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THE PROBLEM OF TYPOLOGY AND DEVELOPMENT TRENDS OF CHERNOZEMS OCCURRING IN POLAND

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The problem of typological arrangement of what are called chernozems which occur within Poland's frontiers, has not been definitely settled. The authors of few works concerning that subject-matter [8, 15, 25, 26] when classifying the soils mentioned into chernozems have limited their division to two subtypes — proper and degraded ones; these terms are still used in the systematization of soils in Poland in force [10, 15].

The results of the author's own investigations carried out in the region of the Lublin Upland in reference to the literature concerning similar soils in the Soviet Union [1, 4, 8, 9, 11, 19] indicate distinctly the necessity for revision of the present views as regards the typological arrangement and division of those soils, which in consequence may lead to a complete elimination of chernozem as a type in the nomenclature of Poland's soils.

These suggestions induced the author to extend the investigations to other regions in Poland where soils classified as chernozems occur. This paper briefly deals with the effects of these investigations.

RESULTS

The soils dealt with occur on deep loess concentrated in several separate regions of southeastern Poland (Fig. 1). Investigations and observations indicate that all those soils are of the some origin and have their common parent rock. Their differentiation chiefly results from the different natural conditions existing in areas of the particular regions (Tab. 1), which, among others, is reflected in the profile morphology of the soils discussed.

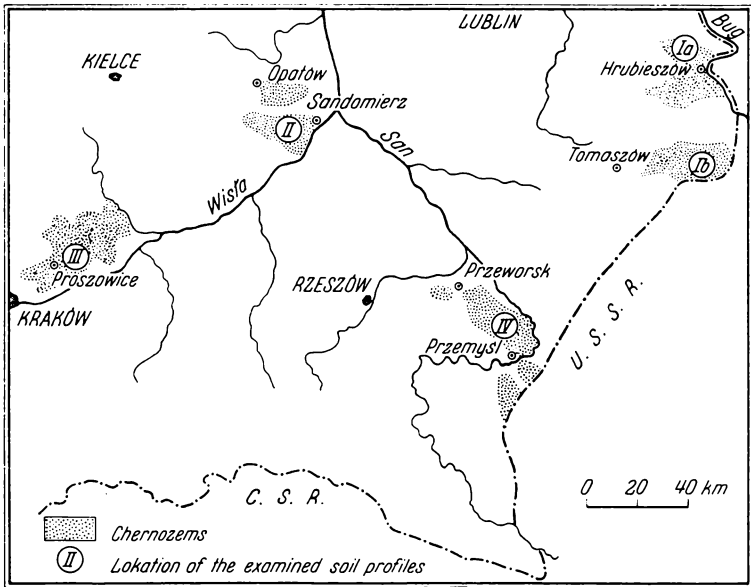


Fig. 1. The chernozems areas in Poland

Table 1

Natural Conditions in Regions Where Chernozems Occur

| Region Profile | height above sea level m | Total annual precipitation mm | mean annual temp. °C | Relief of the land | Depth of CaCO ₃ occurrence cm |
|----------------|--------------------------|-------------------------------|----------------------|--------------------|--|
| Ia | 190-220 | 550 | 7.5 | Poor relief | 100 |
| Ib | 220-260 | 600 | 8.0 | Highly contoured | 110 |
| II | 210-270 | 600-650 | 8.0 | Diverse | 120 |
| III | 230-280 | 650-700 | 7.5 | Poor relief | 150 |
| IV | 200-250 | 650-720 | 7.0 | Diverse | 160 |

It can be generally accepted that toward the south-west direction (increase of rainfalls) those soils have fewer features characteristic of chernozems at more and more strongly expressed degradation rate. This can be noticed by the level decrease of CaCO₃ occurrence brighter colour and worsening of structure in horizon A, a better developed horizon (B) and by a very distinct coating of powder of the aggregates — which to a great extent make the soils investigated, look like the grey forest-steppe soils which cover a considerable area of the neighbouring Soviet territory.

This observation is also confirmed by the results of laboratory investigation part of which have been included in this paper in the form of diagrams (Fig. 2, 3, 4).

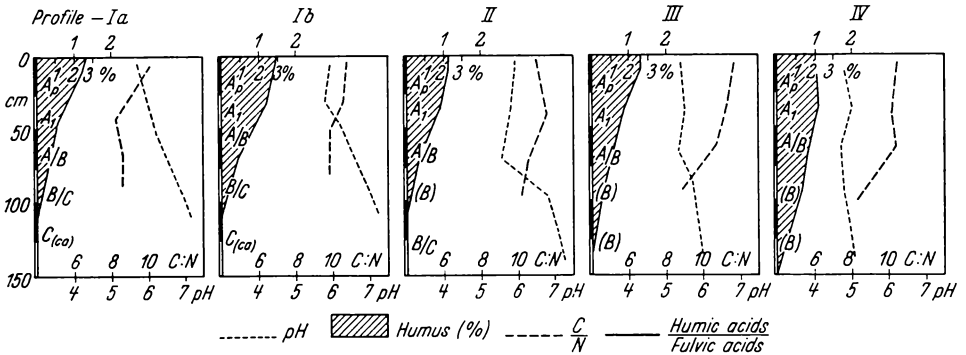


Fig. 2. The distribution of pH, humus, C : N, humic acids : fulvic acids in the profile of the studied soils

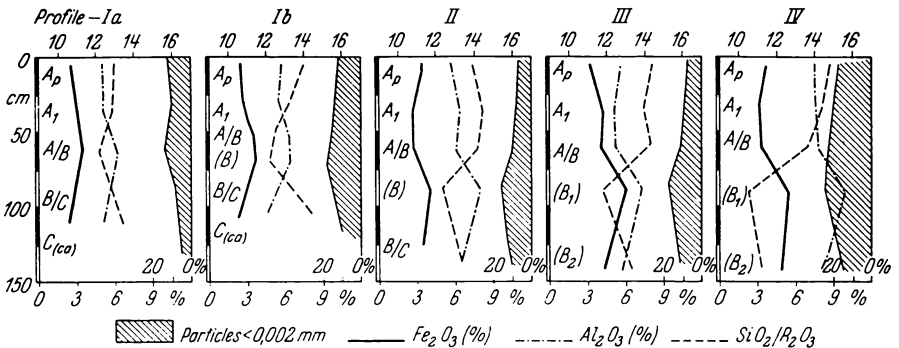


Fig. 3. The distribution of colloids, Fe_2O_3 , Al_2O_3 and molecular ratio of $\text{SiO}_2 : \text{R}_2\text{O}_3$

On comparing the distribution of the values obtained in stock of the soil profiles a distinct regularity can be noticed in the differences appearing, as depending on the region each profile represents. The tendency of those changes is analogous to the morphological variability discussed earlier. A fact attracts attention that both profiles from the Lublin Upland area (Ia and Ib)—as regards certain features and properties—differ significantly from the others, as has already been mentioned [2].

Taking into consideration all the results obtained it may be noted that the soils dealt with are characterized by a small humus content (2—3 percent) and a relatively small reaction (pH 5-6). A distinctly marked

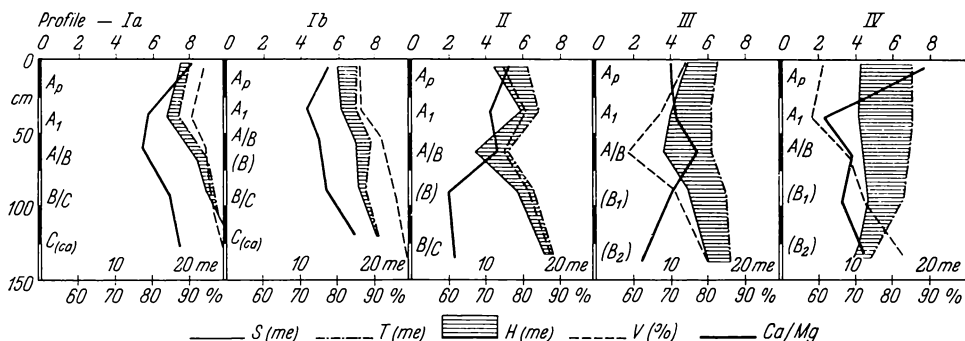


Fig. 4. Behaviour of S, T, H, V-values and Ca : Mg ratio in the profile of the studied soils

displacement of iron and aluminium sesquioxides and even colloidal clay particles ($< 0,002$ mm) — at a considerably differentiated $\text{SiO}_2 : \text{R}_2\text{O}_3$ ratio prove undoubtedly a far advanced degradation of those soils. This is also confirmed by the relation of adsorptive properties (Fig. 4). Relatively low values for S and V and high for H — particularly in profiles III and IV — bring these soils closer to podzolic ones than to chernozems. Only the character of humus itself — according to the ratio of humic and fulvic acids, and the values of C:N distribution (Fig. 2) — may suggest a genetical relationship of those soils with chernozems.

DISCUSSION

The results shown in comparison to papers already mentioned which deal with similar soils of the Soviet territory authorize to conclude, that the soils investigated, apart from their origin have little in common with chernozems and that there are no significant reasons to classify them into this type at the present stage of development.

Adopting the criteria used by the Russian pedologist [1, 4, 7, 9, 16, 19] we find that the soils dealt with show a great similarity to the grey forest-soils in Ukraine mentioned above. They differ from the latter only in morphological features. This fact can be interpreted that in relation to the grey forest-soils some time ago they underwent deforestation and then they were cultivated for many years and that obviously a certain influence must have been exerted on their morphology and certain properties — particularly in the upper layers of the profile.

The author concludes from the above suggestions that to have a proper arrangement of the soil dealt with a new type should be introduced into

the systematic of Polish soils — grey arable soils (post-chnozems) divided into two subtypes — grey and dark grey. Worth mentioning is that the separated third subtype in the Soviet Union — light grey could also be selected in Poland but from quite a different soil type — other pedologist having already drawn their attention to it [8, 14]. This problem, however, deserves a separate study.

Analysing the present developmental trends of the soils dealt with note that they assume different forms as depending on local conditions such as e.g. land relief (erosion), water conditions and utilization of soil.

The effect of the action of the factors mentioned is the exceptionally large differences observed at present in the previously uniform soil cover — even within a small area, which become greater with each year [2, 3]. This variability is manifested morphologically in the variable depths, colour and degree to which each of the genetic horizons are formed and also in the their properties. In many cases, this creates the necessity of regarding a considerable surface of the soils studied (those lying on slopes, shallow, eroded) to the type of brown soils [2, 3, 5, 6] or even to soils with an undeveloped profile [2, 3]. Other soils group — as yet unclassified — into chnozems or deluvial grey soils.

Those fragments of the soils dealt with, which occur in flat areas situated lower and being more moist, undergo relatively the slowest changes (region Ia). Such soils show a relatively low rate of degradation, better morphological features and properties whereby they form a link with chnozems. On the other hand, however, there are factors which may suggest their possible typological relation to black earths [2, 5, 6, 18], which also occur in this area.

REFERENCES

- [1] Bielaja O. P.: Geneticheskiye osobennosti siernych lesnych poczw prawobierieżnoj i lewobierieżnoj lesostepnoj Ukrainy. Poczwowiedien. 2, 1964.
- [2] Borowiec J.: Czarnoziemy Wyżyny Lubelskiej. Cz. I, II, III (Czernoziems of the Lublin Upland. Parts I, II, III). Annales Univ. M. Curie-Skłodowska, Lublin, sec. E, vol. XIX, 1965; sec. B, vol. XX, XXI, 1967.
- [3] Borowiec J.: Wpływ wylesienia i użytkowania rolniczego na morfologię i własności czarnoziemiu w terenie urzeźbionym. (The effect of deforestation and use of farmland on the morphology and properties of chnozems in an undulating territory). Annales Univ. M. Curie-Skłodowska, Lublin, sec. E., vol. XXI, 1967.
- [4] Bożko S. K.: Kłasyfikacja czarnoziemiu URRS. Trudy Naukowo-Doslidnoho Institutu Soczemlerobstwa, vol. IV, Kyiw-Charkiw 1939.
- [5] Dobrzański B., Zbysław B.: Wpływ erozji na ewolucji czarnoziemiu (The influence of erosion on the evolution of chnozems). Roczn. Nauk Roln., vol. 71, 1955.

- [6] Dobrzański B., Zbysław B.: Czarnoziemy na lessach Przedkarpacia (Chernozems on loesses in the Carpathian Foreland). *Annales Univ. M. Curie-Skłodowska, Lublin, sec. E, vol. X*, 1956.
- [7] Iwanowa E. N., Rozow N. N.: Opyt sistematiki poczw stepnoj zony SSSR. *Soobszczenije I. Poczwowiedien.*, 12, 1958.
- [8] Iwanowa E. N., Nogina N. A.: O poczwach Polski i ich klasyfikacji (The soils of Poland and their classification). *Poczwowiedien.*, 3, 1959.
- [9] Jarkow S. P.: Schema klasyfikacji poczw lesostepnoj i czarnoziemnoj ługowo-stepnoj zony. *Sb. "Pomiati akad. W. P. Wiliamsa"*, 1942.
- [10] Kowalkowski A. i inni: Genetyczna klasyfikacja gleb Polski (Genetical Classification of Polish soils). *Roczn. Glebozn.*, vol. 7, 2, 1959.
- [11] Kundler P.: Zur Kenntnis der Rasenpodsole und grauen Waldböden Mittelrusslands im Vergleich mit den Sols lessivés des westlichen Europas. *Z. Pflanz. D. B. Bodenkun.*, 86, 1958.
- [12] Mieczyski T.: Boden der Wojwodschaft Lublin. *Materiały do poznania gleb Polski*, z. 2, Puławy 1932.
- [13] Miklaszewski S.: Czarnoziemy hrubieszowsko-tomaszowskie okolic Dołhobyczowa (The chernozems of the Hrubieszów, Tomaszów and Dołhobyczów regions). *Sprawozd. Tow. Nauk Warsz.*, R. III, 1910, z. 8.
- [14] Musierowicz A.: Klasyfikacja gleb Polski ustalona przez Polskie Towarzystwo Gleboznawcze (A classification of Polish soils by the Polish Soil-Science Society). *Roczn. Glebozn.*, vol. 3, 1954.
- [15] Musierowicz A.: Classification des soils pour la Carte Pedologique de la Pologne. *Eschelle 1:300 000, Rapp. VI-Cong. Inter. Sci.*, vol. E, V, 84, Paris 1956.
- [16] Ponomariewa W. W.: O suszczności i geograficznych zakonomiornostiach podzołobrazowanija. *Poczwowiedien.*, 3, 1956.
- [17] Terlikowski F.: Gleby Polski (Polish soils). *Roczn. Glebozn.*, vol. 3, 1954.
- [18] Turski R.: Charakterystyka substancji organicznej czarnoziemów Wyżyny Lubelskiej w aspekcie ich genezy (A characteristic of the organic substances of chernozems of the Lublin Uplands from the aspect of their genesis). *Annales Univ. M. Curie-Skłodowska, Lublin, sec. E, vol. XXI*, 1957.
- [19] Zołotariew S. A.: O genezisie i klasyfikacji siernych lesnych poczw. *Nauczn. Trudy Ukr. s-h, Akad.*, vol. 10, 1960.

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LE PROBLÈME DE LA TYPOLOGIE ET LES TENDANCES DE DÉVELOPPEMENT DES TCHERNOZEMS SUR LE TERRITOIRE DE LA POLOGNE

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Résumé

L'auteur ouvre une discussion sur le problème de la typologie des sols jusqu'à présent appelés tchernozeems qui apparaissent d'une façon fragmentaire dans la partie Sud-Est de la Pologne (dess. 1).

En se basant sur les résultats des observations au champ et au laboratoire (dess. 2, 3, 4), ainsi que sur la littérature concernant ce sujet, on peut affirmer

que les sols sus-mentionnés ont peu de caractères communs avec les tchernozems. Par contre, ces sols présentent une grande similitude avec les sols gris forestiers, très répandus sur les territoires limitrophes de l'Ukraine.

De la situation ci-dessus présentée, l'auteur conclut que, pour systématiser d'une façon adéquate les sols en question, il faut introduire dans la systématique des sols de la Pologne un nouveau type—les sols gris cultivés (provenant de tchernozems), avec une subdivision en sols gris et sols gris foncés.

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DAS PROBLEM DER TYPOLOGIE UND DIE ENTWICKLUNGSRICHTUNGEN DER IN POLEN AUFTRETENDEN TSCHERNOSEME

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Zusammenfassung

Es wird das Problem der Typologie der sogen. Tschernoseme, die fragmentarisch im südöstlichen Teil Polens auftreten (Abb. 1), vom Verfasser erörtert.

Die Ergebnisse der Gelände- und Laboruntersuchungen (Abb. 2, 3, 4) und diesbezügliche Literatur zeigten, dass die obenerwähnten Böden wenig gemeinsames mit den echten Tschernosemen haben. Sie sind dagegen den im benachbarten Gebiet der Ukraine verbreiteten grauen Waldböden sehr ähnlich.

Auf Grund der festgestellten Lage kommt der Verfasser zu dem Schluss, dass für eine richtige Klassifikation der erwähnten Böden ein neuer Typ—graue Kulturböden, mit der Teilung derselben auf zwei Untertypen, und zwar: graue und dunkelgraue Böden, eingeführt werden sollte.

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ZAGADNIENIE TYPOLOGII I KIERUNKI ROZWOJOWE CZARNOZIEMÓW WYSTĘPUJĄCYCH NA OBSZARZE POLSKI

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Streszczenie

Autor podejmuje dyskusję nad problemem typologii tzw. czarnoziemów, występujących fragmentarycznie w południowo-wschodniej części Polski (rys. 1).

Na podstawie wyników badań terenowych i laboratoryjnych (rys. 2, 3 i 4) oraz w oparciu o wykorzystaną literaturę można twierdzić, że wymienione gleby mają mało cech wspólnych z czarnoziemami. Natomiast wykazują duże podobieństwo do szarych gleb leśnych, szeroko rozprzestrzenionych na sąsiednich obszarach Ukrainy.

Na tle przedstawionej sytuacji autor wyciąga wniosek, że dla właściwego zaseregowania rozpatrywanych gleb należy wprowadzić do systematyki gleb Polski nowy typ—szare gleby uprawne (poczarnoziemne), z podziałem na dwa podtypy—szare i ciemnoszare.

Ю. БОРОВЕЦ

ТИПОЛОГИЯ И НАПРАВЛЕНИЯ РАЗВИТИЯ ЧЕРНОЗЕМОВ НА ТЕРРИТОРИИ
ПОЛЬШИ

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Резюме

В настоящей работе автор обсуждает вопросы типологии черноземов, выступающих фрагментарно в южно-восточной части Польши (рис. 1).

Анализируя результаты полевых и лабораторных исследований, а также используя данные литературных источников, автор утверждает, что названные почвы по своим свойствам мало похожи на черноземы. Вместо этого они имеют много общего с серыми лесными почвами, широко распространенными в соседних областях Украины.

На основе вышесказанного автор приходит к выводу, что для надлежащей систематизации рассматриваемых почв следует ввести в систематику почв Польши новый тип — серая пахотная почва (почерноземная), который в свою очередь делится на два подтипа — серая и темносерая.