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SOIL MAP OF THE RUMANIAN PEOPLE'S REPUBLIC

SCALE 1 : 1,000,000

EXPLANATIONS CONCERNING THE MAP CONTENT

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INTRODUCTION

The Soil Map of the Rumanian People's Republic at the 1 : 1,000,000 scale, published by the Geological Committee, is the result of soil surveys and laboratory investigations carried out especially during the last 20 years, by the Soil Service of the Geological Committee, the Pedology Research Group of the R.P.R. Academy and the Section of Soil Resources and Land planning, attached to the High Council for Agriculture.

For the plain and hilly regions, covered generally by relatively detailed surveys (at scales of 1 : 20,000 up to 1 : 200,000), the existing cartographic material was generalized ; due to this fact, concrete geographical units, characterized by the dominance of a certain genetic soil type are delineated, indicating in addition by signs the local occurrence of certain soils.

In the mountain regions there are few mapped areas. Detailed soil surveys conducted in various characteristic regions of the mountains made it possible to establish correlations between the soil cover and the landforms, lithologie, climate and vegetation. On the basis of these correlations, using geologic, geomorphologic, vegetation and climate maps, the soil association units figuring on the soil map (1 : 1,000,000 scale), were delimitated.

For the territories outside the frontiers of the Rumanian People's Republic, the soil map has been completed on the basis of published material or the documentation obtained from the neighbouring countries ; these have partly interpreted in keeping with the legend of the Soil Map of the Rumanian People's Republic.

In the following pages, explanations concerning the principles used in the classification of the soils included in the legend of the map, are given ; then, a general outlook on natural conditions and the distribution of soils in the Rumanian People's Republic, followed by general characterization of each soil mentioned in the legend of the map, are also given.

REPRESENTATION OF PEDOLOGIC DATA ON THE SOIL MAP

Each genetic soil type and subtype (sometimes even genus) and each soil association indicated in the legend of the Soil Map is represented on the map by a certain colour and number symbol (from 1 to 51, in black on the map and in the legend) ; the number symbols render identification of the mapping units much easier. In the choice of colours for the various soils, particular attention was paid to obtain on the map a sharp differentiation of the soil zones, related soils being rendered in appropriate colours. The steppe and forest-steppe soils are rendered in yellow up to brown, the Grey Forest soils in grey, the Reddish-Brown Forest soils in reddish-brown, Brown and Podzolic soils in various tints of bluish green and blue, and the Alpine soils in pink. Intrazonal soils, that usually occupy small areas, are rendered in much stronger colours : violet, purplish-red, red.

Besides colours, sign symbols of various significance are utilised — some signs being associated to a colour in order to represent a certain soil on the map. For instance, Hydroautomorphic soils are represented on the map by the colour corresponding to the respective Automorphic soil upon which a characteristic blue sign is added.

Other symbols — in grey, blue or red — marked in the legend, in the lower right hand corner of the square corresponding to the respective soil unit, are used on the map to show the presence of local soils or soil associations (on areas to small to be rendered at the scale of the map).

Two units are represented on the map only by signs, the areas occupied by the respective soil being too small.

A third category of signs, grouped together in the legend under the heading "supplementary signs", is used to express on the map certain soil-forming processes of importance from the genetic and practical viewpoint, such as pseudogleyization, swamp areas, salinization, solonization, etc., or certain formations (swamps, floating-reed banks, lakes and pools), that cannot be included in the category of proper soils, or even certain features of the soil cover determined in the first place by the landform (as for instance the contours delineating the areas of soils associated with Lithosols, Regosols and Eroded soils, or those subject to landslides).

Finally, a fourth category of signs and hatchings — drawn in sepia — show the mineral substrata of the soils, specified in the second part of the legend. Thus, for soils developed on the detritus of consolidated-compact rocks, for each group of rocks, similar from the genetic and lithologic viewpoint, special signs were used. In the case of soils developed from mobile or weakly consolidated rocks, the hatchings or signs express the texture of the parent material of the soil.

Therefore, each unit outlined on the map is defined by: the dominant soil or soil association, rendered in colour and number symbol; the nature of the lithologic substratum (for soils formed on consolidated-compact rocks) or the texture class of the parent material (for soils formed on mobile or weakly consolidated rocks) rendered by hatchings or signs in sepia. Some units delineated on the map may include in addition: signs that indicate the local occurrence of soils other than those corresponding to the colour of the respective unit on the map and supplementary signs referring to certain soil forming processes.

The great pedo-geographical units are clearly made evident by special contours which separate the plains and the plateaux from the hills and the mountains. The plains and the plateaux characterized by a low energy of relief are covered by soils with a well developed profile and characterized by no, or slight erosion processes. The hills with a greater energy of relief and degree of dissection, are covered by a relatively varied soil cover; erosion processes are fairly intense and manifested over large areas. The mountains characterized by a very accentuated energy of relief and a very high degree of dissection, have a soil cover in which soils of shallow thickness and of skeletal character predominate; intense denudation frequently determines outcrop of the rock.

I. SOILS AND NATURAL CONDITIONS OF THE RUMANIAN PEOPLE'S REPUBLIC

Principles of soil classification. The following system of taxonomic units is used for the classification of soils in the Rumanian People's Republic:

1. Family of genetic types;
2. Genetic soil type;
3. Genetic subtype;
4. Variety;
5. Genus;
6. Texture species;
7. Variant.

The main soil classification units the genetic soil type, introduced into soil science by V. V. DOKUCHAEV and applied in 1906 by G. MURGOCI, EM. PROTOPOPESCU-PAKE and P. ENCULESCU for the soil map of Rumania.

According to L. PRASOLOV, I. P. GERASIMOV and E. IVANOVA, the genetic soil type is defined by the following qualities :

1. The qualitatively unitary structure of the profile, manifested by the presence of a certain system of horizons ;

2. Unity of the processes of formation, transformation and migration of soil components ;

3. Unitary character of genesis conditions that are manifested both in the ecologic conditions (thermic and hydric regime) and in the natural vegetation type ;

4. Natural fertility level determined by the aerohydric regime and concentration of plant nutrients.

Genetic soil types are grouped into a higher taxonomic category : the family of genetic types. The genetic soil types grouped into a family display certain morphologic features that express a common, general background of the soil-forming process.

The name of "family" was also used, almost with the same significance, by G. MURGOCI (1924). "Family" broadly corresponds to "the soil-forming type", a concept advanced by KOSSOVICH. The family includes one or more specific (normal) genetic soil types and their intergrades towards soil types belonging to other families.

The degree of development of the specific features of a certain genetic soil type is defined by the genetic subtype. Each genetic type is represented by an evolutive genetic series formed by a sequence of subtypes. Therefore, the family comprises specific (normal) genetic series and transition genetic series towards types belonging to other families.

The soils that have developed on certain geologic ground layer are grouped in a taxonomic unit called "genus" (N. M. SIBIRTSEV).

The grouping of soils according to their mechanical composition is called "texture species".

Variety expresses site particularities, in most instances determined by the landform (depression, slope, "placore" etc.).

The state of the soil, determined by agricultural use, forms the „variant", indicated by an additional descriptive term (medow, pastureland, cultivated, eroded etc.).

When designating a soil, the following units are taken into consideration :

Type : Chernozem ; subtype : chocolate ; variety : slope ; genus : on loess ; species : loamy ; variant : cultivated, slightly eroded.

The soil map legend is drawn up on the basis of a system of classification. In general, the soil map does not comprise individual soils, but geographical areas characterized by the predominance of certain soils, with certain specific features. These geographical areas are divided into a system of units : zone, subzone, province, natural region, district and elementary geographic soil area. Only within the elementary area is the soil defined by all its taxonomic qualities (type, subtype, genus, species, variety, variant). Cartographic units of a superior order result from grouping of elementary areas, taking into consideration certain specific features that become more and more general as one rises higher in the system of cartographic units. When the genetic method is strictly applied, the soil map must reflect certain soil and geographic realities, often necessitating corresponding adaptation of the legend. The quality of a soil map is determined by the way in which the soil cartographer is able to solve the question of revealing the geographical soil units, both clearly and comprehensively, according to the scale of the map and the general lines of the soil classification system.

By rigorously respecting the basic principle of the genetic method on relation to the unity between the soil-forming processes and the way in which the soil-forming factors manifest themselves, it is possible to list the soils correctly within the classification system and to delineate exactly the genetic soil units figuring on the map.

For reasons of a systematic and practical agronomic order, particular attention has been paid during the last years to the water regime of the soil, considered as one of the basic criteria of classification. In order to solve this question, an attempt is being made at present to combine the principles stated by A. RODE (1956) on the water regime of natural soils with the principles on natural drainage types (Soil Survey Manual) and those stated by E. MÜCKENHAUSEN.

The legend of the soil map at a 1 : 1,000,000 scale, mentions, apart from the normal genetic series (automorphic and hydromorphic), also the transition genetic series (hydroautomorphic), generically called soils "with Ground-Water Table". The legend likewise indicates the varieties with surface water gley of the normal genetic series.

The genetic soil types occurring on the territory of Rumania are grouped in the following soil families :

1. The family of Chernozems ;
2. The family of Sylvestre (Forest) soils (secondary podzolization zone) ;
3. The family of Podzolic soils (primary podzolization zone) ;

4. The family of Renzinas and Pseudorendzinas ;
5. The family of Saline and Alkali soils ;
6. The family of Bog and Half-bog soils.

1. *The family of Chernozems* includes the following normal genetic series :

a) Chernozems (steppe) ;
b) Leached Chernozems (forest-steppe) ;
and the genetic transition series :
c) Meadow Chernozems ;
d) Medow Leached Chernozems.

The terms of the mentioned genetic series (subtypes) were defined according to the intensity of the bioaccumulative process (humus content and thickness of the humus horizon) and of the eluvial proces (depth of calcium carbonate leaching and degree of differentiation of B horizon).

The normal genetic series of Leached Chernozems includes the following subtypes : Slightly, Moderately and Strongly Leached Chernozem and Podzolized Chernozem (transition towards Grey Forest soils).

The terms of the Meadow series are grouped into subtypes according to the same criteria as the normal genetic series. Subdivisions in terms of the average depth of the ground-water table (meadow-steppe, steppe-meadow and meadow water regime, according to A. RODE, 1956), are not included in the legend of the soil map at a 1 : 1,000,000 scale.

2. *The family of Sylvestre (Forest) soils* (with clay-illuvial B horizon). In the Sylvestre (Forest) soil family the general background of the soil-forming process is characterized by a tendency towards texture differentiation of the profile which leads to the formation of a clayey B horizon and to the residual accumulation of silica in A horizon, under conditions of a moderate degree of base saturation, favourable to the formation of humus of the mull type. The migration of clay downwards has recently been called by the western investigators "lessivage" (AUBERT, DUCHAUFOUR, DUDAL etc.). N. CERNESCU (1937) has shown the difference that exists between "podzolization", which leads to the differentiation of a iron-humus horizon, and the process of clay migration which leads to the formation of a clayey B horizon, which he refers to as "secondary podzolization".

The term of "Sylvestre" (Forest) soils given to this family belongs to G. MURGOCI (1924). In the extensive zone of secondary podzolization there are several bioclimatic facies, to which certain genetic series correspond :

a) Reddish-Brown Forest soils (typical and podzolized) ;

b) Brown Forest soils (typical and podzolized) ;

c) Yellowish-Brown Forest soils (typical and podzolized) ;

d) Grey Forest soils.

In 1924, G. MURGOCI proposed regional designations for these bioclimatic facies : Wallachian, Central European, Atlantic, Ukrainian Forest facies.

The situation of Rumania at a bioclimatic crossroads has made possible the development, under limit conditions, of four genetic series included in the family of Sylvestre (Forest) soils and represented on the soil map at 1 : 1,000,000 scale : Reddish-Brown Forest soil, Brown Forest soil, Grey Forest soil and Yellowish-Brown Forest soil.

The terms of the genetic series of the Sylvestre (Forest) soil family (subtypes) are defined according to the degree of differentiation of the podzolic horizon (A2) and illuvial horizon (B), i.e. the stage of evolution towards the podzolic type (Slightly, Moderately, Strongly Podzolized ,Secondary Podzol).

The Sylvestre (Forest) soil family likewise includes the genetic series (hydroautomorphic) of soils with ground-water table, corresponding to different bioclimatic areas, occupied by the above mentioned normal genetic series (Brown, Reddish-Brown, Yellowish-Brown soils with Ground-Water Table). A special sign indicates the varieties with surface water gley of the terms of the normal genetic series.

3. *The family of Acid Brown soils and Podzolic soils* (with an iron-humus illuvial B horizon), specific of the cold, humid climate of the upper mountain and Alpine levels, includes soils that have developed under conditions favourable to intense decrease of base saturation, to formation of raw acid humus and the mobilization and migration of iron sesquioxides under the protective action of fulvic acids. The extreme term of evolution of the Acid Brown soils of this zone is the typical Podzol with an iron-humus-illuvial or humus-illuvial B horizon, a Primary Podzol according to N. CERNESCU, a Destruction Podzol according to C. CHIRIȚĂ. In the primary podzolization zone (N. CERNESCU, 1934, 1937) there are two genetic series :

a) Typical and Podzolized Acid Brown soils (including Primary Podzol) ;

b) Acid Alpine Meadow soils.

Grouping of the Acid Brown Meadow soils in the same family with Acid Brown soils is jusified by the specific existence in both soils of a very low degree of base saturation, the formation of acid humus and mobilization of iron sesquioxides. On the other hand, Alpine meadows have been greatly extended by the cutting of forests, so that part of these soils have developed secondarily on Acid Brown soils and Primary Podzols.

4. *The Rendzinas and Pseudorendzina family* includes soils of the forest zone formed on calcic substrata (limestones, dolomites, gypsum, marls). The denomination of Rendzina is used only for soils formed on limestones and marly limestones, whereas for the soils formed on clay deposits with a varied calcium carbonate or gypsum content the denomination of Pseudorendzina is used. The terms of the two genetic series of this family are established according to similar criteria applied for Chernozems and Leached Chernozems.

The soils of the Pseudorendzina genetic series that are under the influence of stagnant humidity in excess (the lower third of slopes, depressions of the relief, runoff water on slopes) are included under the generic name of Humic Clay Soils with Surface Water in Excess (Gleyed Pseudorendzinas).

5. *Saline and Alkali soils*. The classification criteria for the soils of this family are those used in the USSR (Solonchak, Solonetz, Soloth). The transition series towards the zonal genetic type (Salinized Chernozems, Solonized Chernozems etc.) do not appear separately on the soil map, at the 1 : 1,000,000 scale.

6. *The family of Bog and Half-Bog soils* icludes two genetic series : a) Peat soils and Peats (eutrophic, mesotrophic and oligotrophic) ; b) Gley soils.

a) Gley soils, covered with a peat stratum less than 30 cm thick, are called Peat soils ; when the thickness exceeds 30 cm, they are classified as Peats ;

b) The genetic series of Gley soils includes the soils of the forest zone formed under the direct influence of the ground water, with a variation range of the hydrostatic level of 0.5 to 2 m, sometimes even rising temporarily to the surface.

Dark-coloured Humic-Gley soils with a humus content exceeding 5% and a well developed humus horizon, formed under the influence of hard water, are known in Rumania under the popular name of "Lăcovişti" (Meadow soils).

Light coloured Low-Humic Gley soils have developed under the influence of slightly mineralized waters ; they have a weakly developed humus horizon and a low humus content (<5%). According to the nature of the parent material, these soils are grouped into :

Grey Low-Humic Gley soils (on clayey deposits) ;

Brown Low-Humic Gley soils (on loamy sandy deposits). In Rumanian, the Low-Humic Gley soils are called "Dernogleic" the prefix

„derno" being adopted from the Russian and meaning bioaccumulative process under grassy vegetation.

The terms of the genetic series of the Humic and Low-Humic Gley soils correspond to the various evolutive phases towards the zonal genetic type (Brown soil, Secondary Podzol).

7. *The group of Flood-plains and Delta soils* includes the soils, as a rule recently formed under conditions specific of the delta and of flood-plains. The evolutive phases and hydrogeologic conditions represent basic criteria for the classification of these soils (Alluvia, Alluvial soils, Chernozems, Brown soils etc.), as may be seen in the legend. Developed flood-plain soils are classified according to the features of the genetic type, corresponding to the climatic zone.

8. *The Mountain soils* are grouped separately, although they belong to certain genetic series of families that may also occur in the plain and low hill regions. The specific conditions of the mountain relief resulting in the formation of shallow profiles, rich in skeleton determine a greater influence of the parent rock.

Rock outcrops with slight or no soil formation appear separately in the legend.

Climate. Due to its geographical position, the territory of the Rumanian People's Republic is a true bioclimatic crossroads. Owing to the frequent changes of the pressure regime, the circulation of the air-mass is subject to intense seasonal fluctuations.

Due to the orientation of the mountain ranges, that influence the displacement of the air-mass, the territory of the country is divided into regions with specific climatic features.

Within the Carpathian arch (Transilvania) and in the Tisa Plain, the NW winds predominate. To the east and south of the Carpathians, the winds that run almost parallel to the mountain chain prevail ; in North Moldavia the NW and then the SE winds predominate ; in South Moldavia and the eastern part of the Rumanian Lower Danube Plain (Bărăgan), the NE and then the SW winds ; in the western part of the Rumanian Lower Danube Plain, the NW and the W winds, and then the E winds. Along the Black Sea coast the N wind is more frequent.

Starting from the north-eastern part of Moldavia and passing to the eastern part of the Rumanian Lower Danube Plain, the climate has an accentuated continental type, characterized by average temperatures in the month of January of below — 3°C and in July of over 22° to 23°C (Dfax, in the Köppen system), and monthly range of average temperatures exceeding 26°C in the central part of the Rumanian Lower Danube Plain. The influence of the Black Sea is manifested by a decrease of the monthly range of average temperatures to 22°C—23°C, brought about by a lowering in summer and rising in winter of the mean temperatures.

With attenuation of the influences from the east and increase of those from the south-west, the continental climate becomes gradually milder towards the western part of the Rumanian Lower Danube Plain; the winters are less cold (the mean temperature in January is —2° to —3°C) and the summers relatively warm. The temperate character of the climate (average temperature in January —3°C) is likewise accentuated in the Tisa Plain due to the interference of predominant southern (pre-Mediterranean) and north-western (Central European) influences.

The mountain relief creates specific climatic conditions due to the influence it exercises upon temperatures and precipitations.

In the plain areas, under conditions of a low relief, the difference in the mean annual temperatures between the south and the north of the country (5° latitude) is only 3°C (11.5 to 8.5°C) and from east to west (9° longitude) only 1°C.

The range of temperatures, in terms of elevations, is much greater, the temperature falling by 0.5 to 0.6°C with every 100 m elevation. In the upper regions of the mountain chain, the mean annual temperatures decrease significantly and may even fall below 0°C (the Omul peak, 2,507 m, —2.6°C).

The regular distribution of mean annual atmospheric precipitations reflects, as a rule, the influence of the general anticyclonal and cyclonal movements of the air-masses, and the modifying role of the relief.

In the south-east of the country (Bărăgan and Dobrogea), with a more continental climate, the amount of precipitations is smaller (350—500 mm); the smallest amount of precipitations (350—400 mm) falls on the Black Sea coast, in the Danube Delta and flood-plain. In the northern and western part of the Rumanian Lower Danube Plain, in the Getic Piedmont and Sub-Carpathians, as well as in the lower mountains of the Dobrogea and Moldavia, the amount of precipitations is higher (500—600 mm); during the warm season the rains are irregular and often fall in the form of showers; in winter, the precipitations are less abundant.

In the west — in the Tisa Plain — the mean annual amount of precipitations is higher (550—630 mm) than in the eastern part of the Rumanian Lower Danube Plain. In the higher regions of the Transilvanian Basin (the Tîrnave Plateau), and in the Someş Plateau, which are likewise under the influence of NW currents, the amount of precipitations is still higher (600—700 mm). The Turda — Alba Iulia — Blaj — Transilvanian Plain zone and Secaşe Plateau, as well as several valleys and intramount basins (the Ciuc—Gheorghieni—Tg. Secuesc etc. intramount depression), sheltered from the W currents by the mountain ridges, receive a smaller amount of precipitations (500—600 mm) than the neighbouring regions, and have a forest-steppe climate. The intramount and foot-hill depressions opening towards the west and north-west (the depressions of Făgăraş, Cibin, Baia Mare, the intramount gulfs of the Tisa Plain) have a relatively humid climate, precipitations usually exceeding 700 mm (and locally even 1,000 mm).

It is for the same reason that greater amounts of precipitations fall on the northern and western slopes of the Carpathians than on the southern and eastern slopes.

The greatest amount of precipitations is registered on the high mountains, where the average annual values exceed 1,200—1,400 mm. In general, at equal elevations, there is a greater amount of precipitations on the mountains in the western part of the country than on the eastern ones.

According to Köppen's system, the territory of Rumania belongs to the following climates :

Steppe climate (BS), sub-arctic forest climate (Df) and temperate climate (Cf). Aridity indices, ranging from 15 to more than 45, show a wide range of humidity conditions, running parallel to increase in the total amount of annual precipitations (350—1,400 mm) and decrease in the mean annual temperatures of the air (+12°C to —2°5C).

Vegetation. On the territory of the Rumanian People's Republic, the vegetation zones and subzones succeed one another in relation to the variations of the water and temperature regimes :

A) Steppe zone :
  1. Steppe subzone
  2. Forest-steppe subzone

B) Forest zone :
  1. Subzone (level) of *Quercus cerris* and *Q. frainetto* forests
  2. Subzone (level) of *Quercus petraea* and *Q. robur* forests
  3. Subzone (level) of mixed *Quercus petraea* and *Fagus silvatica* forests
  4. Subzone (level) of *Fagus silvatica* forests
  5. Subzone (level) of mixed beech and coniferous forests
  6. Subzone (level) of spruce forests *(Picea excelsa)*

C) Alpine zone.

The climatic crossroads, at which the Rumanian People's Republic is situated, reflects the interpenetration of plant areas with thermophilic elements of the south and south-east, and plant areas with xerophilic elements specific of the Asiatic steppe, against a general background in which the plant elements of Central Europe predominate. Among the specific Central European elements are *Quercus petraea, Fagus silvatica, Carpinus betulus, Abies alba* etc., which form together with the species to which they are associated great forests in the hill and mountain regions. Towards the upper limit of the forest, at sub-Alpine level, and in the sub-Alpine meadows, sub-Arctic plants are to be found : *Picea excelsa, Pinus cembra, Loiseleuria procumbens, Salix herbacea, Dryas octopetala, Vaccinium uliginosum,* next to specific Central European plants. (*Pinus montana* etc.).

The border position of the country within the great Central European pysic-geographical unit is illustrated by the fact that the *Fagus silvatica* forests, in their most eastern area of distribution, are encountered in the middle of the Moldavian Table-land (between the Prut and Nistru rivers) in the Moldavian S.S.R. Moreover, it is of interest to note that a plant, characteristic of the Sub-Atlantic Central European lands, *Calluna vulgaris,* is encountered in the northern part of the country, descending on siliceous deposits up to the arch of the East Carpathians, and in the West Carpathians ; in the South Carpathians, the Carpatho-Balkanic association of *Bruckenthalia spiculifolia* takes its place.

South and south-eastern thermophilic plants are to be found especially in south Banat, Oltenia, south-west Wallachia and Dobrogea. The most frequent forest species found in these regions are : *Carpinus orientalis, Fraxinus ornus, Quercus cerris, Q. pubescens, Q. frainetto, Jasminum fruticans, Prunus mahaleb, Syringa vulgaris, Syringa josikaea* (in the West Carpathians and Banat), *Castanea sativa, Pinus pallasiana, Cotinus coggygria. Fagus orientalis* sporadically occurs in the Rumanian Lower Danube Plain and Dobrogea. Among the southern grass species mention should be made of : *Tamus communis, Ruscus hypoglossum, Ceterach officinarum, Saponaria bellidifolia, Nectaroscordium bulgaricum* etc.

Xerophilic plants of the Eurasiatic steppe and forest-steppe are to be found in the eastern and south-eastern part of the country and only occasionally in the western one : *Quercus pedunculiflora, Stipa lessingiana, Adonis volgensis, Onosma tauricum, Centaurea orientalis* etc.

Geographic distribution of soils. The varied bioclimatic conditions that prevail on the territory of Rumania determine a great diversity of zonal genetic soil types.

The main climatic elements of the soil zones of Rumanian are given in the annexed Table.

Climatic conditions of soil zones of Rumania

Soil zones	Climate elements	Mean annual temperature °C	Mean temperature July °C	Mean temperature January °C	Summer days Max T. ⩾25°C	Tropical days Max. T. ⩾30°C	Winter days Min. T. ⩽0°C	Mean annual amount of precipitations mm	Mean annual potential evapo-transpiration mm	Aridity index (De Martonne)
I	Chestnut Steppe Soils	10.7...11.3	22.4	−0.6	80	12	21	350...427	705	16...20
II	Chernozems	8.3...11.5	21.3...23.4	−1.5...−4.0	92...117	31...51	28...40	378...577	672...730	18...27
	Dobrogea and Rumanian Lower Danube Plain	10.5...11.5	22.5...23.4	−2.0...−3.2	98...117	31...51	28...35	378...555	691...730	18...26
	Tisa Plain	10.8	21.4...21.9	−1.5				530...577	695	25...27
III	Leached Chernozems	8.3...11.5	19.3...23.2	−1.1...−4.4	75...120	17...56	24...40	378...620	631...728	20...30
	Dobrogea and Rumanian Lower Danube Plain	10.0....11.5	22.5...23.2	−2.4...−3.2	98...120	31...56	25...35	378...570	694...728	20...27
	Transilvanian Basin and Moldavian Table-land	8.3...9.8	19.3....21.7	−3.0...−4.4	75...102	17...38	31...40	440...520	631...677	27...30
	Tisa Plain	10.7...10.8	21.4	−1.1	97	33	24	560...620	695	27...30
IV	Reddish-Brown Forest Soils	10.1...11.7	21.7...23.1	−0.9...−3.3	107...114	33...51	20...31.	501...661	685...737	24...30
V	Grey and Grey-Brown Forest Soils	8.3...10.5	19.7...21.7	−3.8...−4.9	73...99	15...32	34...43	420...582	636...680	26...32
VI	Brown Forest Soils (typical and podzolized)	6.3...10.6	18.5...21.9	−2.4...−4.9	60...106	10...37	23...41	500...715	614...683	28...35
VII	Podzolic Forest and Yellowish-Brown Forest Soils	6.3...9.8	17.4...20.8	−2.4...−4.9	51...96	7...32	22...39	540...900	591...662	35...45
VIII	Acid Brown Soils, Podzolic Brown Soils and Iron-Humus Podzols	2.0...4.3	11.6...13.4	−4.9...−7.7				910...951	418...486	64...77
IX	Alpine Meadow Soils	−2.6	5.4	−10.5	0.1		161	1,340	260	182

In the Carpathians, under climatic conditions specific of the Central Europe mountains, Alpine Meadow soils, Acid Brown soils, Podzolic Brown soils and Podzolic soils (Podzols) with an iron-humus-illuvial B horizon, Brown soils (mesotrophic-eutrophic) and Podzolic Forest soils with a clay-illuvial B horizon (of the leached type) succeed one another.

At lower elevations, southern and eastern influences, against a general background of Central European influences, are increasingly felt. Thus, in the plain and low hill regions, the bioclimatic facies are differentiated by the predominant influences (from the W, S or E), which are felt in the forest zone, as well as in the steppe and forest-steppe zone.

In the forest zone, the following genetic series occur : Reddish-Brown Forest soils, that are intergrading to Central European Brown Forest soils (in the S and SE of the country) ; Grey-Brown and Grey Forest soils, intergrading to the Grey Forest soils of the USSR (in the E and NE of the country), Brown and Brown Podzolized Forest soils (in the region of the Sub-Carpathian hills) ; Yellowish-Brown Forest soils and Podzolic Forest soils (in the highly humid regions, especially in the N and NW of the country).

The forest-steppe with its specific Leached Chernozems joins the forest zone, making the transition to the steppe and its Chernozems. Chernozems and Leached Chernozems cover wide areas, especially in the Rumanian Lower Danube Plain and Tisa Plain, in the plateaux of Dobrogea, Transilvania and Moldavia.

Owing to the temperature regime, the Chernozems of the Danube steppe formed on loess contain relatively small amounts of humus (3—4.5%) ; they are also characterized by the presence of calcareous pseudo-mycelia and by an intense activity of the soil fauna, specific features of the Danubian-Pontian facies of the Chernozems.

The Chernozems of the Moldavian Table-land formed on loess, under more continental climatic conditions, are richer in humus (4—6%), and have a thicker humus horizon, features that bring them closer to the Typical Chernozems of the USSR. The Chernozems of the Transilvanian Basin, formed especially on marly-clay deposits, are very rich in humus (4—10%).

The Leached Chernozems of the Rumanian Lower Danube Plain forest-steppe show certain transition features to Reddish-Brown Forest soils (particularly the colour and higher clay content of B horizon). The Leached Chernozems of the forest-steppe in the north-western part of the Rumanian Lower Danube Plain and Moldavian Table-land show transition features to Grey Forest soils (Podzolized Chernozems), whereas those of the Transilvanian Basin intergrade to eutrophic Dark Brown Forest soils.

In each bioclimatic soil zone, the topoclimate, the nature of the parent material, the landform and age of the relief, internal drainage of the soil (deficient or excessive), depth of the ground-water table etc. bringt about, by their influence on the evolution of the soil, a great diversity of the soil cover.

In the mountain and hill regions, to the genetic soil type conditioned by the bioclimatic facies, Lithosols, Regosols, Rendzinas and Pseudorendzinas, Hydromorphic soils (Gley or Pseudogley soils and Oligotrophic or Eutrophic Peat soils) are associated.

In the river flood-plains and intramount depressions, Hydromorphic and Halomorphic soil associations predominate. In the steppe and forest-steppe, Chernozems and Leached Chernozems are frequently associated to Chernozemlike Meadow soils or even Meadow soils. When the ground-water table is at a small depth and the water is rich in soluble salts, Halomorphic soil associations occur : Solonchaks, Solonetzes and Soloths, encountered especially in subsidence plains and in certain flood-plains of the steppe and forest zone of the Tisa and the Rumanian Lower Danube Plains.

In the forest zone, the Forest soils are associated to Pseudogley soils, to Humic-Gley or Low-Humic Gley soils, as well as to Eutrophic or Oligotrophic Peats.

Mention should likewise be made of soil associations specific of the recent flood-plains that accompany the course of the rivers.

II. MORPHOLOGIC AND ANALYTICAL DATA REFERRING TO SOILS INCLUDED IN THE LEGEND

AUTOMORPHIC AND HYDROAUTOMORPHIC SOILS

Chestnut Steppe Soils

Chestnut Steppe soils [1] (see legend, No. 1) are zonal soils characteristic of the semi-arid steppe in the south-eastern part of the Rumanian People's Republic. They have formed on loess, loesslike deposits and in some places on sandy deposits, and cover horizontal or gently sloping surfaces at elevations below 150 m. The ground-water table is at great depths, except for the areas with Meadow Chestnut Steppe soils where it is found at depth of less than 10 m.

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[1] Called in Rumania "sol bălan",a popular designation introduced into soil science by G. MUNTEANU—MURGOCI (1911).

Chestnut Steppe soil. These soils have a profile of A1 — AC — Cca — C type, with slightly differentiated horizons and the following general morphologic features :

A1 horizon, 30 to 36 cm thick ; relatively light brown [1]) (generally 10YR 3—4/3) ; abundant wormcasts ; strong or moderate, granular structure ; frequently structureless (massive), breaking to very weak, subangular blocky peds ; friable ; calcareous (violent effervescence with dilute HCl) ; gradual boundary.

AC horizon, 16 to 22 cm thick ; lighter coloured ; weak, subangular blocky structure or massive ; friable ; calcareous ; many pseudo-mycelia ; gradual boundary.

Cca horizon, generally occurs at 50 or 60 cm, with a transitional Cca1 horizon of 16 to 20 cm (darker than that of the rest of the Cca horizon, as it still contains organic matter) that persists till 100 or 140 cm ; yellowish brown, with darker spots ; few efflorescences and small, soft lime concretions ; diffuse boundary to the pale yellow (2.5Y 6—7/4) C horizon.

Throughout the entire profile, krotovinas, earthworm holes and channels etc. are abundant ; the intense activity of the soil fauna and the presence of subangular blocky peds produce a high degree of looseness and a good permeability. Under tillage, Chestnut Steppe soils show a tendency to form a crust.

The humus content is 1.7—2.5% in the upper part of A1 horizon, gradually decreasing in the lower part of the profile ; total P_2O_5 content is 0.110—0.180% and total N content 0.100—0.150% ; C : N = 10—12. The mechanical fractions are almost uniformly distributed throughout the profile ; A1 horizon contains 17—26% clay (less than 0.002 mm) and 50—60% fine sand (except for Chestnut Steppe soils formed on sandy deposits containing less than 10—12% clay and over 65—70% coarse sand). The CO_3Ca content is high at the surface (5—12%) and increases slightly lower down (reaching 13—22% in Cca). Slightly soluble salts are leached from the soil ; in all, they do not exceed 0.1—0.2% up to more than 2 m depth. pH = 7.8—8.5. The cation exchange capacity is, in general, 13—20 meq./100 gm soil. Ca^{++} is predominant among the exchangeable cations. Towards the lower part of the profile there is a slight increase in the relative content of exchangeable Na^+.

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[1]) The names of colours are given according to the Munsell system ; when not otherwise specified, the moist soil is referred to.

The Chestnut Steppe soils that intergrade into Chernozems are darker and have a better soil structure; the upper horizon contains 2.8—3.1% humus and 4—8% CO_3Ca.

Meadow Chestnut Steppe soils. These soils (see legend, No. 10) occur at elevations below 10 m around the Razelm lagoon and Chilia Island in the Danube Delta. The ground-water table is to be found at depths ranging between 2.5 and 5(6) m.

Meadow Chestnut Steppe soils are usually solonized and even frequently salinized in the transitional AC and Cca horizons.

Chestnut Forest Soils
(xerophilic forests in the steppe)

Chestnut Forest soils (see legend, No. 2) are observed either on horizontal or gently sloping surfaces covered with loess, in the south-western part of Dobrogea, or on gentle slopes with loesslike deposits, around the forested areas of North Dobrogea.

The profile of these soils is of A0 — A1 — AC — Cca type; some of its features are due to the development of the soil under xerophilic forests; there is no B2t horizon (specific of soils formed under mezophilic forests).

A0 very thin (about 1 cm) forest litter; partly decomposed leaves.

A1 horizon, 20 to 30 cm thick, divided in: A11 — 5 to 10 cm, dark colour (very dark brown 10YR 2/2 moist, grey brown 10YR 5/2—1, when dry) with fine granular structure and plentiful roots; A12, 15—25 cm, lighter in colour than A11 (very dark greyish brown 10YR 3/2, moist), with medium and coarse granular structure and bleached spots; clear boundary.

AC horizon, (sometimes A3), 15 to 25 cm thick; is still dark coloured (dark brown 10YR 3/3) on account of organic matter; moderate, coarse granular and medium subangular blocky structure; bleached spots; firm; clear boundary.

Cca horizon, 80 to 100 cm; the first 20—30 cm are greyish-brown (10YR 4—5/2) when moist, due to the presence of organic matter; yellowish brown (2.5Y 5/2) when dry; in the lower part of the horizon, pale brown to pale yellowish brown (10YR 6/3—4); many pseudo-micelia, efflorescences and, below 100 cm, lime concretions.

In the typical Chestnut Forest soils carbonates occur in the lower part of A1 or the transitional AC horizons; however, sometimes they are found at the surface or lower down (up to 60—70 cm).

A11 horizon has a high humus (8—15%), and total N (0.300—0.400%) content and a high C : N ratio (15—18). In A12 there is an appreciable decrease (below 4—5% humus, below 0.200% total N); towards the lower part of the profile the decrease is gradual. The pH is above 7 and the degree of base saturation (V), higher than 90% in A11; the decrease in A12 (pH = 6.5—6.9 and V = 85—90%) is followed by an increase lower down.

Due to the humus accumulated in the profiles and to their high pH and V values, these soils resemble Chernozems. The variations in the humus content and base saturation of the profile, as well as the composition of the humus, are specific of Forest soils. Combination of Steppe soil and Forest soil features characterize the Chestnut Forest soils.

Chernozems

Chernozems are characteristic of the steppe proper. They cover level surfaces or gentle slopes that do not exceed, in general, elevations of 150—200 m; they also occur in the depressions of the dry steppe (Chernozems of dry loessial depressions, see legend, No. 7) and on the Aeolian undulated relief in the steppe (associated to Leached Chernozems, see legend, No. 8). The parent material is represented by various sediments: loess, loesslike deposits, alluvia, sands and clays of different origin etc. The ground water is at great depths; only in some areas of the low plains it is to be found at 3—6 m, influencing soil formation.

Chernozems have a typical profile of the A1 — AC — Cca — C type, with clearly outlined horizons. The upper horizon (A1) with accumulations of calcic humus is dark coloured (in general 10YR with values and chromas lower than 3/2, when moist) and a characteristic granular structure. The fairly well developed transitional AC horizon gradually passes to Cca horizon, characterized by accumulation of calcium carbonates in different forms. The calcium carbonates are found in the profile of Chernozems at various depths according to the degree of their development. Throughout the entire profile traces of an intensely active fauna can be noted.

Two Chernozem subtypes are included in the legend of the soil map at 1 : 1,000,000 scale: Calcareous Chernozem and Chernozem (typical), formed as a rule on deposits with a medium texture; a third subtype, Compacted Clayey Chernozem, formed on highly clayey deposits, is also mentioned. Hydroautomorphic Chernozems have been included in distinct units (Meadow Chernozems, Chernozemlike Meadow soils).

Calcareous Chernozems. Calcareous Chernozems (see legend, No. 3) are characterized by the presence of calcium carbonates in the upper half of the A1 horizon (frequently at the surface). The profile has the following morphologic features :

A1 horizon,	35 to 42 cm thick ; very dark brown to dark brown (10YR 2—3/3—2) ; moderate, medium and fine granular structure ; many wormcasts ; friable ; gradual boundary.
AC horizon,	18—25 cm thick ; brown to dark brown (10YR 3—4/2—3) ; moderate to weak, subangular blocky structure ; frequently pseudo-mycelia ; gradual boundary.
Cca horizon,	begins at 60 or 70 cm depth with a transitional C1ca dark coloured (10YR 4/3) due to the presence or organic matter ; many pseudo-mycelia, efflorescences and soft lime concretions ; diffuse boundary to the parent material, of the same colour as that of Cca horizon (generally pale olive brown, when the soil has developed from loess).

Calcareous Chernozem contain 21—28% clay (les than 0.002 mm) in the upper horizon, 3—4% more than the loesslike deposit from which these soils generally develop. The humus content ranges from 2.9 to 4.3%, but the most frequent values are 3—3.3% ; these gradually decrease, but a 1.2—1.5% humus content is still to be found in C1ca horizon. Total N content ranges from 0.150 to 0.200% and total P_2O_5 from 0.150 to 0.180% ; the C : N ratio is equal to 10.4 up to 12.2. At the surface, the CO_3Ca content is 1—3% (sometimes 4—5%), and in Cca horizon it reaches 18—23%. pH = 7.8—8.3. Cation exchange capacity 20—28 meq/100 gm soil ; Ca^{++}, then Mg^{++} are prevalent among exchangeable cations.

Chernozems (typical). In Chernozems (see legend, No. 4), calcium carbonates occur in the lower part of A1 horizon, or in the transitional AC horizon. In South Rumania, Chernozems are known as Chestnut Chernozems (calcareous in the lower half of A1 horizon) and Chocolate Coloured Chernozem (calcareous from AC horizon). They are generally characterized by the presence of lime pseudo-mycelia and are known also under the name of Mycelar Chernozems (this group includes likewise Calcareous Chernozems and Leached Chernozems of the southern part of Rumania). In the north of the country, especially in the Jijia Depression, there are no longer pseudo-mycelia in the Chernozems and the soils are known as Common Chernozems (N. BUCUR) and Chernozem Proper.

The morphologic features of the profile are, as a rule, the following :

A1 horizon,	38 to 42 cm thick, sometimes thicker ; black or very dark brown (10YR 2—3/1—2) ; strong, medium and fine granular structure ; many wormcasts ; gradual boundary.
AC horizon,	16—22 cm thick ; brown to dark greyish-brown (10YR 3—4/2—3) or dark yellowish brown ; weak, coarse granular or fine and medium subangular blocky structure ; frequent lime efflorescences (in southern Rumania in the form of pseudo-mycelia) ; the transitional horizon is sometimes not calcareous and presents the features of a weakly developed B horizon.
Cca horizon,	begins frequently at 65—85 cm depth ; in the upper part (C1ca), that has still a relatively high humus content, many lime efflorescences occur ; in the lower part (C2ca, below 80—110 cm), friable, lime concretions with hard core ; the colour is generally olive brown (2.5Y 4—5/4—6).

In general, the Chernozems contain 25—33% clay in A1 horizon ; in the Jijia Depression the proportion is higher (30—40% clay). There is no clay migration in the profile. The humus content of Chernozems in the southern part of Rumania usually varies from 3 to 4.6% according to climate and texture characteristics. As a rule, with attenuation of the continental climate from east to west, the humus content likewise decreases, ranging from 3.8 to 4.6% in the Chernozems of the eastern part of the Rumanian Lower Danube Plain and Dobrogea, to 2.8—3.2% in the western part of the Rumanian Lower Danube Plain and Tisa Plain. With respect to the texture, the humus content is higher in Chernozems with fine texture. Chernozems in the Jijia Depression are generally rich in humus (4.2—5.7%), having developed on clay deposits under colder and more continental climatic conditions. The thickness of the humic horizon frequently attains 80—100 cm in all Chernozems.

Total N content is 0.130—0.220% and total P_2O_5 0.110—0.200% ; C : N ratio = 11—13.In Cca horizon the CO_3Ca content is 14—23%, higher values characterizing the Chernozems developed from loesslike deposits. The reaction in A1 horizon is almost neutral, pH = 7—7.6 in

Chernozems in the eastern part of the Rumanian Lower Danube Plain and Dobrogea, and 6.6—6.8 in the Jijia Depression and Tisa Plain. The cation exchange capacity T = 25—38 meq/100 gm soil for Chernozems with a medium texture and 34—42 for Clayey Chernozems. The degree of base saturation is very high : 92—96% (or 88—92% in Chernozems of the Jijia Depression and Tisa Plain) ; among the exchangeable cations there is a definite prevalence of Ca^{++}, followed by Mg^{++}.

Compacted Clayey Chernozems. Compacted Clayey Chernozems differ from other Chernozems by their structureless, often starting from the surface. These soils characterize the hilly relief with gentle slopes, cut into clays and marls, especially in the northern part of the Jijia Depression, where they usually occur in association with Leached Compacted Chernozems (see legend, No. 9). These Chernozems have also developed in the north-eastern part of the Rumanian Lower Danube Plain, on alluvial or alluvio-proluvial clayey deposits, where they are known under the name of "Morogane".

Compacted Clayey Chernozems generally have an A1 horizon of 35—50 cm, almost black with metalic reflexes, structureless (compact) or with a strong, prismatic structure, fissures and cracks ; frequent iron and manganese concretions. A usually thick, transitional horizon overlies a horizon with calcium carbonate accumulations ; the colour of the soil is not uniform (dirty brown, sometimes greyish with darker spots) ; CO_3Ca accumulations occur particularly in the form of soft concretions ; iron and manganese segregations are also noted.

Compacted Clayey Chernozems contain over 45—60% clay. They are rich in humus (6—9%) and total N (0.260—0.300%) but poor in total P_2O_5. T = 45—55 meq per 100 gm soil. Ca^{++} predominate among the exchangeable cations. Towards the lower part of the horizon the relative content in exchangeable Na^{+} sometimes increases (up to 6—12% from T), and is considered as residual solonization.

Medow Chernozems (including Chernozemlike Meadow Soils). Meadow Chernozems (see legend, No. 11) have a water regime influenced by the ground-water table situated at a low depth — generally 2(3) to 5(6) m deep — that moistens the soil profile both pellicularly and by capillarity ; a number of its morphologic and physico-chemical features, manifested especially in the lower part of the profile, are likewise influenced by the ground water. Chernozemlike Meadow soils (see legend, No. 13) represent Meadow Chernozems in which the influence of the ground water, usually at a depth of 2 (2.5)—3(3.5) m, is stronger. These soils have been separately marked on the map only in the Tisa Plain (where they predominate) ; in the rest of the country where they occupy restricted areas they are included in Meadow Chernozems.

Meadow Chernozems cover slightly dissected and poorly drained low plains and several low river terraces. As a rule, they are associated with Chernozems (automorphic) which occur on the higher parts of the relief, and with Humic-Gley soils or Solonchaks and Solonetzes that occur on the lowest parts of the relief. The rock from which they have developed is predominantly formed of loess and loesslike deposits.

Meadow Chernozems, like zonal (automorphic) Chernozems are divided according to the intensity of the eluviation of calcium carbonates (calcareous, semicalcareous, very slightly leached Meadow Chernozems). However, in the case of Meadow Chernozems there are also salinized, solonized and solodized varieties.

The upper part of the profile of Meadow Chernozems closely resembles that of the corresponding zonal Chernozems ; the lower part of the profile, however, shows some features that bring them closer to hydromorphic soils. They differ from zonal Chernozems by :

— their darker colour, higher humus content (3.5—5.5 %) and greater thickness of the humic horizon (more than 80—90 cm) ;

— the smaller depth at which effervescence occurs (under similar climatic conditions) and more intense accumulation of generally finely dispersed calcium carbonates in Cca horizon (sometimes up to 30—45 % CO_3Ca) ;

— highly alkaline reaction in the lower part of the profile (pH is more than 8.5—9) ;

— slightly gleyization in Cca horizon, often accompanied by solonization and salinization.

The Chernozemlike Meadow soils are visibly gleyed in Cca horizon, and solonization often occurs in the transitional horizon.

Leached Chernozems

Leached Chernozems are specific of the forest-steppe and represent intergrades between Steppe Chernozems and various — grey, brown, reddish-brown — Forest soils (Silvester). They occur on level surfaces and fairly gentle slopes at elevations ranging approximately from 40(50) to 80(100) m in the plains, or from 80 (100) to 200 (220) m on plateaux and piedmonts ; only in the Transilvanian Plain do they occur between 250 and 450 m elevations. They have also developed in the steppe zone, in the lower parts of the relief (small dry loessial depressions and closed depressions) or on sandy rocks ; Leached Chernozems in the depressions (see legend, No. 7) often show surface water gley (in the forest-steppe zone).

On the Aeolian undulated relief an association of characteristic soils occurs (see legend, No. 8) : Leached Chernozems (predominant) on the slopes of dunes and Chernozems, especially on the ridges of the dunes.

The parent material is varied : loess, loesslike deposits, alluvia, sands and clays of various origin, etc. ; a gravel stratum sometimes lies at small depth below a finer deposit on some of the terraces and piedmonts. The ground-water table is at a great depth (over 5—6 m), except in certain parts of the low plains where it occurs at 2.5—5(6) m depth.

The Leached Chernozem profile is of A1 — B — Cca — C type, with clearly outlined horizons ; it differs from the profile of Chernozems in that the AC horizon has been transformed into a salt free B horizon, sometimes with slight accumulation of clay.

On the soil map these soils have been separated into Slightly, Moderately and Strongly Leached Chernozems and Podzolized Chernozems, formed as a rule on medium textured deposits ; as in the case of Chernozems, there have been distinguished also Compacted Leached Chernozems on highly clayey deposits, Meadow Leached Chernozems and Leached Chernozemlike Meadow soils.

Leached Chernozems (slightly, moderately, strongly). Leached Chernozems formed on medium textured deposits (in general loess or loesslike deposits) cover the widest area. They have the following morphologic features :

A1 horizon,	40 to 50 cm thick ; black or very dark brown (10YR 2—3/1—2) ; strong, granular structure ; friable ; gradual boundary.
A3 horizon,	15 to 25 cm thick ; dark brown or dark greyish brown ; strong, subangular blocky structure ; firm ; gradual boundary.
B2t or B horizon,	20 to 100 cm thick (sometimes thicker) ; brown or yellowish brown (10YR 3—5/3—4) (generally dark brown in the upper 20—30 cm, on account of the humus content) ; subangular blocky or moderate, fine and medium prismatic structure ; very firm ; abrupt boundary.
Cca horizon,	begins at different depths between 70 and 150 cm (sometimes deeper) ; violent effervescence with dilute HCl ; efflorescences (in South Rumania even pseudo-

mycelia) and lime concretions. Its colour is generally yellowish brown or olive brown.

According to the degree of development of the profile, reflected by the thickness ratio between B2 and A1 horizons and the depth to which the calcium carbonates are leached out, Leached Chernozems can be subdivided as follows :

Slightly Leached Chernozems with a thickness ratio between B and A horizons equal to 0.5—0.8 ; depth of Cca horizon, 75—95 cm.

Moderately Leached Chernozems with a thickness ratio between B and A horizons of 0.9—1.4 ; depth of Cca horizon 100—120 cm ; Slightly and Moderately Leached Chernozems have been included in the same unit (see legend, No. 5).

Strongly Leached Chernozems (see legend, No. 6), with a B2/A1 thickness ratio of 1.5—2 (over 2 in Very Strongly Leached Chernozems) ; depth of Cca horizon = 130—150 cm.

According to the Forest soils into which they intergrade, Leached Chernozems have certain specific morphologic features. Leached Chernozems intergrading to Reddish-Brown Forest soils have a better expressed argillic B horizon with a reddish tint ; those intergrading to Grey Forest soils are moderately leached and richer in humus or are podzolized ; Leached Chernozems intergrading to Brown Forest soils are characterized by a relatively low humus content and strong leaching of the calcium carbonates.

Slightly and Moderately Leached Chernozems, formed on medium textured deposits, contain 26—36 % clay in their upper horizon ; a slight increase in the clay content of 1—3 % is noted in A/B or B1, the texture differentiation index being below 1.1 ; in Cca horizon the clay content falls to 23—32 %.

The humus content in horizon A1 is 2.8—4.8 (in the average 3.8 %) and gradually decreases lower down in the profile, being 0.9—2.3 in B21. Total N is equal to 0.140—0.250 % and total P_2O_5, 0.120—0.180 % ; C : N ratio = 11.1—14.8. The pH is 6.5—7 at the surface and gradually increases towards the lower part of the profile reaching 8.1—8.3 in Cca horizon, which is rich in calcium carbonates (13—21 %). Cation exchange capacity varies between 23 and 38 meq/100 gm soil ; Ca^{++}, followed by Mg^{++} are predominant among the cations. Degree of base saturation is 85—95 % in A and gradually increases downward.

Strongly Leached Chernozems contain 28—35 % clay in horizon A ; the content increases in B21 by 5—6 % (up to 35—41 %), the texture differentiation index being as a rule below 1.2, then decreases in B22 and Cca, where it is 27—37 %. The humus content is 2.9—3.8 % at the surface and slowly decreases down the profile ; total N content is equal to 0.110—0.200% ; total P_2O_5 = 0.130—0.190% ; the C : N ratio = = 11.5—15. The reaction, slightly acid at the surface (pH = 6.0—6.9), gradually becomes neutral and than alkaline (pH = 8.1—8.3) in Cca horizon, which contains 8—16% CO_3Ca. Cation exchange capacity ranges between 25 and 33 meq/100 gm soil. Degree of base saturation is 78—92% at the surface and gradually increases towards the lower part of the profile.

Leached Chernozems formed on sandy deposits occupy a fairly wide area in the Rumanian Lower Danube Plain, in the forest-steppe and steppe zone. They are commonly strongly or very strongly leached and sometimes subject to deflation.

The A horizon is 42—55 cm thick, dark greyish brown, dark or very dark grey, structureless or with a weak, fine granular structure (when the texture is loamy sand). A fairly wide transition horizon (20—30 cm) overlies B horizon, 60—100 cm thick, yellowish brown (chestnut), slightly compacted. Cca horizon occurs at varied depths starting from 120—180 cm, according to the texture of the sediment (120 cm in loamy sands, completely absent in sandy soils) ; it is not clearly outlined and as a rule has no lime concretions.

These soils are poor in clay (5—10%), humus (1—2%) and nutrients. The reaction is slightly acid (pH = 6.2—6.8). The cation exchange capacity is very low : 6—10 meq/100 gm soil.

Leached Compacted Clayey Chernozems. These soils are generally structureless (compact), often from the very surface. Associated with Unleached Compacted Clayey Chernozems (see legend, No. 9), they characterize the gentle slopes of the hilly relief, cut into clays and marls, and occur especially in the Jijia Depression. They sometimes develop from alluvial or alluvio-proluvial clayey deposits in the Rumanian Lower Danube Plain (where they are known under the name of "Morogane").

Leached Compacted Clayey Chernozems have the following morphologic features :

A1 horizon.	35 to 40 cm thick ; very dark brown or black (10YR 2/1—2), with metallic reflexes ; clay loam, loamy clay or clay ; in the upper part, self-mulching ; in the lower one, prismatic structure or massive ; very plastic ; very firm ; extremely hard when dry ; fissures and cracks ; iron and manganese concretions ; gradual boundary.
A3 horizon,	15 to 20 cm thick ; similar to above, but extremely firm.
B horizon,	40 to 60 cm thick ; dark brown to dark yellowish brown or dark grey clay, with bluish grey spots ;

moderate or strong, prismatic structure; extremely firm; extremely hard; iron and manganese concretions; abrupt or clear boundary.

Cca horizon, occurs at 90—120 cm. (frequently at 90—100 cm); yellowish brown clay, with dark bluish grey and grey spots; iron and manganese segregations and soft, lime concretions and pockets.

These soils contain 50—60% clay (<0.002 mm). They are rich in humus (6—8%) and total N; the humus content decreases very slowly and remains high down to the lower part of the B horizon, and also often in the first part of Cca horizon. The cation exchange capacity ranges from 45 to 60 meq/100 gm soil. Among the cations, Ca^{++} is predominant, followed by the Mg^{++}; towards the lower part of the profile the relative content in exchangeable Na^{+} becomes appreciable (8—12%).

The almost neutral reaction at the surface becomes slightly acid in A3 and B1 (pH = 6—6.5). The degree of base saturation is high in A (90—93%) and slightly weaker in A3 (85—88%); it increases with depth.

Podzolized Chernozems. These soils occur especially in the eastern part of Rumania in the transition subzone to the forest zone; they are encountered only under forests or in recently deforested areas, since in crops and grasslands silica powdering is soon attenuated, and sometimes only a slight greyish tint is maintained, more visible when the soil is dry. They have developed from loesslike or sandy deposits.

On the map, these soils are included in the same group with Dark Grey Forest soils (see legend, No. 15).

The profile of Podzolized Chernozems differs from that of Leached Chernozems by the bleached spots on the blocky peds in the lower part of A and AB horizons and by the B2t horizon which is more clearly expressed and, as a rule, undergoing clay illuviation.

These soils have the following profile:

A1 horizon, of 20 to 22 cm thick; very dark brown to dark brown (10YR 2—3/1—2), becoming dark grey when dry; moderate or weak, granular structure; friable; clear boundary.

A2 horizon, of 20 to 25 cm thick; dark greyish brown, becoming more grey when dry; moderate, coarse granular and fine subangular blocky structure; bleached spots; firm; clear boundary.

AB horizon, of 12—18 cm thick ; dark brown to brown ; moderate, medium angular blocky structure ; bleached spots ; iron and manganese concretions ; very firm ; gradual boundary.

B2t horizon, of 40 to 100 cm thick ; brown to dark yellowish brown with darker spots ; moderate, fine and medium prismatic structure ; iron and manganese concretions ; very firm ; abrupt boundary.

Cca horizon, begins at 100—160 cm ; yellowish brown to pale brown ; efflorescences and lime concretions.

The clay content in A1 horizon is generally 26—33 % ; it increases in B2t horizon up to 34—35 %. The parent material commonly contains less than 29—33 % clay. The profile shows slight clay migration, the texture differentiation index being 1.1—1.2. The humus content of Podzolized Chernozems under forests is 5—10 % in A1, rapidly falls to 3—5 % in A2 and then gradually decreases with depth ; under crops, the humus content of these soils decreases already from the surface to 2.5—4.2 %. Total N content is 0.320—0.500 %, decreasing in the cultivated areas to 0.150—0.200 %. C:N ratio = 14—17 in A1 (falls to 12—14 if the soil is tilled). P_2O_5 = 0.100—0.150 %. The reaction is slightly acid-neutral ; it becomes more acid in B2t horizon. Cation exchange capacity is 25—45 meq/100 gm soil, with predominance of Ca^{++}. The degree of base saturation is 78—86 % in A1 and generally increases towards the lower part of the profile ; in some parts a slight decrease is noted in AB or B2t.

Meadow Leached Chernozems (including Leached Chernozemlike Meadow soils). Meadow Leached Chernozems, with a superficial groundwater table, have certain specific morphologic features particularly in the lower part of the profile. They occur in slightly dissected, poorly drained low plains and on the low terraces of the rivers in the forest-steppe zone. Generally, they are associated with Strongly Leached Chernozems that occur in the better drained parts of the relief, and with Humic-Gley soils or Solonetzes that occupy the poor drained landforms. They have developed predominantly from loess or loesslike deposits.

The Meadow Leached Chernozems (see legend, No. 12) have the ground-water table at 2(3)—5(6) m depth. According to the development of the profile these soils can be divided in slightly, moderately or strongly leached (on the soil map they are included in the same group). In comparison to the corresponding Automorphic Leached Chernozems, these soils show the following differential morphologic features :

— darker and thicker A1 horizon, richer in humus (3.5—5%) and in total N (0.150—0.300%) ;

— darker B horizon in its upper part, and chestnut (yellowish-brown), often with a greyish tint, in the lower part of the horizon ; frequent dotlike iron and manganese segregations ;

— Cca horizon usually develops at small depths (under the same conditions of climate, rock and relief) ; the lower part of the horizon is grey-greyish brown, and is not uniformly coloured ; calcium carbonates are frequently accumulated in the form of powder and large concretions ; similarly, iron and manganese concretions can also be seen. Analytical data show sometimes a high pH (8.5—9) and a slight salinization or solonization of this horizon.

Leached Chernozemlike Meadow soils (see legend, No. 14) generally have the ground-water table at a depth of 2.5—3.5 m. They represent the intergrade to Humic-Gley soils ; they are separately shown on the map only in the Low Tisa Plain ; in the rest of the country, Leached Chernozemlike Meadow soils are included in the group of Meadow Leached Chernozems. There is a visible gleying process in Cca and sometimes also in B horizon (grey spots) of these soils ; the lower part of the profile is often moderately solonized or salinized.

Leached Chernozemlike Soils (Brunizems)

Leached Chernozemlike Soils occurring in the forest zone, have predominantly developed from deluvial or eluvial, loamy or clay loamy deposits and occur on varied forms of relief : ridges, long slopes, terraces.

They are comonly associated with Humic-Gley soils that cover the undrained parts of the relief, and with Podzolized Forest soils which occur on the higher, better drained forms of the relief.

These soils are characterized by a strongly developed humic horizon, a slight or no textural differentiation throughout the profile and the absence of a Cca horizon or the great depth at which it occurs.

These soils have the following morphologic features :

A1 horizon, of 42 to 50 cm thick ; very dark coloured, black (10YR 2/1) when moist, becoming lighter (10YR 3/2) when dry ; very strong, granular structure ; friable, gradual boundary.

A3 horizon, of 15—30 cm thick ; very dark brown ; subangular blocky structure ; very fine iron and manganese concretions ; firm ; gradual boundary.

B horizon, of 80—150 cm thick, or more ; in the upper part, still dark coloured humus tongues on the outside of peds ; moderate, prismatic structure ; iron and manganese concretions ; very firm ; gradual boundary.

Cca horizon, occurs at 160—180 cm depth or more ; frequently it is absent ; when it occurs, has small amounts of calcium carbonates (generally residual) ; the colour is yellowish brown.

Brunizems often show surface water gley in the upper part of the profile and mottling in the lower part (thus differentiated in Leached Brunizems with surface water gley and Leached Brunizems).

The humus content in A1 horizon is 4—7% ; humus is accumulated over a great depth (up to 100—120 cm). The P_2O_5 content is 0.100—0.190% and total N content 0.200—0.340% ; the C : N ratio is equal to 11—14.5. The reaction is acid (pH = 5.6—6.4) at the surface and gradually decreases with depth. Cation exchange capacity is 25—40 meq/100 gm soil ; Ca^{++} is predominant among the exchangeable cations. Degree of base saturation ranges as a rule between 70 and 85%.

Grey Podzolized Forest Soils

Grey Podzolized Forest soils are zonal soils characteristic of the oak forests in the eastern part of Rumania where the influence of the continental climate is strongly felt ; in our country they represent the continental facies of Forest soils (Silvester). They cover the slopes and ridges of the Moldavian Table-land at elevations of 200 to 300 m, or the high terraces in the piedmonts of Rîmnic and Putna (being the dominant soils in these vineyard regions) and are also found in Dobrogea, particularly on the higher relief of its northern part. They have mostly formed on loess or loesslike deposits with a medium texture, but may also develop on deposits of another origin, of varied texture, usually calcareous.

Grey Podzolized Forest soils have a profile of A0 — A1 — A2 — B2t — Cca — C type, whose characteristics reflect the influence of both the woody and the grassy vegetation. The A1 horizon has a specific grey colour (especially when dry) due to silica powdering of the peds. The B2t horizon, although slightly differentiated as texture, is clearly outlined, and in Cca horizon lime segregations can be seen.

The legend of the soil map also mentions, apart from Grey Podzolized Forest soils, Grey-Brown Podzolized Forest soils and Dark Grey Forest soils, the first forming the transition to Brown Podzolized Forest soils and the latter to Podzolized Chernozems.

Typical Grey Podzolized Forest Soils. These soils are generally associated with Grey-Brown Podzolized Forest soils (see legend, No. 16); they are encountered especially on the sunny slopes or in the areas with a lower elevation. This association stresses the fact that Grey Podzolized Forest soils represent in Rumania the transition facies of these soils to the Brown Forest soils of Central Europe.

They have the following general morphologic features:

A0 horizon,	less than 1 cm; partly decomposed deciduous forest litter.
A1 horizon,	of 10 to 20 cm thick; very dark grey or very dark brown (10YR 3/1, 2—3/2); in the upper part of the horizon, weak, fine and medium granular structure, becoming in the lower part weak, coarse granular structure; friable; bleached spots in the lower part of the horizon; clear boundary.
A2 horizon,	of 10 to 25 cm thick; dark grey, dark greyish brown or brown to dark brown (10YR 4/1—3); coarse granular structure; iron and manganese concretions; firm; clear boundary.
AB horizon,	of 10 to 20 cm thick; dark brown or very dark greyish brown (10YR 3/2—3); angular blocky structure; very many bleached spots; fine iron and manganese concretions; very firm; gradual boundary.
B2t horizon,	of 60 to 140 cm thick; dark brown, brown or dark yellowish brown (10YR 3/3, 4/3—4); strong, prismatic structure; clay coatings on ped faces; fine iron and manganese concretions; sometimes, in the upper part, bleached spots on cracks; very firm; abrupt boundary.
Cca horizon,	begins at different depths, between 90 and 180 cm; yellowish brown or olive (10YR 4—5/4—6, 5Y 4—5/3—4); efflorescences, thin veins and lime concretions.

Grey Podzolized Forest soils have a clay content of 20—36% in A1 horizon, that slightly increases in B2 horizon, the texture differentiation index being 1.3—1.6. The humus content is 5—10%, total N 0.200—0.400%, total P_2O_5 0.100—0.150%; in the cultivated soils both the humus content (2—4%) and total N (0.080—0.220%) decrease. The reaction is slightly acid: pH = 5.7—6.8 in A1, sometimes falling down to 5.2—6.4 in A2 and B2 horizons. The cation exchange capacity varies between 17 and 40 meq/100 gm soil, according to the humus and clay content. Degree of base saturation is 75—85% in A1 and usually decreases to 65—80% in A2 horizon and then gradually increases with depth.

Grey-Brown Podzolized Forest Soils. As already mentioned, these soils appear in association with typical Grey Podzolized Forest soils (see legend, No. 16); they generally occur on the shady slopes, on more clayey rocks or on the higher parts of the relief.

These soils differ very little from Typical Grey Podzolized Forest soils, especially by the dark yellowish brown (chestnut) or brown colour of the upper horizon; B2t horizon is only slightly developed and Cca horizon is often poor in calcium carbonates.

Dark Grey Forest Soils. These soils are included on the map in the group of Podzolized Chernozems (see legend, No. 15), to which they are very close from the morphologic viewpoint.

In contrast to the Typical Grey Podzolized Forest soils, they are characterized by higher development of A1 horizon, which is also richer in humus; the A2 horizon is only slightly expressed (slight silica bleaching, uniformly or in spots); B2t horizon is not clearly differentiated; a slighter leaching of calcium carbonates; Cca horizon occurs at smaller depth (90—110 cm).

The clay content is 22—35% in the upper horizon, and increases very little in B; the texture differentiation index is not higher than 1.2—1.3. In A1 horizon the humus content is 6—10%, total N 0.200—0.240%, total P_2O_5 0.100—0.250%. The reaction is slightly acid or neutral (5.8—7.1). Cation exchange capacity is 20—40 meq/100 gm soil. The degree of base saturation exceeds 75—80%.

Reddish-Brown Forest Soils

Reddish-Brown Forest soils (including podzolized soils) characterize the oak forest level *(Quercus frainetto, Q. cerris)* in the southern part of Rumania, where the influence of the Mediterranean climate is felt. These soils are encountered on level or gently sloping surfaces in the plains and high terraces with good natural drainage, at elevations generally ranging from 60 to 250 m. The parent material is represented by loesslike deposits, Aeolian sands, various terrace deposits, clays and clay loams that always contain calcium carbonates. The ground-water table is at a great depth, except in certain parts of the plain that are not so well drained, where the water table is to be found at 3—5 m depth.

The profile of Reddish-Brown Forest soils is of A0—A1—B2t—Cca—C type; when podzolized it is of A0—A1—A2—B2t—Ca—C type. Characteristic of these soils is the slightly reddish tint of the profile, more evident in B2t horizon, which is strongly developed and with a visibly higher clay content than the parent material.

On the soil map three soils have been differentiated : Reddish-Brown Forest Soils, Reddish-Brown Podzolized Forest Soils and Reddish-Brown Forest Soils with Ground-Water Table.

Reddish-Brown Forest Soils. These soils are generally associated with Reddish-Brown Slightly Podzolized Forest soils, included in the same group (see legend, No. 17) ; the slightly podzolized soils occupy the forested areas or recently deforested areas, whereas Typical Reddish-Brown Forest soils (non podzolized) occur especially on the surfaces that have been tilled for a long time (mostly deriving from progradation of the slightly podzolized soils).

Reddish-Brown Forest soils have the following general morphologic features :

A0	less than 1 cm ; partly decomposed deciduous forest litter.
A1 horizon,	of 30 to 40 cm thick ; very dark greyish brown or dark brown (10YR 3/2—3), becoming greyish brown or brown (10YR 5/2—3) when dry ; strong, medium granular (in the lower part of horizon coarse granular) structure ; iron and manganese segregations ; friable ; gradual boundary.
A3 horizon,	of 10 to 15 cm thick ; brown to dark brown, sometimes dark yellowish brown (10YR 3—4/3—4), with darker spots ; strong, angular blocky structure ; iron and manganese segregations ; firm ; gradual boundary.
B2t horizon,	of 80 to 130 cm thick ; dark brown or dark yellowish brown (10YR 3—5/3—4) when moist, yellowish brown to pale brown (10YR 5—6/4, 6/3) when dry ; strong prismatic structure ; iron and manganese concretions ; very firm ; abrupt boundary.
Cca horizon,	begins between 130 and 180 cm ; yellowish brown to light yellowish brown (10YR 5—6/4) or olive (5Y 3—4/4) ; efflorescences and lime concretions.

In Reddish-Brown Slightly Podzolized Forest soils the A2 horizon is in an incipient stage of development (bleached spots on ped faces).

In the more humid part of the zone, the Reddish-Brown Forest soils formed on level surface and developed from heavier deposits show slight mottling in B2 horizon.

Reddish-Brown Forest soils have a clay content of 30—39% in A1 horizon, wich increases slightly in B2t horizon (40—45%) ; the texture differentiation index generally is 1.2—1.4. The upper part of the profile appears to have a higher clay content as compared to the parent material (32—40%). In the average, the humus content of the upper horizon is 1.8—3% ; total N 0.110—0.150% ; total P_2O_5 0.090—0.140% ; the value of the C : N ratio ranges from 11 to 14. The reaction is almost neutral (pH = 6.2 — 7.4) ; cation exchange capacity : 23—30 meq/100 gm soil ; degree of base saturation = 80—90%. Reddish-Brown Forest soils under woody vegetation have a high humus content (4.5—9%) and total N equal to 0.230—0.390% in the first centimetres ; they are more acid (pH = 6.0—6.8) and have higher base saturation values at the surface, and lower values in the middle and lower part of A1 horizon.

Reddish-Brown Podzolized Forest Soils. Reddish-Brown Moderately-Strongly Podzolized Forest soils (see legend No. 18) only occur in restricted areas ; they occupy the plains in the more humid part of their distribution areas, usually covered by forests, and most of the fixed dunes in the western part of the Rumanian Lower Danube Plain.

The profile of these soils differs from those of the Reddish-Brown Forest soils by the presence of A1 and A2 horizons, of light colour with many bleached spots, by a stronger accumulation of clay in B2t and more intense leaching of calcium carbonates (Cca horizon begins at a depth exceeding 150—200 cm).

Reddish-Brown Podzolized Forest soils contain 25—30% clay in A1 and 40—50% in B2 horizons ; the texture differentiation index is 1.3—1.7. The humus content is high in A1 (4—7%), then rapidly decreases in the rest of A2 horizon down to about 1—2% (cultivated soils contain only 2—3.5% humus at the surface). Total N is 0.114—0.230 ; C : N ratio is equal to 12—15. The pH values are 5.5—6.6 in A1, decrease to 5.0—6.4 in A2, then gradually increase with depth. Cation exchange capacity is 20—25 meq/100 km soil in A1 and increases to 30—35 meq in B2 ; Ca^{++} cation is predominant. Degree of base saturation varies between 60 and 70% in A1 and A2, then gradually increases with depth, reaching 75—80% in B2t horizon.

Reddish-Brown Forest Soils with Ground-Water Table. These soils (see legend. No. 25 a) are characteristic of plains with a ground-water table at 3—4.5 m in the Reddish-Brown Forest soil zone. They are generally associated with Meadow Leached Chernozems, occupying the higher and somewhat drained parts of the relief ; in the lower poorly drained parts, Leached Meadow Chernozems develop.

Reddish-Brown Forest soils with ground-water table have a darker A1 horizon than the corresponding automorphic soils, being richer in humus; B2 horizon is generally dark yellowish brown, or yellowish brown with greyish spots towards the lower part. Ccag horizon occurs at smaller depths (140—160 cm), showing a slight mottling and being usually richer in calcium carbonates. Iron and manganese segregations are present throughout the entire profile.

Brown Forest and Yellowish-Brown Forest Soils (Typical and Podzolized)

Brown Forest and Yellowish-Brown Forest soils, mostly podzolized, are characteristic especially of the humid, temperate zone of the western part of Rumania, with oak forests or mixed oak and beech forests, where the influence of the Ocean (sub-Atlantic) climate is felt. Most of them occur at elevations comprised between 150 and 700 m, on ridges or slopes in the hilly regions, plateaux or piedmonts, dissected to a greater or lesser extent; they also occur on certain high terraces and proluvial fans and, in the north-western part of the country, even in the plains below 150 m elevation. They have developed on deposits of varied origin and texture: loesslike, deluvial and deluvial-proluvial deposits, terrace deposits, clays, residual red clays, marls etc. The ground-water table is at great depths, except some poorly drained parts of the plain.

The profile of Brown Forest and Yellowish-Brown Forest soils is of A0—A1—B2(t)—(Cca)—C type. Slight genetic differences in colour and texture may be noted from one horizon to the next (not differentiated as texture); Cca horizon is often absent or only shows residual calcium carbonates. Yellowish-Brown and Brown Podzolized Forest soils have a profile of A0—A1—A2—AB—B2t—(Cca)—C type, in which the horizons are better differentiated both as regards colour and texture. Surface water gley is often noted in the profile of these soils.

On the soil map Brown Forest and Yellowish-Brown Forest soils, Dark Brown Forest soils, and Yellowish-Brown and Brown Podzolized Forest soils were separated.

Brown Forest Soils. The distribution of these soils is determined by certain conditions of relief and rock. They are encountered on narrow ridges and on relatively steep slopes, subjected to certain erosion, and are predominantly developed from clay deposits rich in calcium carbonates or rocks rich in basic components. On the map, the Brown Forest soil unit (see legend, No. 20) also includes Slightly Podzolized Brown Forest soils and Yellowish-Brown Forest soils (typical and slightly podzolized). Brown Forest soils are mostly used as cropland.

Brown Forest soils have the following general morphologic features :

A0 horizon,	1—2 cm, deciduous forest litter.
A1 horizon,	13 to 45 cm thick ; dark greyish brown or brown to dark brown (10YR 4/2—3) ; strong, medium and coarse granular structure ; sometimes, iron and manganese segregations ; friable ; gradual boundary.
A3 horizon	10 to 30 cm thick ; brown or yellowish brown (10YR 4/3—4), sometimes with diffuse greyish brown or dark yellowish brown spots ; strong, subangular blocky structure ; iron and manganese segregations ; firm ; gradual boundary.
B2 horizon,	30 to 120 cm thick and more ; brown, dark yellowish brown or dark greyish brown (10YR 4/2—4) ; sometimes these colours are distributed in spots ; angular blocky or prismatic structure ; iron and manganese segregations ; abrupt or clear boundary.
Cca horizon	occurs at very different depths : between 60 and 160 cm ; sometimes absent, the B2 horizon passing directly to a non-calcareous parent material.

The profile of Brown Forest soils has often surface water gley.

The clay content of these soils is 30—50% in A1 horizon, and does not vary much throughout the profile ; usually the texture differentiation index does not exceed 1.1—1.2. The humus content is 5—8% in A1 horizon (2—4% in cultivated soils) and gradually decreases with depth. Total N is 0.110—0.270% ; C : N ratio is 10.5—14 in the upper horizon. The reaction is slightly acid-neutral (pH=6.0—7.1) in A1 horizon ; the pH gradually increases lower down. The cation exchange capacity (T) is 25—46 meq/100 gm soil ; Ca^{++} and Mg^{++} predominate among the cations ; degree of base saturation exceeds 75—90% in A1 and increases more and more with depth.

Dark Brown Forest Soils [1]) These soils (see legend, No. 19) occur under transitional bioclimatic conditions from the forest zone (with oak forests) to the forest-steppe zone ; they usually develop from fine textured deposits.

The A1 horizon in the profile of these soils recalls that of Leached Chernozems, wheareas the B2 horizon is similar to that of Brown Forest soils. There usually exists a horizon with calcium carbonate accumulations at variable depths, frequently between 130 and 200 cm.

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[1]) Designated in previous works as Humiferous Brown soils, Pseudorendzinic Brown soils, Chernozemic Brown soils.

Generally, the clay content in A1 horizon ranges between 32 and 50% and increases slightly in A3 horizon. The texture differentiation index is in the average 1.2 (1.0—1.4), reflecting the absence or slight migration of clay in the profile. The humus content is 2.6—4% in A1 horizon (in cultivated soils), and gradually decreases down the profile to 0.7—1% at 100 cm depth. The total N content is 0.125—0.270%, and total P_2O_5 content approximately 0.070%; the C : N ration varies between 11 and 15. Reaction is neutral-slightly acid; pH = 6.1—7.2 in A1 horizon, gradually increasing with depth. Cation exchange capacity ranges from 27 to 42 meq/100 gm soil. Base saturation is high : 85—90% in A1 and 87—93% in B2t.

Brown Podzolized Forest Soils. These soils represent the largest bulk of the Brown Forest soil group; they occur on varied landforms especially on rocks of medium or coarse texture. The unit corresponding to these soils (see legend, No. 21), including only the stages of moderate or strong podzolization, includes also Yellowish-Brown Podzolized Forest soils (Slightly Podzolized Brown Forest soils are included in the group of Brown Forest soils).

Brown Podzolized Forest soils have the following general morphologic features :

A0 horizon, 1 to 4 cm thick; deciduous forest litter in different degrees of decomposition.

A1 horizon, 10 to 20 cm thick; greyish brown or dark greyish brown (10YR 4—5/2); moderate, granular structure; frequently, iron and manganese segregations; friable; clear boundary.

A2 horizon, 10 to 20 cm thick; yellowish brown or dark greyish brown (10YR 4—5/2—4), sometimes with dark yellowish diffuse spots; weak, coarse granular and fine subangular blocky structure, even massive, with tendency to platy structure; bleached spots; iron and manganese segregations; firm; clear boundary.

AB horizon, 10 to 16 cm thick; brown or greyish brown (10YR 4—5/2—3, 2.5Y 5/2), sometimes with yellowish red or dark yellowish brown spots; moderate, strong, angular blocky structure; bleached spots on ped faces; many iron and manganese concretions; very firm; clear boundary.

B2t horizon, 60 to 160 cm thick; brown, (dark) yellowish brown (10YR 4—5/3—4) or olive (5Y 5/3), sometimes with darker spots (10YR 4/2); moderate, prismatic structure ; clay coatings on ped faces ; many iron and manganese concretions ; firm or very firm.

C horizon, (sometimes calcareous), occurs at different depths (100—200 cm and more) ; the other features depend on the parent materia.

Visible mottling may often be observed in the upper horizons.

Brown Podzolized Forest soils show a clear texture differentiation along the profile (texture differentiation index 1.5—2). The clay content is 20—35% in A1 and increases to 40—60% in B2t. The humus content is 5—10% in A1 (in tilled soils only 2—3%) ; in A2 the humus content falls below 1—2%. The total N content is 0.100—0.400% ; the C : N ratio ranges from 11 to 16 in A1 horizon (smaller values are observed in cultivated soils). Acid reaction, pH = 4.7—6.2 in A1 and A2. Cation exchange capacity (T) varies between 10 and 30 meq/100 gm soil in A1, and increases to 20—50 meq in B2t horizon. Among the exchangeable cations, H^+ also begins to play an important part, particularly in A1 and A2 horizons (25—50% of T). Degree of base saturation is 55—75% in A1, slightly decreases in A2 to 50—70% and then shows a slight increase with depth.

Yellowish-Brown Forest Soils and Yellowish-Brown Podzolized Forest soils. In general, these soils are characteristic of the more humid part of the Brown Forest soil zone ; they occur especially in submountain and intramountain depressions, in the Sub-Carpathian hills, or in the plateau regions close to the mountain chains. The parent material from which they develop is usually poor in basic components (and calcium carbonate free). On the soil map, these soils have been included in the group of Brown Forest soils (see legend, No. 20) or in those of Brown Podzolized Forest soils (see legend, No. 21).

These soils differ from the corresponding Brown Forest soils by their pale yellowish colour in the upper horizons ; surface water gley and the absence of a horizon with calcium carbonates are frequently observed ; these soils are often only slightly differentiated as regards the texture (the podzolized soils).

The physico-chemical properties of Yellowish-Brown Forest soils and Yellowish-Brown Podzolized Forest soils closely resemble those of the corresponding Brown Forest soils ; the parent material, poorer in basic components, determined generally a more acid reaction, a lower base saturation and a lower humus and nitrogen content.

Brown Forest and Yellowish-Brown Forest Soils with Ground-Water Table (including podzolized). These soils (see legend, No. 25 b) occur in the subsidence plain, in the north-western part of the country, where they cover relatively level surface with a ground-water table at 2—4 m depth ; they are likewise encountered on certain terraces or non-flooded alluvial plains within the forest zone. They are commonly associated with Slightly Podzolized Low-Humic Gley soils.

In contrast to the corresponding Automorphic Forest soils, these soils usualy have a gleyed horizon below 100 cm depth, without or with frequent lime concretions. They are generally richer in humus, less acid and have a higher base saturation that the corresponding Automorphic Forest soils.

Podzolic Forest Soils

Podzolic Forest soils [1]) are characteristic of the humid zone with *Quercus petraea* and *Fagus silvatica* forests. Under these bioclimatic conditions, they occur on level or gentle sloping surfaces in hilly regions and piedmonts (at elevation over 300—400 m), in intra- and submountain depressions, on terraces etc. They have formed on sediments of various origin, usually non-calcareous or with a low calcium carbonate content, predominantly of medium texture, but may also develop from sediments with a coarse or fine texture. Podzolic Forest soils developing from the latter sediments generally show strong mottling.

Podzolic Forest soils have a profile of A0—A1—A2—AB—B2t—C type, with horizons that are sharply outlined. The upper horizon, residually enriched in silica, is formed of a dark coloured A1 horizon due to humus accumulation, and a light coloured A2 horizon. B2t horizon shows marked clay accumulation ; the texture differentiation index generally exceeds 1.5. Bulk chemical composition of clay is uniform in the profile or shows insignificant differences ; the clay fraction migrates as it is in these soils without suffering any changes (secondary podzolization, degradation podzolization, "lessivage", illimerization). Most of these soils have surface water gley in A2 horizon and the upper part of B2t horizon ; an exception are the Podzolic Forest soils that have developed from sandy deposits.

On the soil map at 1 : 1,000,000 scale, these soils have been divided as follows in terms of the water regime : Podzolic Forest soils, Podzolic Forest Soils with Surface Water Gley and Podzolic Forest Soils with Ground-Water Table.

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[1]) These soils are also known in Rumanian literature under the name of Secondary Podzols, Degradation Podzols, Clay-Illuvial Podzols (or Podzolic soils).

Podzolic Forest Soils. Podzolic Forest soils (see legend, No. 22) developed from medium and fine textured deposits are the most widespread ; on sands and clays they develop relatively seldom.

These soils show the following morphologic features :

A0 horizon,	a few cm thick ; in the upper part undecomposed, in the lower one well decomposed (moder) forest litter.
A1 horizon,	of 5 to 18 cm thick ; greyish brown or very dark greyish brown (10YR 5—3/2) when moist, light grey or greyish brown (10YR 7—5/2) when dry ; massive or very weak, fine granular structure ; few iron and manganese concretions ; the cultivated soils and those under meadows have a darker coloured an a thicker A1 horizon ; clear boundary.
A2 horizon,	of 10—15 cm thick ; light grey or brown to very pale brown (10YR 6—7/2—3, 4—5/3) when moist, with yellowish brown spots ; pale brown, light grey or white (10YR 6—7/3, 7—8/2) when dry, with yellowish brown spots ; massive or platy structure ; friable ; iron and manganese concretions and yellowish red spots ; clear boundary.
AB horizon,	of 15 to 25 cm thick ; yellowish brown (10YR 5/4—8) with grey spots ; weak, angular blocky structure ; bleached spots ; many iron and manganese concretions ; firm ; frequently, wavy boundary or in tongues.
B2t horizon,	of 80 to 200 cm thick ; yellowish brown (10YR 5/4—8) with reddish tint (7.5YR 5—7/8) when dry in the upper part of the horizon, if there is no mottling, and grey spots when there is surface water gley ; strong, prismatic structure ; many iron and manganese spots and concretions, which frequently form a horizon of iron and manganese hydroxide accumulation ; thick clay coatings ; sometimes, in the lower part of the horizon, bleached spots on cracks ; very firm ; gradual or diffuse boundary.
C horizon,	frequently occurs at more than 200 cm depth ; it frequently develops from deposits with a texture other than that of the parent material of the upper horizons. On calcareous parent material, a Cca horizon may occur.

In some places the A1 horizon is very thin (1—2 cm) or even absent, A0 lying directly over A2 (Clay-Illuvial Podzols).

Podzolic Forest soils formed on medium textured deposits have a 16—26 % clay content in A1 and A2 horizons, which increases up to 27—43 % in B2t ; the texture differentiation index is 1.4—2. The humus content in A1 is 2—6 % (sometimes higher in the soils under forests) and rapidly falls to 1—2 % in A2 and 0.5—1 % in AB horizons. Under grass, the humus content is somewhat higher in A2 and AB horizons. Total N content varies from 0.080 to 0.300 % in A1 and decreases to 0.020—0.070 % in AB. The C : N ratio ranges between 10 and 16, but higher values are sometimes found in A1 ; lower values characterize cultivated Podzolic soils. The total P_2O_5 content is 0.040—0.150 %.

The reaction is strongly acid : pH = 4.3—5.6 in A1, decreases slightly in A2 (4.3—5.3) and increases slightly in B2t horizon, where the values are 4.8—6. Cation exchange capacity is 8—22 meq/100 gm soil in A1, decreases to 7—18 meq in A2, and again increases to 15—40 meq in B2t horizon. Degree of base saturation (V) is always lower than 50—55 %, but may fall to 5—10 %.

According to the degree of debasification (desaturation) Podzolic Forest soils can be divided into :

moderately debasified : V = 30—50 (55) % ;
strongly debasified : V = 15—30 % ;
very strongly debasified : V = 5—15 %.

and in terms of the thickness of the debasified stratum :

debasified on a slight thicknes : V<55 % over 25—50 cm ;
debasified on a medium thickness : V<55 % over 50—75 cm ;
debasified on a great thickness : V<55 % over more than 75 cm.

Podzolic Forest soils developing from sandy sediments have an illuvial horizon with only 18—25 % clay and no surface water gley. They are poorer in humus, total nitrogen, phosphorus and exchangeable bases ; usually they are strongly debasified.

Podzolic Forest soils developed from sediments with a fine texture have an illuvial horizon richer in clay (over 45 %) and a texture differentiation index of 1.7—2.5. Accentuated surface water gley is characteristic for these soils. As a rule, they are richer in humus, nitrogen and exchangeable bases than the Podzolic Forest soils developing on medium textured sediments.

Podzolic Forest Soils with Surface Water Gley (Planosols). These soils, formed under the influence of a prolonged humidity excess, occur under conditions of imperfect drainage due to association of certain landforms and rocks. They commonly occur on the gentle sloping steps of the intermount and foot hill depressions and on certain terraces and almost level piedmont surfaces ; they seldom develop on the non-eroded surfaces of the initial plateaux levels. To these landforms, difficultly permeable clay sediments are associated (in general light or medium clays with much silt and little sand).

Characteristic of the Podzolic Forest Soils with Surface Water Gley (see legend, No. 23) is the intense pseudogleyization of the whole profile; the eluvial horizon is visibly pseudogleyed from the surface and B2t horizon is strongly pseudogleyed throughout its entire thickness. There is an accentuated texture differentiation, frequently also due to stratification of the sediment, which intensifies the pseudogleyization process; a slight peat-forming process likewise occurs in some places, accentuating still further the water excess on the surface of the soil.

Generally these soils have the following morphologic features:

A0 horizon, 2 to 3 cm thick; partly decomposed forest litter.

A1 horizon, of 7 to 12 cm thick; brown to greyish brown (10YR 5/1—3); weak, granular structure; sometimes in the first cm, platy structure; iron and manganese concretions; friable; if soil is under meadow, root mat on surface; abrupt boundary.

A2 horizon, of 10 to 30 cm thick; brown to greyish brown when moist with small yellowish brown or strong brown spots; the colour becomes light grey (10YR 7/2) or yellowish, when dry; massive; many, sometimes soft, iron and manganese concretions (1—8 mm Ø); friable; abrupt boundary.

AB horizon, of different thickness, but not thicker than A2; light brownish grey or pale brown (10YR 6/2—3) mottled with yellowish brown or strong brown; weak, fine and medium angular blocky structure; many iron and manganese concretions; bleached spots; clear, frequently wavy (in tongues) boundary.

B2t horizon, of 100 to 160 cm thick; sometimes thicker; mottled, grey and greyish brown (10YR 5/1—2 or 5Y 5/2) with yellowish brown or strong brown; prismatic structure; many, fine iron and manganese concretions; clay coatings on ped faces; fissures and deep large cracks when dry; sometimes, the upper or middle parts of this horizon have a dark (even blackish) colour; gradual or diffuse boundary.

C horizon, (sometimes Cca horizon) occurs deeper than 160 cm; brown to greyish brown (10YR 5/2—3), sometimes with diffuse yellowish brown spots; thin veins, spots and lime concretions occasionally occur, but the soil materials is not clacareous.

The clay content differs very much from one horizon to another and varies from 19—29% in A1 and A2 to 60—67% in B21t; in B22t and C it falls to 50—56%, except when it passes into another deposit. The texture differentiation index is, as a rule, over 2. The humus content = 2—4% in A1, sharply decreases lower down to 0.5—0.8 in AB. These soils are poor in total N (0.090—0.230%) and total P_2O_5. The C : N ratio is 16—19 in A1 horizon; it decreases to 10—12 in A2. The soil reaction is strongly acid: pH = 4.7—5.6 in A1 slightly lower in A2 (4.5—5.2) and gradually increases downward, being equal to 6 at a depth of about 100 cm. Cation exchange capacity is 10—14 meq/100 gm soil in A1 and increases to 30—50 meq in B2t horizon. As regards base saturation, some of the Podzolic Forest Soils with Surface Water Gley (in the intermountain depressions) show debasification on a great soil thickness, and others (on the piedmonts) on a slight soil thickness. In the former, the degree of base saturation is 6—15% in A1 and A2 and in the latter it does not fall below 18—24%; used as grassland or cropland, these latter soils soon become richer in bases, with a degree of base saturation (V) of 40—65%.

Podzolic Forest Soils with Ground-Water Table. They cover only restricted areas and are encountered in the poorly drained areas of certain intramountain and foot-hill depressions or certain low terraces; the ground-water table is at a depth of 2.5—4 m.

The morphologic and physico-chemical features of these soils are similar to those of Automorphic Podzolic Forest soils; they differ however from the latter by the presence of a gleyed horizon that occurs at about 100—200 cm depth, sometimes with lime accumulation (concretions). The gleying process at the lower part of the profile often interferes with pseudogleyization of B2t horizon.

In general, these soils are associated with Podzolized Low-Humic Gley soils.

LITHOMORPHIC SOILS

Lithomorphic soils are intrazonal soils in the formation of which a principal part is played by the mineral ground layer; their morphology and properties are strongly influenced by the parent material, being strongly differentiated from those of the surrounding zonal soils.

The Lithomorphic soils include Rendzinas, Terra-Rossa, Pseudo-rendzinas, Humic Clay Soils with Surface Water in Excess and Smonitzalike Low-Humic Black Clay soils.

Rendzinas. Rendzinas are intrazonal Lithomorphic soils developed from compact rocks rich in calcium salts (limestones, dolomites, compact marls, gypsum etc.). They are encountered in the areas with rock outcrops and usually occur on narrow crests and slopes.

The profile of the Rendzinas is relatively simple, of the A1—C type ; the A1 horizon is often skeletal and briefly passes through an AC horizon to the compact parent rock. According to the colour of A1 horizon there are Rendzinas Proper, Brown Rendzinas and Red-Brown Rendzinas. On the soil map, the first two are included under the same heading (see legend, No. 28) ; the Red-Brown Rendzinas are included together with Terra-Rossa (No. 29).

Rendzinas have the following morphologic features :

A1 horizon, 15 to 30 cm thick ; black or very dark brown (10YR 2/1—2) clay or clay loam ; dark grey or very dark grey (10YR 3—4/1) when dry ; many rock fragments ; strong, granular structure ; frequently, effervescence only on rock fragments ; clear boundary.

AC horizon, 8 to 15 cm thick ; lighter colour than that of the above horizon ; more and more rock fragments ; broken boundary to slightly weathered limestone (generally slightly compac.,

The fine material of the Rendzinas contains over 50 to 60% clay, 15—40% humus, 0.9—2% total N, 0.2—0.4% total P_2O_5 and variable amounts of calcium carbonates ranging from 0 to 50% ; the C : N ratio varies from 12 to 14. Cation exchange capacity often exceeds 75—100 meq/100 gm soil. Base saturation is over 90% and the pH = 6.5—7.5. Rednzinas contain high amounts of skeleton, often more than 50—60%. Rendzinas that have developed in the steppe zone (Dobrogea) are often much poorer in humus (4—8%), total nitrogen (0.250—0.400%) and total P_2O_5 (0.100—0.150%), and their cation exchange capacity is lower (25—35 meq/100 gm soil).

Brown Rendzinas differ from the preceding soils by their lighter colour, in general dark brown or very dark greyish brown (10YR 3—4/2) ; as a rule, they develop on more compact limestones and contain 3—12% humus, 0.120—0.600% total N, 0.150—0.250% P_2O_5 and low amounts of carbonates (0—5%) ; the C : N ratio is comprised between 10 and 14. The cation exchange capacity is 25—50 meq/100 gm soil. Base saturation exceeds 60—80% ; the pH ranges between 6.4 and 7.3.

Red-Brown Rendzinas show a reddish tint in the profile ; the A1 horizon is dark reddish brown to reddish brown (5YR 3—4/3—4), and to the lower part of the profile yellowish red to red (5YR 5/5—8 ; 2.5YR 4/6—8). The formation of Red-Brown Rendzinas is connected to certain limestones whose weathering residual red material give to these soils their specific colour. Humus content : 2—6%; total N : 0.120—0.400% ; P_2O_5 = 0.060—0.200% and 0—20% calcium carbonates ; C : N ratio = = 10—14. Cation exchange capacity is 25—50 meq/100 gm soil ; base saturation over 80% ; pH = 6.6—7.

Rendzinas, under favourable relief conditions, often develop towards Brown Forest soils, passing through the intergrade of Leached Rendzina ; in contrast to Typical Rendzinas, Leached Rendzinas have an intermediate B horizon.

Terra-Rossa. These soils, frequently associated with Red Rendzinas (see legend, No. 29) derive from the red residual weathering products of limestone or of crystalline rocks rich in iron-manganese minerals. These soils have the following general morphologic features :

A1 horizon, about 20 cm thick ; dark reddish brown or reddish brown ; granular structure ; sometimes rock fragments.

B2t horizon, of different thickness (sometimes thicker than 1—2 m) ; yellowish red or red ; angular blocky and moderate, prismatic structure ; fine iron and manganese concretions ; few limestone fragments, with reddish coatings or, in the lower part of horizon, with carbonate coatings ; generally abrupt boundary to parent rock (limestones).

These soils contain 3—8% humus and have an almost neutral reaction.

Pseudorendzinas (Humic Clay Soils on Marly Parent Rocks). Pseudorendzinas are intrazonal Lithomorphic soils that have developed in the forest zone from clay deposits, relatively rich in calcium carbonate.

The profile of Pseudorendzinas, better developed than that of Rendzinas and free of skeletal rock fragments, closely recembles the profile of Chernozems or Leached Chernozems. The stages of evolution of Pseudorendzinas are defined according to the criteria used for Chernozems and Leached Chernozems as follows : Calcareous Pseudorendzinas, Typical Pseudorendzinas, Leached Pseudorendzinas and Podzolized Pseudorendzinas ; these stages of evolution are generally conditioned by the landform.

Calcareous and Typical Pseudorendzinas are generally encountered on the narrow ridges of the hills or on moderate slopes, commonly facing south or west. Their profiles have the same features as the corresponding Chernozems ; A1 horizon is as a rule shallower (20—40 cm).

Leached and Podzolized Pseudorendzinas are characteristic of the gentle slopes, on which denudation processes are slight or inexistent. The degree of leaching of the carbonates is highly variable and the horizon with calcium carbonates often occurs at over 100—150 cm depth. Their morphologic features are similar to those of the corresponding Podzolized and Leached Chernozems ; they are richer in humus and therefore usually darker coloured.

In the profile of Pseudorendzinas the presence of iron and manganese segregations in the form of spots or concretions (that are not found in Chernozems) may be noted ; this aspect is due to the high clay content of the parent material and to the humidity conditions specific of the forest zone in which Pseudorendzinas develop.

Pseudorendzinas are always clayey ; they contain 45—70% clay, sometimes even more (more than 55—75% physical clay). In Leached and Podzolized Pseudorendzinas a slight accumulation of clay is observed in B2t ; the texture differentiation index does not, however, exceed 1.2, so that factually there is not texture differentiation along the soil profile. They have a high humus content, 4—8% (sometimes more) that gradually decreases down the profile, especially in Leached Pseudorendzinas. The total N content is 0.200—0.400 ; the C : N ratio is 11—13. The soil reaction is acid-neutral (pH = 6—7.5). The cation exchange capacity ranges from 30 to 50 meq/100 gm soil (sometimes more). Base saturation in Leached Pseudorendzinas is over 80—90%, and in Podzolized Pseudorendzinas it falls down to 60—75%.

On the soil map, Pseudorendzinas and Leached Pseudorendzinas are included in the same unit (see legend, No. 30) ; in the area corresponding to this unit Leached Pseudorendzinas predominate as a rule.

Pseudorendzinas likewise occur on the soil map within another microcomplex (see legend, No. 33), together with Dark Brown Forest soils. This microcomplex, known under the name of "Piscupia", is encountered in the Brown Forest soil area (including Podzolized Brown Forest soils) of the Getic Piedmont. They have developed on clays with calcareous nodules, under conditions of a nano-relief formed of microdepressions and heights of 10—20 cm, alternating at a distance of 50—100 cm. In the lower parts of this relief, under the influence of a more accentuated humidity that causes leaching of the calcium carbonates, Dark Brown Forest soils (sometimes Podzolized) develop ; on the higher parts of this nano-relief, Pseudorendzinas, sometimes leached or with carbonates (and calcareous nodules) from the surface, occur. Thus, on a restricted surface of only 2—3 m^2 Dark Brown Forest soils alternate with Pseudorendzinas.

Humic Clay Soils with Surface Water in Excess (under humid meadows). These soils are frequently associated with Pseudorendzinas, as they both develop under the same lithologic conditions (the association is mentioned in the legend of the soil map at Nr. 31). Humic Clay Soils with Surface Water in Excess [1]) occupy the lower part of the slopes (headwaters, troughs, valleys etc.) or the lower third (and sometimes also the middle) of the gentler slopes, especially those facing north or north-east. On these landforms favourable conditions exist for the accumulation of a humidity in excess deriving either from the hillside springs or from rainfall; sometimes a temporary or even a permanent water table is formed at shallow depth (in the lower third of the slope).

Formed under the influence of excess humidity, these soils show the characteristics of Hydromorphic soils. Their profile, as a rule deeply leached of salts, is characterized by a very thick humic horizon that often exceeds 1 m thickness; B horizon, generally invaded by humus, is dark coloured. Iron-manganese concretions and specific mottling occur throughout the entire profile, but are visible especially in the lower part (as in the upper part of the profile they are masked by the intensely dark colour of the soil); in B horizon slickensides are noted.

The clay content is 35—58%; the profile does not show a texture differentiation. The humus content is 4—10% in A, 2—4% in B, and 1—1.5% up to 100 cm. Total N content is 0.150—0.500%; The C : N ratio is 11—16. Cation exchange capacity ranges from 30 to 50 meq/100 gm soil; base saturation is over 80% and the pH = 6—6.8.

Smonitzalike Low-Humic Black Clay Soils. These soils (see legend, No. 32), comparable to similar soils in Bulgaria or in Yugoslavia, only occur in the forest zone in the southern and south-western part of Rumania. They have developed from highly clayey deposits and characterize the almost level surfaces of certain Pliocene or Early Quaternary interfluvial areas, drained by deep valleys. The ground-water table is at a great depth (more than 7—10 m).

The profile of Smonitzalike Low-Humic Black Clay soils is of the A1—B2t—Cca—C type and is characterized by its dark colour down to a great depth, sometimes over 100 cm, although the humus content is low, by the slight texture differentiation and by the absence of a granular structure in the upper horizon; iron-manganese concretions occur throughout the entire profile.

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[1]) These soils are known in literature under the name of Black Humid Meadow soils.

A1 horizon, of 20 to 40 cm thick ; clay or loamy clay ; very dark grey or black (10YR 3—2/1) ; angular blocky structure ; iron and manganese concretions ; very firm ; gradual boundary ; (sometimes there is an A3 horizon).

B2t horizon, thicker than 100 cm ; very dark grey (10YR 3/1—2) clay, becoming in the lower part dark brown with lighter spots ; sometimes occurs a darker coloured (10YR 2/1) horizon ; prismatic structure ; many iron and manganese concretions ; extremely hard ; clear boundary.

Cca horizon, occurs at 150—200 cm depth ; greyish brown or dark greyish brown (10YR 4—5/2) clay ; slight or moderate effervescence with dilute HCl ; few lime concretions.

Pseudogleyization of these soils may often be observed ; in this case the colours have a metallic grey tint and mottling appears in B2t horizon. Smonitzalike Low-Humic Black Clay soils with surface water gley are commonly podzolized.

HYDROMORPHIC SOILS

Hydromorphic soils are intrazonal soils formed under conditions of temporary or permanent excess humidity. Their distribution area is therefore determined by local conditions of rock and relief that favour the accumulation of water in excess, either at low depth (ground-water table), or at the surface of the soil (stagnation water due to precipitations, bogging on the surface). Such local conditions occur especially in the poorly drained low plains, flood-plains, low terraces, depressions, on level surfaces covered by clay deposits in the humid zone etc.

The level of the ground-water table is always at less than 2 m depth and shows appreciable fluctuations in the course of the year ; in spring the ground-water table may rise up to the surface of the soil. Mineralization of the ground water is generally low and its various chemical composition depends upon the climatic conditions, the nature of the underlying rocks, the circulation of the ground water. However, there also exist in the humid zone hydromorphic soils in which the water in excess derives from accumulation of rainfall water in the upper part of the soil (soils with surface water gley).

Specific of the profile of hydromorphic soils is the presence of a gley horizon at the level of the ground-water table (or pseudogley in the zones with maximum water stagnation) ; overlying this horizon is a bioaccumulative horizon with features that vary from one type of hydromorphic soil to another, in terms of the degree of hydromorphism, bioclimatic conditions etc.

The following hydromorphic soils are represented on the soil map: Humic-Gley Soils (Meadow Soils) Low Humic Gley Soils, Bog soil and Peats.

Although intrazonal, the hydromorphic soils show certain features determined by the general climatic conditions under which they develop.

Humic-Gley Soils (Meadow Soils) of the Steppe and Forest-Steppe. Humic-Gley soils with a dark coloured upper horizon are formed in the steppe and forest-steppe zone ($P<650$ mm annualy, aridity index<35) under the influence of a shallow ground water. These soils are encountered in the lower undrained parts of subsidence plains, in non-flooded alluvial plains and low terraces, in large and relatively deep depressions that characterize certain interfluvial areas of the Eastern Rumanian Lower Danube Plain, and on the secondary valleys in the plains. They have predominantly developed from clay-loam and clay sediments; on sandy sediments they are only to be found on the lower parts of undulated eolian relief. The ground-water table is up to 0.8—2 m depth and during the rainy season it sometimes rises almost to, or even to the surface. The ground waters are generally only slightly mineralized and cotnain 0.5—1.5 gm salts/litre; generally, bicarbonates and sometimes calcium and magnesium sulphates predominate.

Humic-Gley soils (Meadow soils) in the steppe (see legend, No. 34) are frequently associated with Meadow Chernozems, Meadow Leached Chernozems or with Solonetzes; in these associations they occupy the lower parts of the relief. In some parts they are associated with Bog soils and Half-Bog soils, when they occupy the higher parts of the relief.

After the deepening of the ground-water table, these soils evoluate towards Chernozems.

Humic-Gley soils have an A1g—AG—G an A1—AG—G or an A1—BG—G type of profile.

Humic-Gley soils with the ground-water table at 0,8—1 m depth present the following morphological features:

Ag horizon, 40 to 50 cm thick; black (N 2 or 10YR 2/1) when moist, with frequent yellowish brown (10YR 5/6) spots; granular or fine subangular blocky structure; sometimes structureless; friable or firm; iron and manganese concretions; gradual boundary.

AG horizon. 20 to 40 cm thick; dark grey (5Y 4/1) when moist, grey (N 5—6) when dry, frequently with a greenish or bluish (10GY; 10BG) tint and yellowish brown (10YR 5/6) spots; massive; firm or very firm; many iron and manganese concretions; gradual boundary.

G horizon. occurs at 60—80 cm, rarely at a greater depth ; dark grey or light grey (N 4—6 or 5Y 5—6/1), mottled, greenish (or bluish), grey and yellowish brown ; frequent, soft, lime pockets and grey, lime concretions ; wet.

Carbonates ar found at various depths in the profile of Humic-Gley soils. Generally, in the steppe the calcium carbonates are to be found in the upper part of Ag horizon and in the forest-steppe zone in AG or G horizon of these soils.

Humic-Gley soils are predominantly clayey (over 40—60% clay). They contain 6—12% humus, 0.3—0.8% total N, 0.080—0.150% total P_2O_5 ; the C : N ratio varies between 10 and 12. These soils are often weakly salinized in the upper horizon (0.2—0.3% soluble salts), and sometimes strongly salinized (about 1% soluble salts in the lower horizons). The soil reaction is slightly acid to alkaline, pH = 6.2—8.5, in terms of the content in carbonates and slightly soluble salts ; at the lower part of the profile, the pH value increases up to 8.5—9.5. Cation exchange capacity ranges from 35 to 50 meq 100 gm soil ; of the exchangeable cations, Na^+ sometimes, in Solonized Humic-Gley soils takes on higher values than usual (8—15% of T).

Meadow soils with a deeper ground-water table show visible mottling only starting from the lower part of the A horizon ; the colour and structure of A1 horizon is similar to that of Chernozems. Leached Meadow soils, frequently encountered in the forest-steppe, have a characteristically mottled, compact transitional horizon (BG), with a columnar-like or angular blocky structure, sometimes enriched in clay. Along the contact line with the forest zone, the Leached Meadow soils are often podzolized.

Humic-Gley Soils (Meadow Soils) of the Forest Zone. These hydromorphic soils, with a dark upper horizon are formed in the forest zone (P>650 mm, aridity index >35) under the influence of a shallow ground-water table. In this zone, they are characteristic of the least drained parts of low plains, non-flooded alluvial plains and low terraces, with a ground-water table occurring at less than 1.5—2 m depth. These soils have developed from loamy or clayey sediments, sometimes with thin, sandy or even gravel intercalation.

Humic-Gley (Meadow soils) of the forest zone are included in the same legend unit with those of steppe and forest-steppe areas (see legend, No. 34) ; on the soil map they can be distiguished by their geographic situation.

From the point of view of the aspect of the profile and general morphologic features, Humic Gley soils of the forest zone resemble Humic-

Gley soils of the steppe and forest-steppe zone, but they differ by the small thichness of A horizon, characterized however by a higher humus content, and by the aspect of the gley horizon, whose background is grey-coloured with bluisher tints (pointing to a more intense reduction medium).

Humic-Gley soils of the forest zone have a loamy to clayey texture (23—50% clay). The humus content is 10—20% in Ag, and 5—10% in AG. The total N content is 0.4—1% and total P_2O_5 0.070—0.220% ; the C : N ratio is 11—12, showing an advanced degree of humification. pH values range between 6.2 and 8.3 ; these soils sometimes contain calcium carbonates from the surface. The cation exchange capacity is very high : 60—80 meq/100 gm soil. Base saturation generally exceeds 70%.

Meadow Soils of the forest zone with a deeper ground-water table have a lower humus content that do not usually exceed 10%.

Low-Humic Gley Soils. These are hydromorphic soils with a light-coloured upper horizon (brown or grey), occurring in the forest zone (P>650 mm, aridity index>35). They are encountered in the most poorly drained parts of flood-plains, low terraces, non-dissected or slightly dissected plains ; the ground-water is generally only slightly mineralized and is to be found at depths smaller than 1—2.5 m. The sediments from which these soils have developed have a predominant loamy or clayey texture. Thin, sandy and even gravel intercalations often occur in these sediments.

Low-Humic Gley soils have a profile of Ag—AG—(Go)—Gr type when the ground-water table is at a depth of less than 0.8 m, and a profile of A—B2tg—BG—G type when the ground-water table lies between 0.8 and 2 m. Low-Humic Gley Soils with Surface Water Gley have a profile of Ag—B2tg—BG—G type. All these soils are frequently more or less podzolized. They are included in the same unit on the soil map (see legend, No. 35).

Low-Humic Gley soils have the following morphologic features :

Ag horizon, 15 to 20 cm thick ; dark grey or dark greyish brown with yellowish brown spots ; granular structure ; iron and manganese concretions ; firm ; gradual boundary.

AG horizon, 30 to 50 cm thick ; brown or greyish brown, mottled with yellowish brown or grey (with greenish or bluish tints) ; prismatic structure or massive ; many iron and manganese concretions ; gradual boundary.

G horizon, occurs at 60—80 cm; till 100—120 cm the oxidation processes predominate and lower down the reduction processes; wet; sometimes sulphur segregations.

Low-Humic Gley soils contain generally about 5% humus and 0.300% total N in the upper horizon; total P_2O_5 content is 0.100—0.140%, and C:N values are comprised between 11 and 13. The soil reaction is acid (pH = 4.9—6.6) and the degree of base saturation moderate, (V = 55—75%).

The soils with a deeper ground-water table develop only from sediments with a coarse texture that insure a good drainage of the upper horizons, and whose features (colour, structure, humus content) closely resemble those of zonal soils with which they are usually associated (Brown Forest soils or Podzolic Forest soils). They only cover a restricted area.

Low-Humic Gley soils with surface water gley are periodically boggy on the surface, due to deficient internal drainage of the soil (fine texture, negative landforms). Surface water gley (pseudogleyization) interferes with gleyization brought about by the ground-water table, so that the entire profile appears to be strongly gleyed. Low-Humic Gley soils with surface water gley commonly are more or less podzolized; in this case the ground-water table occurs at a greater depth (2.5—3.5 m).

Low-Humic Gley soils with surface water gley contain 2—6% humus, have an acid reaction (pH = 5.8—6.7) and base saturation ranging from 50 to 80%. The features of these soils depend to a great extent on the salt content of the ground water. When the water contains calcium bicarbonate, the soils are richer in humus and have a higher base saturation, and sometimes even a horizon with accumulation of calcium carbonates at the lower part of the profile. When the ground water contains sodium salts, these soils may undergo a certain degree of solonization in the transition of the lower horizon.

Claypan Soils. Claypan soils are hydromorphic soils formed under the influence of excess humidity due to rainfall, which periodically accumulates and stagnates in the upper part of the soil. These soils are encountered only in the forest zone on almost level surfaces without external drainage (terraces, etc.), with a clayey, difficultly permeable ground layer; sometimes they occur in the valleys without an outlet and in slight depressions within the forest zone.

Claypan soils are usually more or less podzolized; they are frequently associated with Podzolized Forest Soils with Surface Water Gley (see legend, No. 24).

The profile of Podzolized Claypan soils is strongly gleyed due to the influence of the stagnant water in the soil ; B horizon is often transformed into a pseudogley horizon.

Podzolized Claypan soils (in humid depression), have the following general morphologic features :

A1g horizon,	15—20 cm thick ; grey or dark grey (5Y 5/1) with frequent yellowish red (5YR 4/8) spots along root channels ; massive or tendency to weak, platy structure ; iron and manganese concretions ; friable ; clear boundary.
A2g horizon,	10—20 cm thick ; grey when moist, light grey (5Y 7/1) when dry, with yellowish red spots ; weak, platy structure or fine angular blocky structure ; many iron and manganese concretions ; friable ; abrupt boundary.
ABg horizon,	12 to 18 cm thick ; dark grey, mottled with grey and yellowish brown ; angular blocky structure ; vertical cracks ; frequent iron and manganese concretions ; firm or very firm ; clear boundary.
B2tg horizon,	100 to 200 cm thick ; (dark) olive grey, olive or dark grey, mottled with yellowish red or yellowish olive ; prismatic structure or massive ; vertical cracks ; iron and manganese concretions ; very firm ; sometimes the upper part is darker than the ABg horizon and the lower part of BG horizon ; clear or abrupt boundary.
Cca horizon,	occurs at very great depths (lower than 200—300 cm), or is frequently absent.

Podzolized Clapan soils have a low humus (2—4 %) and total N content (0.100—1.150 %) ; the soil reaction is slightly acid in A1g and still more acid in B2tg. Although morphologically the soils appear to be strongly podzolized, the degree of base saturation does not generally fall below 60—70 %.

Bog Soils, Peat Soils and Peats. These soils developed under conditions of a permanent excess humidity, and a rich hydrophilic or hygrophilic vegetation. They are characteristic of undrained land-forms, usually in the flood-plains of the middle or lower course of the rivers, in depressions.

Bog soils cover large areas in the Danube Flood-Plain and Delta. Their profile is characterized by a strongly gleyed upper horizon, rich in organic matter, of humic-peaty nature, followed by a reduction gley horizon. In the fluviatile-maritime Danube Delta there are wide areas of Bog soils with marine salinization, developed from marine shelly sands ; a specific plant association grows on these soils, formed of *Phragmites communis* in which *Salicornia herbacea* also develops during the dry summer period.

Bog soils gradually grades into Peat soils and Peats, whose upper horizon is formed of more or less peaty organic matter. These soils have been divided into Peat Gley soils (Boggy Peat), Peat soils and Peats, according to the thickness of the upper organic horizon, which is 0—20 cm, 20—50 cm and over 50 cm respectively.

In terms of their features (which reflect the conditions of formation and specific vegetation), Peat soils and Peats have been divided into : Eutrophic (see legend, No. 36) and Oligotrophic (see legend, No. 37).

Eutrophic Peats and Peat soils are encountered in swampy depressions fed by the ground water. The specific vegetation is formed of green mosses and different eutrophic hydrophilic vascular plants. They contain 53—94% organic matter. 6—47% ashes, 0.5—4% total N, 0.050—0.570% total P_2O_5, 0.018—1.440% K_2O, 0.8—15.9% CaO. 0.5—5.8% Fe_2O_3. The cation exchange capacity is high, 65—165 meq/100 gm peat, the reaction acid-neutral (pH = 5.1—7.6) and the degree of base saturation high, 50—100%.

Oligotrophic Peats and Peat soils develop under the influence of atmospheric humidity, on acid rocks, in a climate with a high amount of precipitations and low temperatures. They frequently occur in the mountain regions, in the upper forest zone. The specific vegetation is prevalently made up of white moss *(Sphagnum)*. These soils contain 93—99% organic matter, but a much smaller content of mineral substances : 1—7% ashes, 0.5—1.8% total N, 0.050—0.150% total P_2O_5, 0—0.060% K_2O, 0.020—0.420% CaO, 0.070—0.420% P_2O_5. The cation exchange capacity is high, 95—135 meq 100 gm peat ; the soil reaction is strongly acid (pH = 3—4.4), and base saturation low, 14—45%.

The maximum thickness of peats in Rumania is 8 m.

"Plaur" or "Plavie" (floating reed banks). The floating reed banks are formed of interlacing roots and old rhizomes of reeds and other plants, in general slightly decomposed, among which mud has deposited. The wind sometimes displaces these floating islands, characteristic of the Danube Delta.

HALOMORPHIC SOILS

Halomorphic soils — Solonchaks, Solonetzes and Soloths — are soils in whose formation and evolution slightly soluble salts play or have played an important role. The origin of these slightly soluble salts differs :

in flood-plains and slightly dissected relief of the low plains, the salts of halomorphic soils derive from the redistribution of salts occurring in small amounts in the sediments and ground waters and from their accumulation under certain geomorphologic and hydrogeologic conditions. The formation of halomorphic soils around the continental saline lakes and around lagoons or close to the sea-shore is linked to the presence of salts in the waters and deposits of lacustrine or marine origin. The formation of halomorphic soils on the slopes or even the ridges in plateau or hilly regions is determined by the outcropping of saliferous rocks (residual halomorphic soils) or the presence of such rocks in the ground layer, from where the salts are transported by subterranean waters which issue as hillside springs (Semi-residual halomorphic soils).

In Rumania, halomorphic soils occupy insular areas, where conditions favouring the accumulation of salts prevail. These conditions are : climate with a dry period in summer, associated with depressionary landforms and deficient drainage of the shallow ground water. The greatest depth of the ground-water table starting from which salinization of the upper soil horizons occurs (critical depth) ranges, in Rumania, from 1.8 m for slightly mineralized ground waters to 2.5—3.5 m for strongly mineralized waters. These conditions are encountered only in the lowest parts of the slightly dissected and poorly drained accumulative plains of the steppe and forest-steppe zone. It is therefore in such areas that halomorphic soils develop. Residual and semi-residual halomorphic soils, which may be encountered under various relief or climate conditions, form an exception, their distribution being determined by the presence of saliferous rocks close to the surface.

Solonchaks. Solonchaks (see legend, No. 38) occur in the undrained areas and occupy the lower parts of the depressions and valleys, ponds, the margins of salt lakes or the site of former salt lakes. The ground waters under Solonchaks are usually strongly mineralized.

In the profile of Solonchaks the horizons are not always sharply outlined. The upper horizon, of variable thickness (20—60 cm) is rich in salts, especially within the first centimetres, and poor in humus ; there are frequent efflorescences, thin, white veins of soluble salts and sometimes gypsum crystals. The gley process increases in the lower horizons ; humidity gradually increases and at 1—2 m the ground water, which is usually very salty, occurs.

The content in slightly soluble salts in the upper horizon of Solonchaks generally exceeds 1.5%. Solonchaks are often topped by a thin crust very rich in salts. In these soils accumulations of sodium salts (chlorides, sulphates and sometimes carbonates), and to a lesser extent calcium and magnesium salts (sulphates and sometimes chlorides), usually occur. After the salts contained, there are chloride, sulphate-chloride, chloride-sulphate, sulphate, sodic-sulphate, sodic Solonchaks.

The accumulation of soluble salts is accompanied by the accumulation of salts in the ground waters. Mineralization of the ground water and the salinity of the soils increase with the decrease of the depth of the ground-water table (and therefore increased surface evaporation). The process of mineralization of the ground waters and accumulation of salts in the soil develops in stages. In the north-eastern Rumanian Lower Danube Plain mineralization of the ground waters takes place in the following successive stages : bicarbonate, sulphate-chloride and chloride ; salinization of soils passes through the calcium-bicarbonate, mixed and sulphate-natrium-chloride stages.

Solonetzes. Solonetzes (see legend, No. 39) generally occur in depressions and valleys or around the lakes of the plain. They usually develop in a complex of soils, either with Solonchaks or Humic-Gley soils, or with Chernozemlike Meadow soils ; in the first instance they occupy somewhat higher forms of relief, and in the latter case, the lower parts. The ground waters under Solonetzes are often mineralized.

Solonetzes have a clearly differentiated profile.

A1 horizon, (eluvial), 1 to 25 cm thick ; (very) dark greyish brown or dark grey (10YR 3—4/2 ; 3/1) ; when the horizon is not too thin, colour is lighter in its lower part (10YR 4—5/2) ; platy structure ; sometimes bleached spots ; abrupt boundary.

B2sa horizon, (illuvial), 20 to 60 cm thick ; greyish brown or dark greyish brown (2.5Y 4—5/2) ; plastic and impermeable ; extremely hard when dry ; columnar or prismatic structure ; sometimes, in the lower part, efflorescences of soluble salts ; gradual boundary.

Ccag horizon, occurs at 30—80 cm ; mottling gradually increases downward ; towards 1.50—2.5 m, ground water with different degrees of mineralization.

Characteristic of Solonetzes is the alkaline reaction and their high content in exchangeable Na^{+} (and sometimes exchangeable Mg^{++}) in the B horizon. Sodium saturation exceeds 20%, reaching in sodic Solonetzes up to 70—80% of the cation exchange capacity in B horizon ; sodic Solonetzes likewise have a very strongly alkaline reaction (pH = 10—12).

In the course of desalinization, the Solonetzes of the Rumanian Lower Danube Plain generally grade into Steppe Solonetzes and then to Solonized Chernozems ; in the Tisa Plain solodization of these soils occurs in most parts.

Soloths. These soils (see legend, No. 40) occur on restricted areas. Their formation is closely linked to the accumulation and stagnation of water on the surface of Solonetzes and Solonized soils ; hence, Soloths are mostly encountered in certain depressions.

The profile of Soloths is of the A1—A2—AB—B2t—(Cca)—C type, being similar to that of Podzolic soils ; there are, however, much more iron and manganese concretions, which often develop in a compact stratum at the lower part of the A2 horizon. In comparison with Podzolic Forest soils, Soloths have a less acid reaction and a higher degree of base saturation.

Provincial Distribution of Halomorphic Soils in Rumania. On the territory of Rumania there are several regions characterized by the prevalence of a certain type and intensity of soil salinization and mineralization of the ground water, and by a given tendency in the development of the salt accumulation processes. In terms of this viewpoint, the following salinization provinces can be distinguished :

1. *Province of predominant chloride salinization* (NaCl 80—90% of total salts content) includes the area with hydromorphic soils along the Black Sea coast. Solonchaks predominate.

2. *Province of predominant sulphate-chloride salinization* (predominant NaCl, next to which appreciable amounts of SO_4Na_2 and small amounts of SO_4Mg occur) corresponds to the low, central part of the north-eastern part of the Rumanian Lower Danube Plain. Both, Solonchaks and Solonetzes occur, but strongly salinized Solonetzes predominate.

3. *Province of predominant chloride-sulphate salinization* (predominant SO_4Na_2, with which NaCl and SO_4Mg are associated ; gypsum frequently occurs in the profile) includes the eastern part of the East Rumanian Lower Danube Plain. Both Solonchaks (predominant) and Solonetzes occur.

4. *Province of predominant sulphatic salinization* (net predominance of sulphates, among which SO_4Ca) corresponds to the Jijia Depression and some parts of the Bîrlad Plateau. Saline soils (Solonetzes and Solonchaks) mostly occur on the slopes or flood-plains.

5. *Province of predominant sodic-sulphate or sulphate-sodic salinization* (with predominant SO_4Na_2 or CO_3HNa) includes the Tisa Plain and part of the East Rumanian Lower Danube Plain. Net predominance of Solonetzes.

6. *Province of predominant sodic salinization* (net predominance of CO_3Na_2 and CO_3HNa : 70—85%) includes the southern part of the Rumanian Lower Danube Plain, Covurlui Plain and part of the Bîrlad Plateau. Halomorphic soils, especially sodic Solonetzes, occur in the flood-plains.

7. *Călmățui and Danube flood-plains* represent a separate region, due to the great variety of types and intensity of salinization of halomorphic soils. The Călmățui flood-plain is the largest area of halomorphic soils in Rumania, with the highest degree of salinization.

WEAKLY DEVELOPED SOILS

This group of soils includes non-developed or weakly developed soils, in whose profile no particular morphogenetic features can be distinguished that permit their listing in a given genetic soil type. Their features are determined in the first place by the lithologic ground layer, which is but little modified by the soil-forming processes. These soils may occur in any natural zone, in certain conditions of relief and rock.

This group includes Regosols and Lithosols, encountered especially in regions with a rough relief, and Alluvia and Alluvial soils of the flood-plains ; to these may also be added the developed soils with a differentiated profile encountered in the non-flooded alluvial plains.

Regosols. Regosols (see legend, No. 44) are non-developed or weakly developed soil formations that develop from loose sedimentary deposits (sands, loess or loesslike deposits, clays, marls etc.). As a rule, they occur in regions with a rough relief, where water erosion is fairly accentuated, so that the rhythm of the denudation process is more intense or, at any rate, equal to the soil-forming process. These soils likewise occur in areas of active deflation, with eolian undulated relief and sandy sediments. Alluvial Regosols, indicated on the map and in the legend under the name of Alluvia or Alluvial soils, are characteristic of the river flooded alluvial plains.

In the dissected regions, Regosols are generally associated with various zonal soils, more or less eroded, immature soils in various stages of evolution and even outcrops of the parent rock (the respective zonal soil depends upon the natural zone) ; in some parts they are associated with Pseudorendzinas.

The profile of Regosols is characterized by a weakly outlined A1 horizon, 30—40 cm thick, brown or greyish brown in the forest zone and brown — dark brown or dark greyish brown in the steppe and forest-steppe zone, with a weak structure or even structureless ; there is a rapid transition to the parent material, represented by mobile sediments.

In terms of the zone in which they occur and other soil-forming conditions, Regosols may grade into Chernozems, Leached Chernozems, Forest soils, Pseudorendzinas, Humic-Gley soils etc.

Sandy Regosols (Psammoregosols) are fairly widespread in the Rumanian People's Republic, in the steppe and forest-steppe zone, on eolian undulated relief in continental or marine sands.

Psammoregosols have an upper horizon of 10—35 cm thick, light yellowish brown or pale brown, structureless and loose because of the sandy texture ; it also contains shelly fragments in the case of marine sands. The underlying horizon is formed of non-cohesive sand, of light grey or very pale brown colour, in which rusty or yellowish iron oxide spots may occur ; in marine sands, shelly fragments become abundant and sometimes thin layers of shells occur.

Psammoregosols formed on continental sands contain over 90—95% sands (of which 8—15% coarse sands, the rest fine sands in which the 0.1—0.2 mm fraction is predominant), less than 0.5—0.8% humus and 0.030% total N. They are free of calcium carbonates and have an acid reaction. Psammoregosols developed from marine sands contain over 95—96% fine sand (in which the 0.1—0.25 mm fraction predominates ; sometimes coarse sand occurs in the surface samples). They have, as a rule, a humus content of less than 1%, total N below 0.050% and 14—20% CO_3Ca represented especially by shelly fragments ; the soil reaction is alkaline (pH = 8.2—8.6). They usually show slight salinization of the natrium-chloride type, below 60—80 cm depth.

Lithosols. Lithosols (see legend, No. 45) differ from Regosols by the fact that they have developed on consolidated compact rocks. They usually occur in the mountain regions, where compact rocks are prevalent and the rough relief favours geologic erosion. Lithosols generally develop over restricted areas ; consequently, on the soil map they are represented together with other soils, and particularly with mountain soils ; only in North Dobrogea do they occupy larger areas. Lithosols are commonly associated with compact rock outcrops (rocky land).

Lithosols differ from Regosols by the skeletal character of the weakly developed A1 horizon. Detritus in the upper horizon is mixed in the first phases of evolution with a fine material, very rich in organic matter deriving especially from the decaying of moss and lichen remains ; in the more advanced phases of development, A horizon may often has a granular structure. More or less weathered compact rock reach 20—30 cm thickness and become rich in fine earthy matter that underlies the upper horizon.

According to their features and in terms of the conditions under which they form and the direction in which the soil develops, Lithosols may be divided into : Mor Lithosols, Moder Lithosols, Mull Lithosols, Podzolic Lithosols, Chernozemlike Lithosols etc.

On the soil map, the direction in which Lithosols or Regosols develop is often indicated by a sign added to the Lithosol or Regosol unit, sign which corresponds to the developed soil with clearly expressed morphogenetic features, associated with them.

Alluvia. This unit (see legend, No. 41) includes relatively recent, not yet developed alluvio-proluvial or alluvial deposits. They occupy the embankments in the immediate vicinity of the water courses or frequently flooded areas.

Alluvia do not show morphologic differentiation of the profile, or brown). In general, they have a fine or medium texture, which often only a slightly darker tint in the first few centimetres (brown or greyish varies downward due to stratification of the deposit.

The humus content is 0.8—2% and total N 0.070—0.120% in terms of the texture. Usually, these soils contain calcium carbonates from the surface. The alluvia of rivers whose hydrographic basin has developed in regions with predominant crystalline rocks are very poor in, or free of calcium carbonates.

Alluvial Soils. This unit (see legend, No. 42) includes the soils that correspond to the incipient stages of soil formation of the alluvial or alluvio-proluvial deposits. They occupy most of the seldom flooded areas of the alluvial plains and actual subsidence zones.

In Alluvial soils, certain morphogenetic features are somewhat more clearly outlined (humus accumulation, leaching of salts, structure etc.) ; the profile, being only slightly differentiated from the viewpoint of soil formation, cannot be listed in a given genetic soil type. The upper horizon is 20—30 cm thick, has a brown or dark yellowish brown colour, and a moderate or strong, granular structure ; then a gradual transition to alluvial deposits takes place. If the original Alluvia contains calcium carbonates, the Alluvial soils are subject to surface effervescence, and at the lower part of the upper horizon, CO_3Ca efflorescences or even lime concretions occur ; Alluvial soils of the humid zones, in which carbonates are often leached from the upper horizon, or those formed on initially carbonate free alluvia may be an exception.

In terms of the texture, Alluvial soils contain 1.3—7% humus (the more clayey they are the higher the humus content), and 0.070—0.330% total N. Calcareous Alluvial soils contain 2.5—10% CO_3Ca. The pH = 7.8—8.3 Non-calcareous Alluvial soils have a slightly acid reaction.

Due to the shallow depth of the ground water in flood-plains, Alluvia and Alluvial soils are frequently gleyed or even boggy ; in the steppe and forest-steppe zone they may sometimes be salinized or solonized.

Soils of the Unflooded Alluvial Plains. This unit (see legend, No. 43 a. b. c.) includes Chernozems, Leached Chernozems and Forest soils developed on alluvial deposits in the unflooded alluvial plains. These soils correspond to an advanced stage of evolution of Alluvial soils towards the respective genetic types ; they characterize the higher and better drained parts of the unflooded alluvial plains.

The morphologic features of these soils are very close to those of the respective zonal soils ; in most cases, they are gleyed at the lower part of the profile ; the ground-water table is at a low depth. Stratification of the deposits is sometimes noted at the bottom of the soil profile.

AUTOMORPHIC SOILS OF THE MOUNTAIN AND SUB-MOUNTAIN REGIONS

The soils occurring in the mountain and sub-mountain regions were grouped in the associations specified in the legend of the soil map (No. 46—51). Apart from the soils specified in each unit, these associations also include Lithosols, Regosols and Eroded soils, and sometimes also Hydromorphic soils or integrades to the latter.

In the mountain and sub-mountain associations, the following automorphic soils are included : Brown and Yellowish-Brown Forest soils, Brown and Yellowish-Brown Podzolized Forest soils, Podzolic Forest soils, Acid Brown soils, Podzolic Brown soils, Iron-Humus Podzols, Apline Meadow Humus-Silicate soils, Alpine Meadow Humus-Silicate soils Intergrading to Iron-Humus Podzols. The first soils (various Forest soils) also occur in the hills and plains ; the latter soils occur, in Rumania, only in mountain regions.

Brown Forest Soils. Mountain Brown Forest soils are eubasic and mesobasic soils developed from sedimentary rocks rich in bases, especially on calcareous rocks (calcareous conglomerates, Sinaia Beds, marls etc.). On such rocks these soils are encountered from the foot of the mountains up to 1,000—1,200 m elevation (sometimes even more), under beech or beech and fir tree forests, in the undergrowth of which a mull flora is to be found.

Brown Forest soils are frequently associated with Yellowish-Brown Forest soils and their podzolized stages (see legend, No. 46) ; Podzolized

Forest soils occur in this association on gentler slope and thicker cover deposits.

The profile of Brown Forest soils is of the A0—A1—B—C type; these are frequently, residual calcareous soils. Generally, they have a skeletal character, the more intense the steeper is the slope. The soils with a medium or fine texture often show mottling, the more intense, the gentler is the slope.

Brown Forest soils have the following morphologic features :

A0 horizon, 1—2 cm thick ; composed of mull-moder.

A1 horizon, 10—25 cm thick, divided in A11 and A12 ; A11 horizon has a dark brown or very dark brown colour and moderate, granular structure ; friable ; A12 horizon is brown or dark brown (10YR 4/2—3) and has a coarse granular or fine subangular blocky structure ; a transitional AB horizon, about 10 cm thick, follows ; gradual boundary.

B horizon, 20—70 cm thick or more ; brown, dark yellowish brown or dark greyish brown (10YR 4/2—4) ; coarse granular or subangular blocky structure ; friable ; gradual boundary.

BC horizon, has more and more rock fragments.

The clay content of these soils is very variable (15—45%) in terms of the parent rock ; usually there is not a clay migration along the soil profile. Humus content is 6—12% in A11 horizon and 3—7% in A12 horizon ; in B horizon it decreases below 2%. The soil reaction is slightly acid (pH = 6—6.7). The cation exchange capacity is 35—50 meq/100 gm soil in the upper horizon and significantly decreases to 15—30 meq towards the lower part of the profile. Base saturation is high throughout the entire profile, generally over 75% in eubasic soils and 60—75% in mesobasic soils.

Brown Podzolized Forest Soils. Brown Podzolized Forest soils occur in the mountains on relatively permeable petrographic ground layers or on gentler slopes with a thick cover deposit; bioclimatic conditions and elevations are those shown for Brown Forest soils.

They differ, however, from the latter by the presence of an A2 horizon and by the difference between the textures of A and B2t horizons. The soil reaction is more acid (pH = 5—6) and base saturation is lower (50—70%).

Yellowish-Brown Forest Soils (including podzolized). These soils are varieties of the respective Brown Forest soils formed on less basic rocks or under higher humidity conditions. They are mesobasic soils, characteristic of beech forest level, formed on varied rocks : Sinaia Beds, calcareous conglomerates, products resulting from weathering of acid or intermediate crystalline rocks etc. These soils ocuppy large areas on sedimentary deposits, especially on those with a fine texture and sometimes with carbonates.

The profile of these soils differs from that of the corresponding Brown Forest soils by their somewhat lighter colour of the upper horizon (having a lower humus content) and by the yellowish tint of the entire profile. They are sometimes residually calcareous, but relatively intensely debasified in the upper part of the profile.

Yellowish Brown Forest soils contain 2.5—7% humus in A11, only 1—3% in A12 and less than 1.5% (or even than 0.8%) in B horizon. Cation exchange capacity is 15—40 meq/100 gm soil in A11 horizon and falls to 10—25 meq towards the lower part of the profile. The soil reaction is slightly-moderately acid (pH = 5.5—6.5) and the degree of base saturation ranges from 50 to 80%.

Podzolic Forest Soils. Mountain Podzolic Forest soils occur on relatively restricted areas, as a rule associated with Brown or Yellowish-Brown Podzolized Forest soils (see legend, No. 47). They have developed from a permeable petrographic ground layer, poor in bases (sandstones, sands, gravels etc.) on level surfaces or gentle slopes in the beech forest level, at elevations up to 1,000 m. However, these soils also occur on rocks richer in bases, at elevations of 1,000—1,500 m, under conditions of a more humid climate, under a cover of acidifying plants.

In contrast to the Podzolic Forest soils of the hill and plain regions, they have a shorter profile, with thinner horizons, and in many cases skeletal character. These soils usually have a yellowish tint. When they are not too sandy, mottling frequently occurs.

The humus content is 5—10% in A1 and 2—4% in A2 horizon. The soil reaction is slightly-moderately acid (pH = 5.4—6) and the degree of base saturation relatively low in the upper horizon (V = = 20—40%).

Acid Brown Soils. Acid Brown soils represent a large group of oligobasic soils formed on rocks relatively poor in bases : acid and intermediate crystalline rocks (mica-schists, gneisses, granites, andezites etc.), and sedimentary rocks poor in bases (sandstones, conglomerates etc.). They are encountered at elevations ranging from 300—400 m to 1,700—1,800 m, under beech *(Fagus silvatica)*, spruce *(Picea excelsa)*, and mixed forests *(Picea excelsa, Abies alba, Fagus* *silvatica).* They also occur in small areas under associations of *Juniperus sibirica* with *Vaccinium* sp. In the region of the high hills they occur under beech *(Fagus silvatica)* and oak *(Quercus petraea)* forests.

The varied bioclimatic conditions within the wide area in which Acid Brown soils occur have brought about the formation of various soils, which may be grouped as follows :

Acid Yellowish-Brown soils with mull ;

Acid Yellowish-Brown soils with moder ;

High-Humic Acid Brown (sometimes yellowish) soils with moder or moder-mor.

The former are grading into Yellowish-Brown Forest soils (with an active argillic process), and the latter represents the initial terms of the genetic series of iron-humus illuvial podzolization.

Acid Yellowish-Brown Soils with mull occur al elevations of 300—700 m under beech and oak and beech forests. Ericaceae and moss sometimes form the ground soil cover in these forests and their glades, especially in the mountains in the north of the country.

The distribution area of these soils comes in contact at the lower limit with the eutrophic-mesotrophic Yellowish-Brown and Brown Forest soils (of the clay-illuvial series) and with the Podzolic Forest soils ; at their upper limit, these soils come in contact especially with Acid Yellowish-Brown soils with moder (see legend, No. 48).

Acid Yellowish-Brown soils with mull have a profile of the A0—A1—AB—B—BC—C type. The horizons show little difference in colour and have a non-differentiated or slightly differentiated texture profile.

These soils have the following morphologic features :

A1 horizon,	5—15 (25) cm thick ; dark greyish brown (10YR 4/2) when moist, light greyish brown or pale brown (2.5Y 6/2—3) when dry ; medium and coarse granular structure ; clear or gradual boundary.
AB horizon,	10—15 cm thick ; colour lighter than above ; coarse granular or fine subangular blocky structure ; sometimes, iron and manganese concretions ; gradual boundary.
B horizon,	40 to 100 cm thick ; yellow or pale yellow (2.5Y 7—8/4, 7/6) ; medium subangular blocky structure ; iron and manganese segregations, and sometimes concretions ; rock fragments, generally weathered ; abrupt or clear boundary.
BC horizon,	occurs at 50—100 cm depth ; more and more frequent strongly weathered rock fragments.

The clay content is 20—30 % and is practically uniform throughout the whole profile. The humus content is 3—8 % in A1 horizon, significantly decreasing in AB or in the upper part of B horizon (1.6—2.4 %) ; the total N content is 0.150—0.400 % in A1 horizon and decreases to 0.090—0.120 % in AB or B ; the C : N ratio is about 13—14 in both horizons. Cation exchange capacity is 13—25 meq/100 gm soil in A1 horizon and gradually decreases towards the lower part of the profile. The soil reaction is acid : pH = 4—4.6 in A1 horizon and increases to 4.6—5.0 in the lower part of B horizon. Base saturation is as a rule below 30 % in A1 horizon, decreases in AB and B horizon and increases towards the lower part of the profile (B—BC). These soils contain free sesquioxides (up to 40—60 % free Fe_2O_3 as compared to total Fe_2O_3) almost uniformly distributed throughout the profile, or slightly accumulating in B horizon. SiO_2/R_2O_3 ratio varies in terms of the nature of the rock ; these values are generally higher in A1 horizon and lower in B horizon, but within a close range.

Acid Yellowish-Brown Soils with moder occur at various elevations, from 600—700 m to 1,300—1,500 m, under beech forests *(Fagus silvatica)* in whose floor vegetation and glades *Ericaceae* and *Lycopodiaceae* are sometimes to be found ; these soils may also occur under spruce forests *(Picea excelsa)*. They are associated (see legend, No. 48), especially towards the upper limit of their distribution area with Acid Brown soils and even with Podzolic Brown soils.

Acid Yellowish-Brown soils with moder have a profile of A0—A1—AB—B—C type, characterized by the absence of texture differentiation and by the slight morphologic expression of the horizons.

A0 horizon, 2—5 cm thick ; partly decomposed forest litter.

A1 horizon, 10—20 (25) cm thick, divided in : A11, 3 to 6 cm thick, brown to dark brown or very dark greyish brown (10YR 4/3, 3/2) when moist, pale brown or dark grey (10YR 6/3, 4/1) when dry ; A12, 7 to 15 (20) cm thick, dark yellowish brown (10YR 4/4) when moist, (light) yellowish brown (10YR 5—6/4) when dry ; weak, granular structure or massive ; friable ; gradual boundary.

AB horizon, 10 to 15 cm thick.

B horizon, 20—70 cm thick ; dark yellowish brown or yellowish brown (10YR 4/4, 5/5) when moist, yellowish brown or pale yellow (10YR 6/4, 2.5Y 7/4) when dry ; frequent yellowish red and grey spots ; subangular blocky structure ; gradual boundary.

C horizon, occurs at 50—100 cm ; weathered rock.

In most cases, Acid Yellowish-Brown soils with moder contain many rock fragments ; sometimes, in the soils occurring on gentle slopes and formed on finer textured material, slight mottling of the B horizon is noted.

The clay content of these soils is commonly below 30% (loamy-sand or sandy-loam) and always gradually decreases downward. The humus content is over 10% in A1 : sharply falls in A12 to less than 2—6% and to less than 2.5% in B. The total N content is 0.100—0.450% in A1 and total P_2O_5 content, 0.060—1.00% (sometimes more) ; the C:N ratio is 20—24 at the surface and decreases to 14—15 with depth. The cation exchange capacity ranges from 12 to 25 meq/100 gm soil in A1 horizon and decreases with depth. The soil reaction is acid : pH = 4.8—5.4 in A11, slightly lower in A12 sometimes attaining 4.5, and then increases to 5—5.5 in B horizon. Base saturation may exceed 35% within the first few centimetres (A11), falls below 20% and even 10% in the rest of A12 horizon and then gradually increases to 50% in BC (or up to 100% on calcareous rock).

When the forest has been cut and replaced by grass *(Festuca rubra* etc.), Acid Yellowish-Brown soils partly modify their features under the influence of the grassy vegetation. Thus, the colour of A12 and AB horizon becomes darker (by one value and chroma unit), the humus content is almost the same in A11 but increases up to twofold values in A12 ; the C : N ratio falls to 15—17 in A11 as a consequence of increase of the N content and degree of humification of organic matter (predominantly mull). Base saturation likewise increases in A11 (up to over 50%), but remains low in A12 and especially in AB horizon. Similarly, pH values increase to 5.5—5.7 in A11. In opposition, when *Nardus* is prevalent in the secondary grassland, pH values and base saturation decrease.

High-Humic Acid Brown Soils with moder or moder-mor are characteristic of spruce forests level *(Picea excelsa)* or even of mixed forests *(Picea excelsa* with *Fagus silvatica* and *Abies alba).* In the northern part of the country these soils also occur under pure beech forests of the upper limit. They have formed on the mountain slopes at elevation ranging from 600—700 m to 1,500 m in the north of the country and between 700 m and, 1,800 m in the south, on acid or intermediate rocks (sandstones, conglomerates, crystalline schists, granites, andesites etc.).

These soils are frequently associated with Podzolic Brown soils and in some places with Iron-Humus Podzols ; in this association (see legend, No. 49), High-Humic Acid Brown soils occupy the steeper slopes and those facing south (generally in the lower part of the spruce forest level). They are likewise associated with Yellowish-Brown Forest soils (see legend, No. 47) ; in this association they occur on more acid rocks, under moss or ericaceae, and on the northern slopes.

High-Humic Acid Brown soils are characterized by rapid acidification and predominant clay destructive processes. Their profile is of the A0—A1—B—C type, with accumulation of humus of the moder type, without texture differentiation.

A0 horizon,	under the undecomposed forest litter or under the moss layer there follows at last 1 cm of blackish brown moder or a thin mor layer ; abrupt boundary.
A1 horizon,	5—15 cm thick, sometimes thicker ; dark brown or very dark greyish brown (10YR 3/2—3) ; coarse texture ; many rock fragments ; weak, granular structure ; whitish sand grains, without humus coatings ; clear boundary.
B horizon,	15—16 cm thick ; yellowish brown (10YR 5/6) when moist, pale yellow (2.5Y 7/4) when dry ; the same texture ; moderate or weak, subangular blocky structure ; rock fragments, more and more frequent ; gradual boundary.
C horizon,	occurs at 30—80 cm ; weathered rock.

The clay content is 20—35% in the upper part of the profile and gradually decreases with depth. The humus content is 10—20% in A1 horizon, 5—10% in B horizon and 2—4% in BC ; fluvic acid predominates in the composition of humus. The total N content in A1 horizon is 0.4—0.9%. The C : N ratio is 17—20 and is just as high in the upper part of B horizon. Cation exchange capacity is, as a rule, 30—60 meq/100 gm soil in A1 and 10 meq in B horizon. These soils contain free Fe_2O_3 and Al_2O_3 ; there is none, or an insignificant sesquioxide migration. SiO_2/R_2O_3 ratio differs according to the nature of the rock (4—10). In the upper part of the profile the values are higher than at the lower part, varying however within close limits (for instance 5.48 in A1 and 5.03 in B). The soil reaction is strongly acid : pH = 4.—5.4 in A1, sometimes decreases slightly in B below 5, then increases at the transition to the rock. Base saturation is 15—40% in A1 and somewhat lower in B horizon ; in the north of the country, base saturation in A1 is less than 10%, increasing in B horizon to 10—15%.

Under a grassy vegetation of *Festuca rubra, Agrostis tenuis* or *Nardus stricta,* these soils develop morphologic features close to those of Humus-Silicate soils intergrading to Iron-Humus Podzols ; a weak structure is noted in A1 horizon.

Podzolic Brown Soils. Mountain Podzolic Brown soils characterize the level of the spruce forest *(Picea excelsa)*. These soils occur at elevation of 700—1,700 m in the mountains of the northern part of the country and at 1,000—2,000 m in the mountains of the southern part of the country. They usually develop from acid rocks : siliceous sandstones and conglomerates, crystalline schists, acid eruptive rocks. On sandstones and acid crystalline schists these soils also occur under mixed spruce and beech forests with *Ericaceae,* in the microclimatic conditions of the northern slopes.

Podzolic Brown soils are associated (see legend, No. 49) with Acid Brown soils and, in some places, with Iron-Humus Podzols, in the level of spruce forests ; in this association they occupy the gentler, northern slopes. They are likewise associated with Iron-Humus Podzols under *Pinus montana* at the lower limit of the inferior Alpine level, occupying especially the slopes (see legend, No. 50).

Podzolic Brown soils represent a stage of evolution of Acid Brown soils towards Iron-Humus Podzols. They have a profile of A0—A1—Bir—C type, in which sesquioxide migration is observed :

A0 horizon,	2 to 3 cm thick ; black moder ; sometimes moder layer is replaced by a moss layer *(Polytrichum, Thuidium)* ; abrupt boundary.
A1 horizon,	4 to 15 cm thick ; dark brown (7.5YR 3/2) or black on account of humus accumulation ; massive ; angular grains of quartz, without humus or sesquioxide coatings ; rock fragments ; clear boundary.
Bir horizon,	30 to 80 cm thick, sometimes thicker ; in the upper part, dark reddish-brown (5YR 3/2), in the lower one reddish brown or yellowish red (5YR 5/4—6); massive; more and more frequent rock fragments ; gradual boundary.
C horizon,	occurs at 40—100 cm depth ; rock fragments predominate.

Podzolic Brown soils generally are loamy-sandy or sandy-loamy. The humus content is 15—25% in A1 and gradually decreases down the profile (6—10% in Bir and 1—2% in C horizon). Fulvic acids predominate in the composition of humus : the humic acids-fulvic acids ratio is 0.3—0.7. Total N content is high, and the C : N ratio is as a rule over 20. The cation exchange capacity is 30—40 meq/100 gm soil in A1 horizon and decreases with depth. The migration of sesquioxides from A1 horizon and their accumulation in Bir horizon is noted. The soil reaction is strongly acid : pH = 4.3—4.9 in A0, 3.8—4.7 in A1 ; it sometimes decreases slightly in the first part of Bir horizon, then gradually increases with depth, attaining 4.5—5. Base saturation varies between 10 and 45 % in A1 and 20—25 % in Bir horizon ; it then gradually increases to 40—50 % at the boundary with the parent material, when the latter is not acid.

Under grass vegetation, Podzolic Brown soils grade into soils similar morphologically to Humus-Silicate soils intergrading to Iron-Humus Podzols.

Iron-Humus Podzols. These mountain soils are characteristic of the upper part of the spruce forest level and *Pinus montana* level. They occur under *Picea excelsa* forests with a ground cover of *Ericaceae (Vaccinium myrtillus, V. vitis-idaea, Brukenthalia spiculifolia)* or moss *(Polytrichum, Sphagnum* etc.), and under associations of *Pinus montana, Loiseleuria procumbens* and *Rhododendron kotschyi.*

They occur on the ridges or gentle slopes of the mountains, at elevations of 1,800—2,300 m, on acid and permeable rocks (granites, gneiss, sandstones, conglomerates etc.). On acid rocks and under microclimatic conditions of humidity and shade, they also occur at lower elevations — up to 1,500 m or even 1,000 m. — under beech or mixed forests with an *Ericaceae* ground cover.

In the level of *Picea excelsa* forests, Iron-Humus Podzols develop locally among Acid Brown soils and Podzolic Brown soils (see legend, No. 49). In the level of *Pinus montana* associations, Iron-Humus Podzols are associated with Podzolic Brown soils (see legend, No. 50), the former predominating.

Iron-Humus Podzols are very acid soils, characterized by the formation and accumulation of raw humus, and by advanced destruction of primary silicates and migration of the decomposition products together with humic acids. The profile is of A0—A1—A2—Birh—C type, with clearly differentiated genetic horizons. On the soil surface there is either a cover of *Vaccinium* or *Sphagnum,* or a cover of spruce needles. The profile has the following morphologic features :

A0 horizon,	3 to 7 cm thick ; very dark brown or very dark grey ; raw humus predominates.
A1 horizon,	5 to 15 cm thick (sometimes reunited with A0) ; dark brown, very dark brown, or very dark greyish brown (7.5YR 3/2, 10YR 2—3/2) ; massive ; some rock fragments ; much raw humus and moder ; abrupt boundary.
A2 horizon,	8 to 15 cm thick (sometimes thicker or thinner) ; grey (10YR 5—4/1) when moist, light grey (10YR 6—7/1)

when dry ; massive (single grain) ; rare rock fragments ; abrupt boundary.

B21irh horizon, 3 to 8 cm thick ; dark reddish brown (5YR 3/2—4) ; massive ; more frequent rock fragments ; gradual boundary.

B22irh horizon, 6 to 20 cm thick ; dark reddish brown, gradually becoming downwards brown (7.5YR 4/4) or yellowish brown (10YR 4—5/4) when moist, strong brown or reddish yellow (7.5YR 5—6/6) when dry ; massive ; more and more frequent rock fragments.

BC horizon, occurs at 30—70 cm depth ; yellowish brown ; rock fragments predominate.

Iron-Humus Podzols are sandy to sandy-loamy. The humus content is 12—25% in A1 and only 1—5% in A2 horizon ; in B21irh the humus content increases to 5—15% and rapidly decreases downward. In the composition of the humus, fulvic acids predominate (the humic acids : fulvic acids ratio is 0.3—0.7). The total N content is 0.2—0.6% in A1 horizon. The C : N ratio is 18—30 in A1 and generally higher in B21irh. The cation exchange capacity varies very much in the profile : 60—70 meq 100 gm soil in A0, 25—60 meq in A1, 6—20 meq in A2 ; it increases up to 50 meq in B21irh and then decreases to 5—15 meq/100 gm soil in BC horizon. pH values and degree of base saturation (V) likewise vary very much in the profile : in A0 horizon, pH = 3.7—4.6 and V = 20% ; in A1, pH = 3.9—4.4 and V = 13—25% ; in A2, pH = 4.1—4.5 and V = 6—10% ; in B21irh, pH = 4.4—5 and V = 13—30% ; in B22irh horizon the values increase slightly. There is an accentuated accumulation of free sesquioxides in B21irh.

Apart from Iron-Humus Podzols, Iron Podzols and Peaty Podzols also occur. The former contain much less humus in B21ir horizon, that takes on a more intense reddish tint ; they occur on slopes under *Picea excelsa* forests. The latter have a well developed peaty horizon under a ground cover of moss *(Sphagnum, Thuidium* or *Polytrichum)*; they are the most acid and the poorest of the Iron-Humus Podzols.

Iron-Humus Podzols likewise develop under grass ; High-Humic Iron-Humus Podzols, in which A2 horizon is invaded by humus, occur especially under *Nardus stricta.*

Alpine Meadow Humus-Silicate Soils. These soils are characteristic of grasslands with *Carex curvula* in the upper Alpine level. They occur at over 2,400 m elevation, in general on steep slopes, predominantly facing north and west ; in some places, in glacial cirques, they also occur at lower elevations. They have developed from varied rocks : sandstones, conglomerates, different crystalline schists and eruptive rocks.

They are associated with Humus-Silicate soils, intergrading to Iron-Humus Podzols (see legend, No. 51), the later predominating.

Alpine Meadow Humus-Silicate soils are very acid soils, rich in humus. Their profile is of the A—AC—C type, slightly differentiated, and with the following morphologic features :

A0 (or A11) horizon	5—6 cm thick ; root mat with little mineral material (generally fine sand, brought by the wind from rocky lands).
A1 horizon,	12—15 cm thick ; very dark greyish brown (10YR 3/2) ; sand or loamy-sand ; single grain ; loose ; clear boundary.
AC horizon,	10—15 cm thick ; brown (10YR 4/3) ; sand with more and more frequent rock fragments ; abrupt boundary.
C horizon,	more or less weathered compact rock, occurs generally at 30—35 cm depth.

A1 horizon contains up to 30—40% organic matter (humic substances and intermediate products of plant decay). Humus, especially in the transition horizon, appears in the form of a dark coloured powder, easily detachable from the mineral particles. In AC horizon, the humus content still is 10%. The total N content is 0.9—1% ; the C : N ratio is as a rule over 20. The cation exchange capacity is about 30—50 meq/100 gm soil in A1 and 10 meq in AC horizon. The pH value is approximately 4 and sometimes lower in AC horizon (when the parent material is acid). Degree of base saturation is about 10% in A horizon ; in soils formed on acid rocks it decreases to 4—5% in AC horizon, and on basic rocks it increases up to 70—85%.

Alpine Meadow Humus-Silicate Soils intergrading to Iron-Humus Podzols. These soils, also called Alpine Meadow Brown soils, are characteristic of *Carex curvula* grasslands of the Alpine level. In contrast to the previously described soils, they occur on gentle slopes or platforms, at elevations of over 2,300 m. They develop on varied, acid or basic rocks: conglomerates, sandstones, crystalline rocks.

In comparison to Alpine Meadow Humus-Silicate soils their profile, in which a B2ir horizon with accumulation of sesquioxides occurs, has the following general morphologic features :

A0 horizon,	4—7 cm thick ; organic mat or dark greyish brown coloured rhizomes ; abrupt boundary.
A1 horizon,	12—25 cm thick ; very dark greyish brown ; loamy sand or sandy loam, with rock fragments ; massive ;

sand grains without colloidal coatings (mainly in the lower part of the horizon) ; clear boundary.

B2ir horizon, 20—35 cm thick ; reddish brown, sometimes darker or yellowish ; loamy sand with many rock fragments ; massive ; clear boundary.

BC horizon, 10—15 cm thick ; yellowish brown ; rock fragments predominate ; abrupt boundary.

C horizon, compact rock, occurs at 50—80 cm.

The humus content of moder type is 15—40% in A0, with a high C : N ratio (the total N content being 0.5—0.8%) ; in A1 horizon the humus content is 10—25% and in B2ir horizon, 3—7%.

Cation exchange capacity is about 20—45 meq/100 gm soil in the upper horizon. pH is equal to 4.2—4.8 in A0 and does not exceed 5 down to B2ir horizon when the parent material is basic. Base saturation in A0 is 20—30%, decreases in A1 to 10—15% and gradually increases in B2ir horizon according to the nature of the parent material.

BIBLIOGRAPHY

1. ASVADUROV H. Cercetări pedologice în sectorul Mihăilești—Bălăria—Grădiștea. *D. S. Comit. Geol.* XLII, București, 1959.
2. ASVADUROV H. Cercetări pedologice în Cîmpia înaltă Hagieni—Fetești. *D. S. Comit. Geol.* XLII, București 1959.
3. ASVADUROV H., VASILESCU P. Cercetări pedologice de recunoaștere în regiunea colinară dintre Topolog, Vedea și Argeș. *D. S. Comit. Geol.* XLVII, București 1962.
4. ASVADUROV H., VASILESCU P. Cercetări pedologice de recunoaștere în sectorul Ilia—Vorța—Zam. *D. S. Comit Geol.* XLVII, București, 1962.
5. BUCUR N. Caracterizare elementară a complexului pedologic din depresiunea Jijia—Bahlui. *Acad. R.P.R. (Iași). Studii și Cercet. științ.* VI/1—4. Iași, 1953.
6. BUCUR N., BARBU N. Complexul agropedologic din podgoria de la sud de Iași. *Acad. R.P.R. (Iași). Bul. științ. (Biol. Șt. agric.)* VI/4, Iași 1954.
7. BUCUR N., BARBU IAȘI N. Complexul de condiții fizico-geografice din „Coasta Dealul Mare-Hîrlău". *Probleme de Geografie,* I, București, 1954.
8. BUCUR N. Clasificarea pedogeografică a lăcoviștilor din R.P.R. *Probleme de geografie,* III, București 1957.
9. BURT M. Unele particularități legate de evoluția solului în cîmpie. *Probleme agricole,* nr. 2, 1955.
10. BUTNARU V. Cernoziomul degradat de la Miroslava-Iași. *Acad. R.P.R. (Iași). Stud. Cercet. științ. (Biol. St. agric),* III/1—4, Iași 1952.
11. BUTNARU V., PLEȘA D. Morfogeneza solurilor silvestre din bazinul Crasnei (Podișul central Moldovenesc). *Știința Solului* nr. 2/1964.
12. CERNESCU N. Zone de soluri în Bucegi. Bul. Soc. Natur. Rom. București, 1933.
13. CERNESCU N. Facteurs de climat et zones de sol en Roumanie. Inst. Geol. Rom. *Std. Tehn. și Econ.,* Seria C, nr. 2, București 1934.
14. CERNESCU N. Die Bodenzonen der Region des humiden Klimas Rumäniens. *V. Kommiss. Internat. bodenk. Ges.* Wien, 1937.
15. CERNESCU N. Contribuțiuni la cunoașterea chimismului genetic al solurilor cu orizont de acumulare a argilei I. Solul brun-roșcat de pădure. *Bul. Fac. de Agron. București.* Nr. 2 — 1945.
16. CERNESCU N. Contribuțiuni la cunoașterea solurilor zonale cu orizont de acumulare a argilei II. Podzolul de depresiune. *Bul. Fac. de Agron. București* nr. 3, 1945.

17. CERNESCU N. Les sols situés entre le Danube, les Carphates et la Mer *Noire. VI-ème Congr. Intern. Sci. Sol.* vol. E, Comisia V. Paris, 1956.
18. CERNESCU N., FRIDLAND V. M., FLOREA N. Raionarea pedogeografică a R.P.R. Realizări în geografia R.P.R. în perioada 1947—1957, Bucureşti, 1958.
19. CERNESCU N., ŞERBĂNESCU I., TUFESCU V., STOENESCU ST. M. Condiţiile naturale şi solurile R.P.R. Cercetări de pedologie. Editura Acad. R.P.R. Bucureşti, 1961.
20. CERNESCU N. Clasificarea solurilor cu exces de umiditate. *Cercetări de pedologie.* Edit. Acad. R.P.R. Bucureşti, 1961.
21. CERNESCU N. Harta de soluri a Romîniei, scara 1 : 500.000. *D. S. Comit. Geol.* (1955—1956), Bucureşti, 1962.
22. CERNESCU N., FLOREA N. Lista sistematică a solurilor din R.P.R. *Studii şi cercetări de Biologie şi Ştiinţe agricole. Acad. R.P.R.* — Baza Timişoara, Tomul IX, nr. 1—2, 1962.
23. CERNESCU N., GÎTA ELENA, STOICA ELENA, PAPACOSTEA P., POPA ELENA. Solul podzolic de la Săsar — Baia Mare şi efectul ameliorativ al marnării. *Comit. Geol. Studii Tehn. şi Econ.* Seria C, nr. 11, Bucureşti, 1963.
24. CHRIŢĂ C. D. Contribuţii la cunoaşterea genezei şi evoluţiei solurilor prin procese de degradare. *An. ICEF,* VII (1941). Bucureşti, 1942.
25. CHIRIŢĂ C. D. Contribuţii la cunoaşterea solurilor din regiunile accidentate din zona podzolirii. *Studii şi Cerc. ICEF.* XII, Bucureşti, 1951.
26. CHIRIŢĂ C. D. Sols de forêt de la région carpathique et precarpathique roumaine. Leur succession génétique et géographique *Rapp. présenté au VI-ème Congr. Intern. de la Sci. du Sol.* Paris, 1956.
27. CHIRIŢĂ C. D., TUFESCU V., BĂNCILĂ T., BĂLĂNICĂ T., BELDIE AL., CEUCA G., MEHEDINŢI V. Solurile bazinului superior şi mijlociu al Putnei. *Probleme de pedologie. Acad. R.P.R.* Bucureşti, 1958.
28. CHIRIŢĂ C. D., TUFESCU V., CEUCA G., PÎRVU E., POPA A., IONESCU M., NONUŢĂ I. Solurile bazinului mijlociu al Bistriţei între Broşteni şi Bicaz. *Probleme de Pedologie. Acad. R.P.R.* Bucureşti, 1958.
29. CHIRIŢĂ C., PĂUNESCU C. Solurile brune şi podzolice din R.P.R. *Cercetări de Pedologie. Acad. R.P.R.* Bucureşti, 1961.
30. CHIRIŢĂ C., BUTUCELEA SOFIA, IONESCU M., MEHEDINŢI V., POPA A. Procese de pedogeneză şi soluri de degradare morfogenetică în zona solului brun-roşcat de pădure din Cîmpia Romînă. *Acad. R.P.R. (Cluj). Studii şi Cerc. de Agron.* XIII, Cluj. 1962.
31. CÎRSTEA D. Solurile în partea superioară a interfluviului celor două Secaşe (Raion Sebeş-Alba). Acad. R.P.R. (Timişoara). *Studii Cerc. şt. (Biol. şi St. Agric.)* VII/1—2. Timişoara. 1960.
32. CÎRSTEA ST., MATEESCU SC. Cercetări pedologice între Jiu şi Olt. *D. S. Comit. Geol.* XLII. Bucureşti, 1959.
33. CÎRSTEA ST., MATEESCU SC., CAZARO GH., MARŢIAN N. Cercetări pedologice în sectorul dintre Baia de Criş—Sarmisegetuza—Vinţul de Jos. *D. S. Comit. Geol. XLIII.* Bucureşti, 1962.
35. CÎRSTEA ST., MARŢIAN N. Cercetări pedologice în sectorul Călimăneşti—Băbeni—Bistriţa—Armăşeşti—Vădeni. *D.S. Comit. Geol.* XLII. Bucureşti, 1962.
36. CONEA ANA, TUTUNEA C., MUICĂ N. Cercetări pedologice îm Cîmpia dintre Olt şi Argeş. *D. S. Comit. Geol.* XLIV. Bucureşti, 1962.

37. CONEA ANA, POPOVĂŢ ANGELA, VOLOVICI C., MUCENIC IULIA, CÎRSTEA D. Cercetări pedologice în partea estică a interfluviului Călmăţui — Ialomiţa. *D. S. Comit. Geol.* XLIV. Bucureşti, 1962.
38. CONEA ANA, VOLOVICI C., MUCENIC IULIA, NIŢU I. Complexul pedologic al Văii Călmăţuiului. *D. S .Comit. Geol.* XLIV. Bucureşti, 1962.
39. CONEA ANA, VOLOVICI C., MUCENIC IULIA, NIŢU I. Solurile Cîmpiei şi dealurilor Oradiei. *D. S. Comit. Geol.* XLVII. Bucureşti, 1962.
40. CONEA ANA, VOLOVICI C., MUCENIC IULIA, NIŢU I. Solurile Cîmpiei şi dealurilor Oradiei. *D. S. Comit. Geol.* XLVIII. Bucureşti, 1962.
41. ENCULESCU P. Evoluţia succesivă a solului şi subsolului din depresiuni şi paralel cu aceasta şi a vegetaţiei spontane ce o suportă, din stepa uscată pînă în zona forestieră. *Viaţa Agricolă*, XI/12, Bucureşti, 1920.
42. ENCULESCU P. Contribuţiuni la studiul turbei şi turbăriilor din România. *D.S. Inst. Geol. Rom.* Bucureşti, 1916.
43. ENCULESCU P. Zonele de vegetaţie lemnoasă din România în raport cu condiţiunile oro-hidrografice, climaterice, de sol şi de subsol. *Mem. Inst. Geol. Rom.* Bucureşti, 1924.
44. ENCULESCU P. Le climat comme facteur de variation des types zonaux de sols (Dégradation et régradations des sols). Mém. sur la nomenclature et la clasification des sols. p. 269—270. Helsingfors, 1924.
45. ENCULESCU P. Le sol et la végétation spontanée de Roumanie — *La Roumanie agricole*, p. 25—50, Bucarest, 1925.
46. ENCULESCU P. Loessul din România şi solurile zonale ce s-au format pe socoteala sa. *Bul. Agric.* VII/11—12. Bucureşti, 1929.
47. ENCULESCU P. Le l [illegible] de la Roumanie et les sols zonaux formées à ses dépens. *Ann. Sci. de l'Acad. des Hautes Etudes agron. de Bucarest*, I. Bucarest 1929.
48. ENCULESCU P. La marne et les sols qui peuvent se former à ses dépens. *Ann. Sci, de l'Acad. des Hautes Études agron. de Bucarest,* I. Bucarest, 1929.
49. ENCULESCU P., SAIDEL T. Les pâturages et les sols salés de la Vallée du Călmăţui. *C. R. Congr. Int. d'Agric. du Haag*, 1937.
50. ENCULESCU P. Le sol Branciog ou Brancioc. *Ann. de la Fac. d'Agron. de Bucarest.* p. 77—90. Bucarest, 1940.
51. FLOREA N. Solurile R.P.R., *Rev. Natura 3,* Bucureşti, 1955.
52. FLOREA N. 50 ani de dezvoltare a cercetărilor de Geografia solurilor în ţara noastră. *Rev. Natura 2,* Bucureşti, 1956.
53. FLOREA N. Date asupra influenţei apei freatice în formarea şi evoluţia solurilor din Cîmpia Brăilei. *An. Univ. Parhon,* 12, Bucureşti, 1956.
54. FLOREA N. Privire sumară asupra solurilor din partea de sud a regiunii Piteşti (I). *Probl. agric.* 11, Bucureşti, 1956.
55. FLOREA N. Privire sumară asupra solurilor din partea de sud a regiunii Piteşti (II). *Probl. agric.* 12, Bucureşti, 1956.
56. FLOREA N. Quelques particularités morphogénétiques des tchernozioms phreatique humides (de prairie) de la Plaine Roumaine. *VI-ème Congrès Internat. Sci Sol.* (E, 5), Paris, 1956.
57. FLOREA N. Cercetări pedologice în Cîmpia Tecuciului. *D. S. Comit Geol.* XLI, Bucureşti, 1957.
58. FLOREA N. Raionarea preliminară a sărăturilor din R.P.R. *Probl. agric.* 9, Bucureşti, 1958.
59. FLOREA N. Noua hartă de soluri a R.P.R. şi resursele funciare ale ţării. *Rev. Natura,* XI/3, Bucureşti, 1959.

60. FLOREA N., PREDEL FL., MUNTEANU I. Cercetări pedologice între Mostiștea și Argeș. *D.S. Comit. Geol.* XLII, București, 1960.
61. FLOREA N., FRIDLAND V. M. Soluri (Capitol în Monografia geografică a R.P.R., vol. I). Edit. Acad. R.P.R. București, 1960.
62. FLOREA N. Privire generală asupra sărăturilor din R.P.R. *Cercet. de pedologie Acad. R.P.R.* București, 1961.
63. FLOREA N. Indici de clasificare a cernoziomurilor danubiene pentru hărți la scară mijlocie. *Cercet. de pedologie, Acad. R.P.R.* București, 1961.
64. FLOREA N., MUICĂ N. Observații pedologice generale în podișul Sucevei. *D.S. Comit. Geol.*, XLVIII, București, 1962.
65. FLOREA N., CONEA ANA Solul castaniu (maroniu) de păduri xeroterme și șibleacuri, un nou sol pentru R.P.R. *D.S. Comit. Geol.* XLVIII, București, 1962.
66. FLOREA N., STOICA L., STOICA ELENA Contribuții la cunoașterea solurilor cenușii de pădure din R.P.R. — *Comit. Geol. Studii Tehn. și Econ.* seria C, nr. 11, București, 1963.
67. FLOROV N. Über die Degradierung des Tschernosioms in den Waldsteppen. *An. Inst. Geol. Rom.*, XI, București, 1926.
68. FRIDLAND V. M. Solurile R.P.R. și legăturile lor geografico-genetice. *Rev. Natura*, 5, București, 1957.
69. GUȘTIUC L. Propunere de clasificare a solurilor aluviale din luncile rîurilor din R.P.R. — *Lucr. științ. ale Inst. Agron. „Ion Ionescu de la Brad"* — Iași, 1959.
70. GUȘTIUC L., CHIRIȚĂ C. Solurile din Delta Dunării și evoluția lor. *Hidrobiologia*, vol. I. Edit. Acad. R.P.R., București, 1958.
71. GUȘTIUC L., GHEORGHIU E., POPESCU M. Solurile de pe grindul Chilia și măsurile pedoameliorative. *Lucrări științifice. Inst. Agron. „Ion Ionescu de la Brad"*, Iași. Edit. Agrosilvică, 1960.
72. GOGOAȘĂ T., CUCUTĂ AL. Cercetări pedologice în partea estică a cîmpiei Vlăsia (Raionul Snagov). *D. S. Comit. Geol.* XLII, București, 1959.
73. GOGOAȘĂ T. Cercetări pedologice în cîmpia dintre Ialomița—Mostiștea—Lunca Dunării—Valea Jegălia. *D. S. Comit. Geol. XLIII*, București, 1962.
74. GOGOAȘĂ T., CUCUTĂ AL. Cercetări pedologice în partea de nord a Platformei Covurlui. *D. S. Comit. Geol.*, XLIII, București, 1962.
75. HORNUNG ST. Aspecte agro-pedologice din Basinul Rîului Negru (Trei Scaune) — *Probleme agric.* 3, București, 1956.
76. IANOVICI V., FLOREA N. Tipurile de scoarță de alterare și răspîndirea lor pe teritoriul R.P.R. — *Studii Tehn. și Econ. Comit. Geol.* Seria C, nr. 11, București, 1963.
77. IONESCU SISEȘTI GH., SAIDEL T. Etudes des principaux types de sol de la Roumanie par la methode physiologique végétale afin de determiner leur besoins en azote, phosphore et potassium et leur besoin d'engrais chimique. București, 1929.
78. IONESCU SISEȘTI GH. Studiul principalelor tipuri de sol ale Romîniei prin metoda fiziologic vegetală, pentru a determina conținutul lor de azot, fosfor și potasiu și necesitatea lor de îngrășăminte. *An. ICAR*, I. p. 14—55, București, 1930.
79. IONESCU SISEȘTI GH. Cercetări asupra podzolului. *Viața Agric.* 11, București, 1932.
80. IONESCU SISEȘTI GH. Contribution à l'étude de la fertilité de tschernosioms. Oxford 1935, I. p. 261—264.

81. IONESCU SISEȘTI GH. Dezvoltarea studiilor despre sol în Romînia. *Acad. Rom. Discursuri de recepție* LXIX, M. O. și Impr. Statului, Impr. Națională. București, 1937.
82. IONESCU SISEȘTI GH. Tipurile principale de sol din Romînia și necesitatea lor de îngrășăminte. Impr. Independența, București, 1937.
83. IONESCU SISEȘTI GH. Principalele tipuri de sol din Romînia. Răspîndire, descriere, compoziție, starea de fertilitate, nevoia de îngrășăminte. *Publ. ICAR*, 47. București, 1939.
84. IONESCU SISEȘTI GH., COCULESCU GR. Die Hauptbodentypen Rumäniens. *An. ICAR*, X, București, 1939.
85. IONESCU SISEȘTI GH., STAICU I. Agrotehnica (2 vol.) Ed. Agro-Silvică de Stat, București, 1958.
86. MĂIANU AL. Cercetări asupra salinizării secundare a unor soluri îndiguite și irigate din Lunca Dunării. *ICCA, An. Secției de Pedologie*, XXX, București, 1962.
87. MĂIANU AL. Studiul procesului de salinizare secundară a solului pe parcele de orezărie dispuse în trepte. Măsuri de prevenire și combatere. *ICCA. An. Secției de Pedologie*, XXX, București, 1962.
88. MĂNUCĂ O. Aspecte în legătură cu caracteristica și geneza solurilor alcalice de pe malul stîng al Crișului Alb. — *Probl. de Pedologie. Acad. R.P.R.*, București, 1958.
89. MAXIM I., SOROP GR., STOIAN D. — Contribuții la cunoașterea solurilor din golurile de munte. În vol. „Pajiștile din Masivul Parîng și îmbunătățirea lor", Ed. Agro-Silv., București, 1962.
90. MATEESCU SC., SOROCINSKY C. Cercetări pedologice în Podișul Sucevei, Sectorul Lespezi—Zvoriștea—Gura Humorului—Ciumulești. *D. S. Comit. Geol.* XLIX/II, București, 1964.
91. MAVROCORDAT GEORGETA, NICOLAU MARGARETA. Caracterizarea solurilor din sud-vestul Cîmpiei Transilvaniei (Turda-Cîmpia Turzii). *Știința Solului*, 1. București, 1964.
92. MIHAI GH., PÎRVU E., TUFESCU V., MUTIHAC V., NONUȚĂ I., BELDIE AL. Studiul terenurilor degradate din bazinul Bistriței în amonte de Bicaz (condițiunile fizico-geografice, procesele de eroziune, solurile și stațiunile forestiere). *ICES. Manuale. Ref. Monogr.* (2). București, 1958.
93. MIHAI GH. Clasificarea solurilor din R.P.R. *Revista pădurilor* nr. 7 și 9/1961.
94. MOȚOC M. Cercetări în legătură cu solul și eroziunea solului executate în Bazinul Cîlnăului, porțiunea inferioară a Podișului Rîmnicului Sărat și Bazinul superior al Rîmnicului Sărat. *D. S. Inst. Geol. Rom.* XXXVI, București, 1952.
95. MOȚOC M. Eroziunea solului și măsurile de combatere în centrul Dobrogei. *Probl. agric.* București, 1954.
96. MOȚOC M. Combaterea eroziunii solului în R.P.R. *Rev. internaț. pt. agric.* 1, Sofia—București, 1957.
97. MOȚOC M. Eroziunea solului și combaterea ei pe terenurile arabile în R.P.R. *Probl. agric.* 2, București, 1957.
98. MUREȘANU P. L., PETRESCU C. Cercetări comparative asupra cernoziomului ciocolatiu din Cîmpia de vest și cel din Cîmpia dunăreană. Acad. R.P.R. (Timișoara). *Stud. și Cerc. (Biol. șt. agric.)*, VI/1—2, Timișoara, 1959.
99. MURGOCI M. G. Le sol arable. La Roumanie ; esquisse géographique III-e Congrès du pétrole. Bucarest, 1907.

100. MURGOCI M. G. Zonele de soluri din Romînia. *An. Inst. Geol. Rom.*, IV, București, 1911.
101. MURGOCI M. G. Die Bodenzonen Rumäniens. *An, Istn. Geol. Rom.* IV, 1910, București, 1911.
102. MURGOCI M. G. Études sur le sol arable de la Roumanie. Internat. Mitteilungen für Bodenkunde. I, 1912, Helft 6, Berlin.
103. MURGOCI M. G. Opere alese. Edit. Acad. R.P.R., București, 1957.
104. NEMEȘ M., CSAPO I., MAXIM I., VELEA C. Contribuții la studiul răspîndirii și clasificării solurilor din raionul Cluj. *Acad. R.P.R. Cluj. Studii și Cercet. de Agron.*, X, Cluj, 1959.
105. OANCEA C. Cercetări pedologice în nordul interfluviului Dîmbovița—Mostiștea. *D. S. Comit. Geol.* XLII, București, 1959.
106. OANCEA C., MUNTEANU I. Solurile interfluviului Ialomița — Călmățui. *D. S. Comit. Geol.* XLVIII, București, 1962.
107. OBREJANU GR., STÎNGĂ N., BLĂNARU V. Caracterizarea agrochimică a cîtorva zăcăminte de turbă din R.P.R. *Acad. R.P.R., Bul. Științ. (Biol. și Șt. agric.)* VIII/4, București, 1956.
108. OBREJANU GR., IANCOVICI BR., MAIANU AL., STÎNGĂ N., VINTILĂ IRINA. Cercetări agro-pedologice în bazinul superior al Oltului (Depresiunea Bîrsei, Sf. Gheorghe, Tîrgu Secuiesc). *An. ICAR.*, XXIV/5, seria nouă, p. 9—28, București, 1956.
109. OBREJANU GR., IANCOVICI BR., CANARACHE A., MOȚOC EUGENIA, ȘERBĂNESCU I., THALER ROZALIA. Contribuții la studiul clasificării și fertilității solurilor din regiunea inundabilă a Dunării (Sect. Călărași—Brăila—Tulcea). *Probleme de Pedologie. Acad. R.P.R.*, București, 1958.
110. OBREJANU GR., STÎNGĂ N., BLĂNARU V. — Contribuții la studiul turbelor din R.P.R., formarea, clasificarea și caracterizarea lor agrochimică. *Probl. de Pedologie. Acad. R.P.R.*, București, 1958.
111. OBREJANU GR., CANARACHE A., VINTILĂ IRINA, BĂJESCU IRINA, CHIRIAC AURELIA, MOȚOC EUGENIA, POPA M., TEODORU O., THALER ROZALIA. Caracterizarea agro-productivă a solurilor din estul Olteniei. *An. ICAR* — XXVII, A, București, 1960.
112. OBREJANU GR. Contribuții la caracterizarea agro-productivă a cernoziomurilor levigate din estul Olteniei. *Probleme actuale de biologie și științe agric., Acad. R.P.R.*, București, 1960.
113. OBREJANU GR., BĂJESCU IRINA, CANARACHE A., CHIRIAC AURELIA, MOȚOC EUGENIA, POPA M., SALZMAN SARINA, SILVIA F., VINTILĂ IRINA. Date fizice, chimice și biologice pentru caracterizarea agronomică a solurilor din R.P.R. *Cercet. de Pedologie, Acad. R.P.R.*, București, 1961.
114. OBREJANU GR., VINTILĂ IRINA, BĂJESCU IRINA, CANARACHE A., CHIRIAC AURELIA, MOȚOC EUGENIA, MOȚOC M., POPA M., TEODORU O., THALER ROZALIA, TRANDAFIRESCU T. Caracterizarea agro-productivă a solurilor din partea de est a Cîmpiei Romîne. ICCA., AN XXIX, (A), București, 1961.
115. OBREJANU GR., TEODORU O., BĂJESCU IRINA, CANARACHE A., CHIRIAC AURELIA, MOȚOC EUGENIA, SALZMAN SARINA, THALER ROZALIA, TRANDAFIRESCU T., VINTILĂ IRINA. Caracterizarea agro-pedologică a sectorului dintre Olt și Dîmbovița. *ICCA, An. Secției de Pedologie*, XXX, București, 1962.

116. OBREJANU GR., CANARACHE A. Aspecte fizice ale fertilității solurilor din depresiunile părții de est a Cîmpiei Romîne. *ICCA — An. Secției de Pedologie*, XXX, București, 1962.

117. OPREA C. V., STAICU I., MUREȘANU P. L. Contribuții la cercetarea solurilor și a condițiilor istorico-naturale de geneză și evoluția lor în vestul țării în zona de interfluviu dintre Mureș și Bega. *St. și Cercet. șt. (Biol. și șt. agric.)* I/1—4, Timișoara, 1954.

118. OPREA C. V., MUREȘANU P. L., STAICU I. Contribuții la studiul sărăturilor din partea de vest a țării. *Acad. R.P.R. — Studii și Cerc. șt.* I/1—4, Timișoara 1954.

119. OPREA C. V., DRĂGAN I., CRIȘAN I., OPRIȘ L. Fondul pedologic al părții de vest a țării și valoarea lui agricolă. *Acad. R.P.R. (Timișoara). Studii (Biol.-șt. agric.)* IV, 1—2, Timișoara, 1957.

120. OPREA C. V., CRIȘAN I., DRĂGAN I., OPRIȘ L., POPESCU G. Contribuții la cunoașterea și punerea în valoare a nisipurilor din partea de nord-est a R.P.R. *Acad. R.P.R. Timișoara. Studii Cerc. (Biol. St. Agric.)*, IV/1—2, Timișoara, 1957.

121. OPREA C. V., MUREȘANU P. L., PETRESCU C., VÎLCEANU NICOLETA. Contribuții la cunoașterea procesului de geneză și evoluție a lăcoviștilor din Cîmpia de vest a R.P.R. — *Acad. R.P.R., Timișoara. Stud. Cerc. (Biol. St. agric.)*, V/1—2, Timișoara, 1958.

122. OPREA C. V., BĂLAN S. Fondul biopedoclimatic din raionul Oravița și valoarea lui agricolă. *Acad. R.P.R. Timișoara. Std. Cerc. (Biol. St. agric.)*, VI/3—4, Timișoara, 1959.

123. OPREA C. V. Condițiile de pedozeneză și însușirile morfologice, fizice și chimice ale lăcoviștilor din Cîmpia de vest a R.P.R. — *Probl. actuale de biol. și St. agric. Acad. R.P.R.*, București, 1960.

124. OPREA C. V., BĂLAN S. Condițiile de pedogeneză și solurile din raionul Moldova Nouă, reg. Timișoara. *Acad. R.P.R. Timișoara. Stud. Cerc. (Biol. St. agric.)*, VII/1—2, Timișoara, 1960.

125. OPREA C. V., BAUMSTARK I. Condițiile de pedogeneză și solurile caracteristice din depresiunea Almașului (reg. Timișoara). *Acad. R.P.R. Timișoara, Stud. Cerc. (Biol. St. agric.)*, VII/3—4, Timișoara, 1960.

126. OPREA C. V., MUREȘANU P. L., DRĂGAN I., CRIȘAN I., OPRIȘ L., MIHOC EMA, BĂLAN S., BAUMSTARK I., PETRESCU C., VÎLCEANU NICOLETA. Contribuții la cercetarea solurilor din partea de vest a țării. *Acad. R.P.R. Timișoara. Stud. Cerc. șt. (Biol. St. agric.)*, VIII/3—4, Timișoara, 1961.

127. PĂUNESCU C. Solurile forestiere din subzona fagului formate pe gresii sărace în baze și problema împăduririi pe aceste soluri. *Rev. Pădurilor* 12, București, 1953.

128. PĂUNESCU C. Observații în legătură cu succesiunea altitudinală a solurilor formate pe calcare tithonice de pe muntele Cristianul Mare. *Rev. Pădurilor*, LXVIII (4)7, București, 1953.

129. PĂUNESCU C. Observații în legătură cu evoluția solurilor forestiere pe diferite substrate în zona forestieră montană. *Rev. Pădurilor*, 7 București, 1954.

130. PĂUNESCU C. Contribuții la caracterizarea, sistematica și geografia solurilor de pădure din munții Bîrsei. *Știința Solului* 1, București, 1963.

131. POP E. Mlaștinile de turbă din R.P.R. Ed. Acad. R.P.R., București, 1960.

132. POPOVĂȚ ANGELA, RAPAPORT CAMELIA. Privire generală asupra solu-

rilor dintre Olt şi Vedea Topolog (între Slatina şi Jiblea). *Comunic. Acad. R.R.P.*, Bucureşti, 1959.

133. POPOVĂŢ ANGELA, RAPAPORT CAMELIA, DRAGU I. Procese de eroziune a solurilor în partea de vest a Platformei Cotmeana. *Comit. Geol. Studii Tehn. şi Econ.* Seria C, nr. 11, Bucureşti, 1963.

134. POPOVĂŢ M. Degradation des sols de steppe. Application à l'étude agrogéologique des environs de Perişorul (Distr. Dolj). *An. Com. Geol. Inst. Geol. Rom.* XVIII. Bucureşti, 1937.

135. POPOVĂŢ M. Étude agrogéologique de la région Podari—Vîrvorul—Panaghia (Dép. de Dolj, Roumanie). *Inst. Geol. Rom. — Studii Tehnice şi Econ.* Seria C, nr. 9, Bucureşti, 1945.

136. POPOVĂŢ M. Note préliminaire sur les sols de la région comprise entre le Jiu et le Desnăţui (Dolj), *C. R. Inst. Géol. Roum.* XXX, Bucureşti, 1948.

137. POPOVĂŢ M., SPIRESCU M. Cornetele şi solurile roşii din nord-vestul Olteniei. *Acad. R.P.R., Bul. St. (Secţ. St. Biol. agron., Geol. Geogr.)* IV/3, Bucureşti, 1952.

138. POPOVĂŢ M. Cercetări pedologice în regiunea Cetatea — Bîcleş — Argetoaia — Terpeziţa (jud. Dolj) — Mehedinţi *D. S. Com. Geol.*, XXXVII, Bucureşti, 1953.

140. POPOVĂŢ M., SPIRESCU M. Les sols rouges du SW de la République Populaire Roumaine. *6-ème Congr. Internat. Sci. sol. (E, 5)*, Paris, 1956.

141. POPOVĂŢ M., CÎRSTEA ST., MATEESCU SC. Cercetări pedologice în sectorul dintre Jiu şi Desnăţui, de la Dunăre pînă la Bucovăţ. *D. S. Com Geol.* XLI, Bucureşti, 1957.

142. POPOVĂŢ M., OANCEA C., PARICHI M. Solurile formate pe depozite eoliene din sectorul Cetate—Dunăre—Desnăţui (Oltenia de S). *D. S. Comit. Geol.* XLVII, Bucureşti, 1962.

143. PREDA M., CRIŞAN I. Solurile negre de fîneaţă umedă şi cu exces de umiditate din Transilvania şi folosirea lor raţională în agricultură. *Acad. R.P.R., (Cluj), Stud. Cerc. de agron.* IX, Cluj, 1958.

144. PREDA M., CRIŞAN I., ROMAN I., TAROPA T. Solurile din bazinul Mureşului, de la confluenţa cu Arieşul. *Acad. R.P.R., Filiala Cluj, St. şi cerc. de agron.* XIII, Cluj, 1962.

145. PREDEL FL., MUNTEANU I. Cercetări pedologice în sectorul nordic al cîmpiei Tecuciului. *D. S. Comit. Geol.* XLII, Bucureşti, 1959.

146. PREDEL FL. Condiţiile naturale şi solurile din regiunea Nicoreşti—Adjud—Petreşti—Baloteşti—Tepu. *D. S. Comit. Geol.* XLIX, Bucureşti, 1964.

147. PREDEL FL. Solurile din zona central-vestică a Moldovei (Roman—Piatra Neamţ—Bacău—Odobeşti—Hăbăşeşti). *Ştiinţa Solului* 1. Bucureşti, 1964.

148. PROTOPOPESCU PAKE EM. Cercetări agrogeologice în Cîmpia Romînă dintre valea Mostiştei şi Olt. *D. S. Inst. Geol. Rom.* I, (1910), Bucureşti, 1923.

149. RAPAPORT CAMELIA, MAVROCORDAT GEORGETA. Cercetări pedologice între Mureş şi Tîrnava Mică. *Acad. R.P.R. (Timişoara). Stud. Cercet. (Biol. şt. agric.)*, Timişoara, 1960.

150. RAPAPORT CAMELIA. Contribuţii la cunoaşterea solurilor pseudorendzinice din interfluviul Mureş—Tîrnave. *Acad. R.P.R. Filiala Cluj, Stud. şi Cerc. de agronomie*, XIII, Cluj, 1962.

151. RAPAPORT CAMELIA, POPOVĂŢ ANGELA. Solurile dernopodzolice cultivate şi necultivate din platforma Cotmeana. *Ştiinţa Solului*, 2, Bucureşti, 1963.

152. SAIDEL TH. Étude chimique des principaux types de sols de Roumanie. *C. R. du XIV-e Congrès international d'agric.*, 4-e Sect. R. 44, Bucarest, 1929.
153. SAIDEL TH. Communication préliminaire sur les sols salés de la vallée du Călmățui. *C. R. Inst. Géol. Roum.* XXV, Bucarest.
154. SANDU GH. Acumularea sărurilor în apele freatice și în solurile din lunca inferioară a Dunării (Sectorul Piua Petrii — Brăila). *Probleme agricole*, București, 1961.
155. SPIRESCU M. Cercetări pedologice în regiunea dintre T. Severin—Broșteni și Gura Motrului. *D. S. Com. Geol.* XXXVII, București, 1953.
156. SPIRESCU M. Cercetări pedologice în Bărăgan, la W de V. Jegălia. *D. S. Com. Geol.* XII, București, 1957.
157. SPIRESCU M. Cercetări între Jiu și Gilort la S de Depresiunea Tg. Jiu. *D. S. Com. Geol.* XLI, București 1957.
158. SPIRESCU M. Cercetări pedologice în vestul Depresiunii subcarpatice oltene. *D. S. Com. Geol.* XLI, București, 1957.
159. SPIRESCU M., CHIȚU C., BĂLĂCEANU V. Cercetări pedologice în Cîmpia de la vest de București. *D. S. Comit. Geol.*, XLIII, București, 1962.
160. SPIRESCU M., CHIȚU C., MUCENIC IULIA. Cercetări pedologice în regiunea deluroasă dintre Argeș și Zăbrăuț. *D. S. Comit. Geol.*, XLIII, București 1962.
161. STAICU I., MUREȘANU P. L., OPREA C. V. Contribuții la studiul sărăturilor din partea de vest a țării. *Acad. R.P.R. (Timișoara). Stud. Cerc. (Biol. St. Agric)* I/1—4, Timișoara, 1954.
162. STAICU I., OPREA C. V., MUREȘANU P. L. Noi contribuții la cunoașterea sărăturilor din Cîmpia de vest a R.P.R. *Acad. R.P.R. (Timișoara). Stud. Cerc. Biol. St. agric.)* III/3—4, Timișoara, 1956.
163. TEACI D., SAVOPOL S., FLOCA FL., NASTEA ST. Considerații asupra clasificării genetice și agro-productive a solurilor regiunii Dobrogea. *Cerc. pedologie (Ed. Acad. R.P.R.)*, București, 1961.
164. TEACI D. Solurile raionului Sînnicolaul Mare, reg. Arad și problemele tehnice care se pun în legătură cu folosirea lor. *Probleme agricole*, 2, București, 1954.

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