective a clearly understood and easy-to-use approach to communication for a wide range of users.

In 2006, work began on the design and planning for a soil grid of the world at fine resolution 100 m and this became known as GlobalSoilMap (Arrouays, 2014).

**Soil group of type Chernozems**

Chernozems are widely recognized at the bigger part of the Danube Hilly Plain and occupy about 20% of the entire country territory (Fig. 1). Geographical localization is associated with the most southern occurrence in Europe and is formed under the temperate continental climatic conditions. This fact is manifested at the enhanced mineralization of organic matter and lower amount of carbon stock.

Main concepts comprise that they have thick dark mineral horizon with high rate of accumulation of organic matter; base saturation is high (> 85%); have a remarkable structure. Main processes that take place are humus accumulation of mull type, high biological activity, leaching.

**Fig 1. Scheme of distribution of soil group of type of Chernozems with varieties (calcareous, typical, leached, degraded/lessive/, clayey ‘karasoulouk’ and meadow) on the territory of Bulgaria**

Epipedons have a key role in Soil Taxonomy, in the World Reference Base for Soil Resources and other classification systems. Sets of properties may define horizon set and be given specific names, such as a *mollic* epipedon.

Soils containing mollic epipedon are among most productive soils recognized in many classification schemes as Mollisols, Chernozems, Phaeozems, Kastanozems or Chestnut soils.

Soil Taxonomy required a *mollic* epipedon for Mollisols order classification. *Mollic* epipedon may occur in other orders without Mollisol classification. Compare to WRB it includes more diagnostic criteria like phosphate content, the *n* value and seasonal moisture content.

Methods for generalizing of *mollic* diagnostic epipedons in Bulgaria meet a definition of qualitative/quantitative criteria, in a strict sence morphology (thickness and color requirements), general chemical analyses (Ca-humate compounds, pH values, base saturation, carbon content, ratio C/N), factors of soil formation (rock, slope, texture classes etc.) (Shishkov et al., 2016).

In the region the soil types cannot be simply correlated with RSGs of WRB followed definition of Kastanozems and difference from Chernozems occurrence with diagnostic *mollic* horizon. Gaps detected in correlation of national classification with WRB are vague definition of Reference group Kastanozems which outcomes in poor rules for application and unclear difference with Chernozems in the region at occurrence the same diagnostic *mollic* horizon.

**Soil group of type Gray-brown forest soil (mostly Luvisols)**

Gray-brown forest soils are associated with most southern distribution of forest-steppe zone recognizable on the territory of Northern Bulgaria from east to west (Fig. 2). Soils have formed in the temperate continental climate with periodic East European and Atlantic influence. Environment conditions contribute to the prolonged weathering in situ during the whole year. Commonly have a mixed vegetative cover, but were dominantly forested soils.

Main concepts comprise that they have clay enrichment in compacted Bt horizon result of their evolution; base saturation is high (> 80%); gradual decrease of organic matter is to the considerable depth; biological circle promotes yearly supply of considerable amount of elements back into the soil.

Main processes that have taken place are textural differentiation, humification, lessivage and weathering in situ.

**Fig. 2. Scheme of distribution of soil group of type of Gray-brown forest soils with varieties (partly Phaeozems and mostly Luvisols) on the territory of Bulgaria**

One should be mentioned, soil texture is unlike as at the parent materials.

Lessivage in the gray-brown forest soils is a factor of illuvial (Bt) horizon formation with oriented skins of clays on ped surfaces.

The areas of gray-brown forest soils occupy approximately 14.5% of the entire country territory. Prevailing of the humus accumulation or the textural differentiation reflects at the soil morphology and followed defining of soil subtypes after Bulgarian classification. Subtype of dark gray-brown forest soil occupy approximately 1.79% and could perform *mollic* horizon and associated with Phaeozems WRB (IUSS Working Group WRB, 2015) or Mollisols Soil Taxonomy. In the subtype of Gray-brown forest soils *argic* horizon took precedence so these soils are referred as Luvisols in WRB or *argillic* horizon in Alfisols in Soil Taxonomy. Most precise definition of *argic* horizon is after Baren et al. (1987), definitely only for cases of illuviation of clay. From the scientific point of view it is unclear why change is needed in the WRB (2014) introduces new guidance for *Argic* horizon which differs from that in WRB (2006).

**Soil group of type Pseudopodzolic forest soils (Planosols)**

Three soil varieties with similar morphology and soil properties are considered as pseudopodzolic and occupy nearly 9.75% of the country territory: *Light gray forest soil (pseudopodzolic)* in northern part of country; *Cinnamonic podzolic soils (pseudopodzolic) and Zheltozem podzolic (pseudopodzolic) soils* in the southern part (Fig. 3). Pseudopodzolic forest soils are differentiated soils with abrupt textural difference, compaction pronounce, strong ash color presence in the upper layer. Seasonal water logging is typical in the upper part.

**Fig. 3. Scheme of distribution of soil group of type of Pseudopodzolic forest soil (Planosols) with varieties (Light gray, Cinnamonic and Zheltozem podzolic) on the territory of Bulgaria**

Main concepts comprise that they have sharp increase in clay content at the illuvial (Bt) horizon and eluvial horizon; chemical weathering in situ significantly contributes for the texture differentiation. Main processes have taken place are leaching and lessivage, oxidation and reduction, pseudogley and weathering in situ, complex formation and migration. Products of these processes are the free (nonsilicate) forms of elements, released through the destruction of the primary mineral lattices (ratio of $SiO_2/R_2O_3$ of the clay fraction) showed differentiation which is an evidence of movement of iron and aluminum down the profile. There is luck of destruction at the mineral part. No tonguing of albic material is admitted into clay-rich *argic* horizon.

Classification after WRB (IUSS Working Group WRB, 2015) required abrupt textural difference in reference group of Planosols. Soil Taxonomy required the *ochric* epipedon and the *argillic* horizon for Alfisols Order classification.

**Soil group of type Cinnamonic forest soils (Chromic Luvisols)**

Soil type Cinnamonic forest soil is widely spread in Southern Bulgaria, localized as well in valleys as hills and mountainous highlands (Fig. 4). Soils occupy approximately 21.91% of the entire country territory. Most of the soils are shallow however among them 1 000 000 ha are deep soils. Nowadays climate is transitional continental influenced by the Mediterranean.

**Fig. 4. Scheme of distribution of soil group of type Cinnamonic forest soils (Chromic Luvisols) on the territory of Bulgaria**

Main concepts comprise that they have clay enrichment result of advanced hydrolysis of the silicates and release of iron oxides that give the soils a reddish color, base saturation is high (> 80%). Main processes have taken place are weathering in situ, lessivage, leaching, rubification and humification.

Subtype varieties differ in the degree of leaching (slight, moderate, and strong), in the thickness of the humus horizon, in the degree of erosion (slightly, moderately, or not eroded) and in the occurrence of gleyic or vertic properties in the profile. In the WRB 2006 soil variety Chromic Luvisol was dismissed, the WRB edition 2014 again introduces it back and the new guidance for *Argic* horizon which differs from that in WRB 2006.

Keys to Soil Taxonomy required the *argillic* horizon for Alfisols order classification.

**Soil group of type Smolnitsa (Vertisols)**

Main concepts comprise that Smolnitsa have intense dark color, high (> 30%) clay content, base saturation is high (90%), low content of organic matter and low biological activity, has cracks that open and close each year. The main processes that have taken place are self-pedoturbation due to high shrinking-swelling activity and leaching. Smolnitsa is generally distributed in southern Bulgaria in regions bordered by cinnamonic forest soils and occupies about 5.34 % of the entire country's territory (Fig. 5). Climate is confined to the transitional continental climatic zone with Mediterranean influence. The clay mineralogy is dominated by stable minerals of the smectites group. This indicates the physical properties of the soil and particularly shrinking and swelling activity. The main role of the swelling and shrinking is permanent movement of soil that minimizes the "B horizon" development in these soils.

**Fig. 5. Scheme of distribution of soil group of type Smolnitsa (Vertisols) in Bulgaria**

**Soil group of type Brown forest soils (Cambisols)**

The belt of woodlands with Brown forest soils comprises all mountains in the country under dense deciduous or coniferous forests cover and occupies about 14.7% of the entire country territory (Fig. 6). In different parts of the country these soils are found in high-hilly and mountain regions with altitude over 700 m and to 1800 m above the sea level on any topographic position.

**Fig. 6. Scheme of distribution of soil type of Cambisols in Bulgaria**

Main concepts comprise that soils are well drained, fairly often with rock fragments, have uniform texture, minimum translocation of silicate clays and are not prone to compaction. These soils typically show little evidence of weathering in situ and oxidation of iron oxides. The soil processes may change from place to place but leaching is principal in the most years. They may be found as in temperate as in humid continental climate conditions. Typical soils are acid where the content of humus distribution is with sharp decrease from the surface at the depth. Principal variation within the type is thickness, humus content, and base saturation.

Most common diagnostic feature is a *cambic* horizon which is recognized by change of structure development or absence of rock structure in at least half the volume, compared to the lower horizon in the Reference Group of Cambisols and Inceptisol order classification.

**Soil group of type Dark mountainous forest and mountainous meadow soils (Umbrisoils)**

Dark mountainous forest and Mountainous meadow soils are found at the humid subalpine and alpine areas and developed in a wet and cool upland grassland environment on the hard rock. The dark mountainous forest soils occupy about 0.99% of the entire country territory and Mountainous meadow soils are about 1.52% (Fig. 7).

**Fig. 7. Scheme of distribution of soil group of type Dark mountainous forest and Mountainous meadow soils (Umbrisols) in Bulgaria**

Main concepts comprise that they are not differentiated dark colored soils, accumulated considerable amount of organic substances of moder type, low base saturation, and high rates of skeletal performance. Principal variation within the type is the soil thickness. The diagnostic horizon *umbric* is used at suborder level for Gelisols, Inseptisols, Ultisols. In Soil Taxonomy there are demands for subsurface horizons: allowed is a *cambic, albic, agric, calcic* and others.

**Soil group of type Alluvial (Alluvial meadow) and Colluvial (Colluvial meadow) soils (Fluvisols and Colluvic Cambisols)**

Main concepts comprise that soils are without diagnostic horizons, characterized with inherited properties from parent materials and occur in many environments. Complexity of alluvial soil formation is more common than simplicity. Alluvial soils in Bulgaria occupy about 5.29 % of the entire country territory in accumulative landscapes (Fig. 8). Traditionally in Bulgarian concept the alluvial soils comprise larger group of soils, referred as meadow. This was confirmed over the years during the large soil survey in the country.

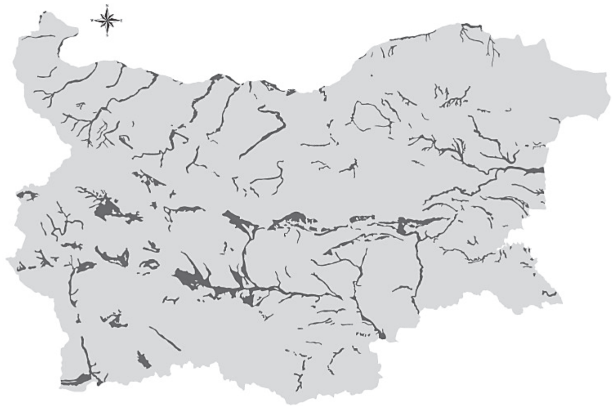

**Fig. 8. Scheme of distribution of soil group of type Alluvial(Alluvial meadow) and Colluvial(Colluvial meadow) soils (Fluvisols and Colluvic Cambisols)in Bulgaria**

In antiquity civilizations in Southern Europe (Italy, Greece, Crete ets.) had developed on fertile soils in river valleys not affected by floods and differ from contemporary scarce discharge regimes of water in rivers. Bulgarian systematic approach is that alluvial (or alluvial meadow soils) may develop in the absence of continued flooding and deposition of recent alluvium. This is the main difference of the national systematic with other international systems there soils rapidly change to Cambisols.

Deluvial (colluvial) soils are localized on the talus drift and creep fans in the hilly regions and occupy 1.27 % of the entire country territory. Usually enclosed depression is full with mixed kind of deposits.

Single group of these soils is absent in WRB and FAO-UNESCO (1990).

**Soil group of type Hydromorphic or Swamped soils (Gleysoils and Histosols)**

Main concepts comprise that soils developed under natural or maintained conditions of excess moisture, are water logged and occur in many environments. Regional precipitation and air temperatures do not inflict profile hydromorphic status. The main processes that have taken place are linked to prolonged exposure to anaerobic conditions in water saturated soils, and seasonal alteration of reduction and oxidation conditions. Soils with gleyic color properties commonly have conditions of limited soil drainage for most of the year. Gleysoils are characterized by quite prolonged exposure to anaerobic conditions. Traditionally, in Bulgarian systematic the *gley* color properties are linked with its pronouncement in the profile and the soil hydromorphic status or frequency and duration of wet periods and so-called *typical gley*, *gley-like*, and *gleic*. Swamped, boggy, and peat soils (Histosols) are characterized by a permanently high level of groundwater (Fig. 10). The decomposition of organic tissues takes place only in dry conditions.

**Fig. 10. Sheme of distribution of soil group of type of Hydromorphic and Swamped soils (Gleysols and Histosols) in Bulgaria**

**Soil group of type Rendzinas**

Rendzinas occupy about 2.4% of the entire territory (Fig. 9). The term rendzic is derived from the Polish. Rendzinas are shallow dark colored soils developed on consolidated calcareous rock. Main concepts comprise that they have *mollic* horizon mixed with skeletal part overlapped by calcareous rock. Due to the high humus and carbonate content these soils are called humus-calcareous or rendzinas. Dominated humic acids are bound with calcium. Soils are very well drained and have high natural fertility, but shallow depth limits agricultural use due to *abundance of stones*.

**Fig. 9. Scheme of distribution of soil of soil group of type of Rendzinas in Bulgaria**

## Conclusion

The example of Bulgarian soil classification issues of correlation and harmonization with the World systematic systems demonstrates the practical value of having the capability to track and respond to contemporary demands, provides an indication of the soil quality management challenges that will dominate in coming years as countries attempt to substantially increase food production within a resource constrained world.

Generalized rating of specific soil groups according to the national classification, WRB (2006), WRB (2014), Soil Taxonomy and FAO Revised Legend of the World Solis based on the above finding, a provisional assessment is made of the status and trend of the correlation in order of soil quality importance for the region. At the same time an indication is given of the reliability of these estimates. The status of soil in the region is mixed. In the low-income countries in the Southeast Europe is a significant challenge to national prosperity as significant export of agricultural products (cereals) and nearly all rely heavily on soils for wealth generation. The intensification of common integration and to a lesser extent the threats to soil function capacity in the region are serious and require immediate action to avoid large scale economic costs and environmental losses.

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