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REGULARITIES OF ECOLOGICAL DIFFERENTIATION OF THE SOILS COVER IN THE EAST-SLOVAKIAN LOWLANDS

The character of the soil cover in the landscape is depends on the physical geographic regularities of the differentiation the pedosphere (e.g. horizontal zonation, vertical zonation, detailed ecological differentiation, etc.). With them are associated soil-forming processes to form soil cover of the regions. East- Slovak Lowland has been and is a typical agrarian ecosystem. The intensity of agriculture in that region is dependent on the production of a range of soil and from inputs to production. In our paper we'll take the quality of the soils, typologically-production categories of the soil - soil-fertility of East-Slovak Lowland and also the representation of the soils from aspects of the economic profitability of crops and comparison these parameters with the Slovak Republic. In line with recent Morphogenetic and soil classification system of the Slovak Republic on the territory of the East- Slovak Lowland, we can define 9 soil groups, 17 types and several subtypes, varieties and forms of soil. Most of the soils on the East-Slovak Lowlands are uses as agricultural land, till 69 % of the territory, of which 68 % is arable land. It is grown here especially densely sowing cereal crop (37 %), followed by grain maize (10 %), legumes (5 %), oil plants (10 %), sugar beet (5 %), annual fodder (8 %), perennial fodder products (8 %).

The soil cover on the East-Slovakian plain is different from the soil cover of East- Slovakian hilly country. While for the soil cover differentiation of East-Slovakian plain is applies mainly azonation (substrate-morphological-hydrological conditions) for the differentiation the soil cover of East-Slovakian hilly country is applies above all of barrier zonation and only partially azonation (Podvihorlatská hilly country). The regularities and conditions are significantly affecting the fertility of agricultural soils and land use of the landscape. From the aspect of fertility are dominated here productive category of soils O3 (very productive soils).

Key words: pedosphere, regularities of ecological differentiation, landscape, soils

Лисняк А. А., Вилчек Дж., Михаэли Е. ЗАКОНОМЕРНОСТИ ЭКОЛОГИЧЕСКОЙ ДИФФЕРЕНЦИАЦИИ ПОЧВЕННОГО ПОКРОВА ВОСТОЧНО-СЛОВАЦКОЙ НИЗМЕННОСТИ

Характер почвенного покрова в ландшафте зависит от физико-географических закономерностей дифференциации педосферы (например, горизонтальной и вертикальной зональности, детальной экологической дифференциации и т.д.). С ними связаны почвообразующие процессы формирования почвенного покрова регионов. Одним из таких регионов есть Восточно-словацкая низменность, которая была и остается типично аграрной экосистемой. Интенсивность сельского хозяйства в этом регионе зависит от производственных возможностей почвы и от технологии самого производства. В нашей работе мы изучили качество почв, типологические производственные категории почв, то есть все показатели плодородия почв Восточно-словацкой низменности, а также аспекты экономической рентабельности сельскохозяйственных культур и сравнили эти параметры с почвами в целом по Словацкой Республике. В соответствии с последней Морфогенетической классификацией почв Словацкой Республики, на территории Восточно-словацкой низменности мы выделили 9 групп почв, 17 типов и несколько подтипов разновидностей и разрядов почв. Большинство почв Восточно-словацкой низменности, а это до 69 % территории, используются в качестве сельскохозяйственных угодий, из которых 68 % используется как пашни. Здесь преимущественно выращиваются зерновые культуры (37 %), кукуруза на зерно (10 %), бобовые (5 %), масличные культуры (10%), сахарная свекла (5 %), однолетние кормовые (8 %) и многолетние кормовые культуры (8 %).

Нашими исследованиями выявлено, что почвенный покров Восточно-словацкой равнины значительно отличается от почвенного покрова Восточно-словацкой холмистой местности. В то время как для экологической дифференциации почвенного покрова равнинной территории применимы азональность (субстрат-морфологически-гидрологические условия), то холмистая территория относится, прежде всего, к барьерной зональности и лишь частично к азональной. Эти закономерности и условия значительно влияют на плодородие сельскохозяйственных земель и землепользование ландшафта региона, что обуславливает здесь преобладание почв продуктивной категории ОЗ (очень плодородные почвы).

Ключевые слова: педосфера, закономерности экологической дифференциации, ландшафт, почвы

Лісняк А. А., Вілчек Дж., Міхаелі Є. ЗАКОНОМІРНОСТІ ЕКОЛОГІЧНОЇ ДИФЕРЕНЦІАЦІЇ ГРУНТОВОГО ПОКРИВУ СХІДНО-СЛОВАЦЬКОЇ НИЗОВИНИ

Характер ґрунтового покриву в ландшафті залежить від фізико-географічних закономірностей диференціації педосфери (наприклад, горизонтальної та вертикальної зональності, детальної екологічної диференціації і т.д.). З ними пов'язані ґрунтоутворюючі процеси формування ґрунтового покриву регіонів. Одним з таких регіонів є Східно-словацька низовина, яка була і залишається типово аграрною екосистемою. Інтенсивність сільськогосподарства в цьому регіоні залежить від виробничих можливостей ґрунту і від технології самого виробництва. У нашій роботі ми вивчили якість ґрунтів, типологічні виробничі категорії ґрунтів, тобто всі показники родючості ґрунтів Східно-словацької низовини, а також аспекти економічної рентабельності сільськогосподарських культур і порівняли ці параметри з ґрунтами в цілому по Словацькій Республіці. Відповідно до останньої Морфогенетичної класифікації ґрунтів Словацької Республіки, на території Східно-словацької низовини ми виділили 9 груп ґрунтів, 17 типів і кілька підтипів різновидів і розрядів ґрунтів. Більшість ґрунтів Східно-словацької низовини, а це до 69 % території, використовуються в якості сільськогосподарських угідь, з яких 68 % використовується як рілля. Тут переважно вирощуються зернові культури (37 %), кукурудза на зерно (10 %), бобові (5 %), олійні культури (10 %), цукровий буряк (5 %), однорічні кормові (8 %) і багаторічні кормові культури (8 %).

Нашими дослідженнями виявлено, що ґрунтовий покрив Східно-словацької рівнини значно відрізняється від ґрунтового покриву Східно-словацької пагорбової місцевості. У той час як для екологічної диференціації ґрунтового покриву рівнинної території застосовані азональність (субстрат-морфологічно-гідрологічні умови), то пагорбова територія відноситься, насамперед, до бар'єрної зональності і лише частково до азональної. Ці закономірності і умови значно впливають на родючість сільськогосподарських земель та землекористування ландшафту регіону, що обумовлює тут переважання ґрунтів продуктивної категорії ОЗ (дуже родючі ґрунти).

Ключові слова: педосфера, закономірності екологічної диференціації, ландшафт, ґрунти

Introduction

The East-Slovakian lowland has an area of 4000 km². It belongs to the East-Pannonian basin. The East-Slovakian lowland is divided on the East-Slovakian plain and East-Slovakian hilly country [3]. The East-Slovakian lowland is from the aspect of the structure a great tectonic depression filled Neogene marine, brackish, lacustrine (gravel, sand, clay, marl) loose sediments. Their surface is almost continuously superimposed the Quaternary sediments of different origin (fluvial, aeolian and polygenetic). The East-Slovakian plain has the monotonous planar relief of the accumulation plains (amplitude to 30 m). East-Slovakian hilly country to the north and west has smoothly modeled undulating re-

lief. It is represented by the relief of denudation hilly country with amplitude from 31 to 100 m. The altitude in lowland varies from 94 m above sea level in the south to 360 m above sea level on the northwest. The climate of East-Slovakian lowland is moderately continental. Most of the East-Slovakian plain has a warm dry to moderately dry climate with cold winters. In the East-Slovakian hilly country is the climate slightly warm humid with cold winters too. The average annual air temperature ranges from 9.4° C in the south into 8.6° C in the north of Lowland. Total annual precipitation (observation period 1951 - 1980) ranges from 559 mm into 661 mm [1, 4]. The maximum of precipitation is in the vegeta-

tion period, but they are unevenly spread over. During the year the maximum is in the June and the minimum in January. From the aspect of land cover the East-Slovakian lowland is now completely deforested area, agrarian ecosystem. Soil cover in the lowland and the quality and fertility

of the soils from the aspect of the nature structure of the landscape is influenced by geological substrate, the slope of the landforms and hydrological conditions (extensive areas of lowland are affected by the high level of the groundwater).

Materials and Methods

The contribution originated on the basis of terrain research the soil cover of the East-Slovakian lowland and also the materials of the informative system on the soils of Slovakia. The informative system represents the rich database of the characteristics of the types of soils and the spatial differentiation of the soil cover, utilization and protection of soils. From the informative system were specifically used: - the qualitative databank on the unit habitats of soils in the

Slovakia (Soil science and conservation research institute Bratislava), - the updated collection of the BSEU – the maps in digital forms of the bonited soils-ecological units (GIS ARC INFO) and following information databases (SSCRI Bratislava), - soils-ecological regionalization of the agricultural soils in Slovakia and of typologically productive categories of agricultural soils [2], potential economic parameters of the soil units [6].

Results and Discussion

East-Slovak Plain is the accumulative plain with an area of the 3228 km². The geological substrate consists of quaternary fluvial gravels, sands, sandy loams, heavier loamy and sandy loamy sediments and muddy loamy clay, somewhere from the eolian sediments. Fluvial sediments on the plain have the extensive collectors of groundwater with the water level near the surface. The specific feature of the plain are: slope of the landforms with a value below 2° and the hydrological conditions (water level is near the surface). Both factors jointly, as well as the geological substrate (soil-forming rocks) and the fluvial geomorphological processes had influenced of the soil-forming processes and the nature of soil cover. According to the morphogenetic classification of the soils of Slovak Republic [5] here is dominates the one group of soils - Fluvisols. It is most widespread group of soils on the floodplains. They occupy the almost 65 % of East-Slovakian plain. This group is represented by the type of gleyic Vertic Fluvisols associated with Fluvic Gleysols. It is a very productive arable land (O3), suitable mainly for cereal production, but also for root crops, oil crops and technical crops. The group of Fluvisols is associated

sporadically with the salic till sodic Fluvisols and Solonchaks even Solonetz on the very heavy alluvial sediment, but these types of soils have a negligible representation. On the salic and sodic soils (Solonchaks and Solonetz) are very low productive grasslands (T3). The soil group of Planosols and Stagnosols is represented the types Eutric to Distric Planosols and (Luvic-, Albic) Stagnosols. They are located on loess loams and colluvial sediments on the floodplains of rivers and in terrain depressions by rivers and other depressions and on the alluvial cones (2.6 % of the area, the category O7 - low productive arable soils). These types of soil is occurs in the East – Slovak Plain small part of the south from the river Uh, Wetland of Senianske and the north-eastern part of the plain in the wider surroundings area of the Sobrance (the Sobranecká rovina plain). Arable soils of this soils type are very low productive. At the East-Slovakian plain between the fertile types of soils (productive category O3) belong Mollic Fluvisols and calcareic Mollic Gleysols (occurring on the floodplain the river of Ondava and in the some south part of Medzibodrožie). They are suitable to a growing for the wide spectrum of crops and valuable feature for

these types of soil is the supplementary humidity (capillary water). Most fertile soils of East-Slovakian plain are Chernozems (productive category O3). They are represented by three subtypes Luvi-Haplic Chernozems, (Gley-) Haplic Chernozems on loess and loess loams and calcareous (Gley-) Haplic Chernozems on carbonate fluvial and loess sediments. On the East-Slovakian plain they are concentrated in two localities. On the Malčice table and in the southern part the Trebišov table. Haplic Luvisols represented with the type of Stagni-Haplic Luvisols on the loess loams and polygenetic loams in the center of the eastern half of the East – Slovakian plain (Kapušíanske Pláňavy). Albic Luvisols are represented with the type of Stagni-Albic Luvisols that is associated with Luvic Stagnosols on loess loams. Occur on the southern shore of the Zemplínska šírava water reservoir. The Cambisols are represented the types of soils Eutric Cambisols and Dystric Cambisols, associated with Leptosols and with Stagnic Cambisols on medium heavy, lighter and stony substrates of non-carbonate soil-forming rocks. Their presence from the aspect of character of the soil cover and soil fertility on East-Slovakian plain we consider as insignificant (only the tiny islands in the Medzibodrožie). The Arenosols, type eutric Haplic Arenosols associated with eu-

tric Cambic Arenosols (the Medzibodrožie and sporadically in the central part of the East-Slovakian plain) are less and low productive arable soils (category O6, O7) with low water capacity and quick mineralization of organic matter. They are suitable for the growing the less demanding crops (e.g. *Secale cereale* – rye).

The East-Slovakian hilly country has an area of 772 km². The soil cover is varied here. The soil types of hilly country include into five soil type groups (group of Leptosols, Chernozems, Planosols, Luvisols, Cambisols and Podzols). The diversity of soil cover is conditioned by the type of geosystems. The hilly country is one part of paradyamic system - contrast region, which has created on the contact with the adjacent mountains on the basis of the horizontal bindings between two genetically distinct physical geographic units. The group of Leptosolos occupies a small areal in the mountains (Zemplínske vrchy Mountains, Chlmecké pahorky hills and Tarbucka). It represents the soil type Litosol, which is developed in two varieties: carbonate (soil-forming rocks the Mesozoic sediments in Zemplínske vrchy hills) and acidic (soil-forming rocks are the volcanic rocks). These types of soils covers less productive grasslands (category T3). A similar character and occurrence have also Rendzic and non redzic Leptosols. In the

Table 1

Representation of the soils from the aspect of the economic profitability of crops in %

Profitability category	Winter wheat	Maize for grain	Sugar beet	Winter rape	Crop production total
East-Slovakian Lowland					
Soil non-profitable	2.3	47.5	39.5	19.2	46.9
Soil low profitable	5.1	9.6	11.6	41.3	14.0
Soil medium profitable	47.8	20.7	9.89	23.3	16.9
Soil highly profitable	27.9	22.2	39.1	16.2	22.2
Soil very highly profitable	16.9	-	-	-	-
Slovak Republic					
Soil non-profitable	36.3	59.5	61.0	31.3	54.4
Soil low profitable	15.8	3.1	1.3	31.2	13.9
Soil medium profitable	13.7	12.9	3.4	17.3	7.3
Soil highly profitable	21.4	15.4	22.4	13.6	10.6
Soil very highly profitable	12.8	9.1	11.9	6.6	13.8

Table 2

Structure of typological-productive categories of agricultural soils in %

Productive categories of soils	East-Slovakian lowlands	Slovak Republic
O1 – most productive arable soils	-	5.8
O2 – highly productive arable soils	-	9.8
O3 – very productive arable soils	11.3	9.0
O4 – productive arable soils	28.6	11.8
O5 – medium productive arable soils	7.8	8.7
O6 – less productive arable soils	6.1	9.0
O7 – low productive arable soils	0.2	3.5
OT1 – medium productive arable soils, very productive grassland	21.8	1.9
OT2 – medium productive arable soils, medium productive grassland	0.9	4.4
OT3 – low productive arable soils, less productive grassland	3.5	5.1
T1 – productive grassland	0.4	9.4
T2 – less productive grassland	17.9	12.8
T3 – low productive grassland	0.7	7.3
N – territories unsuitable for agro-ecosystem	0.8	1.5

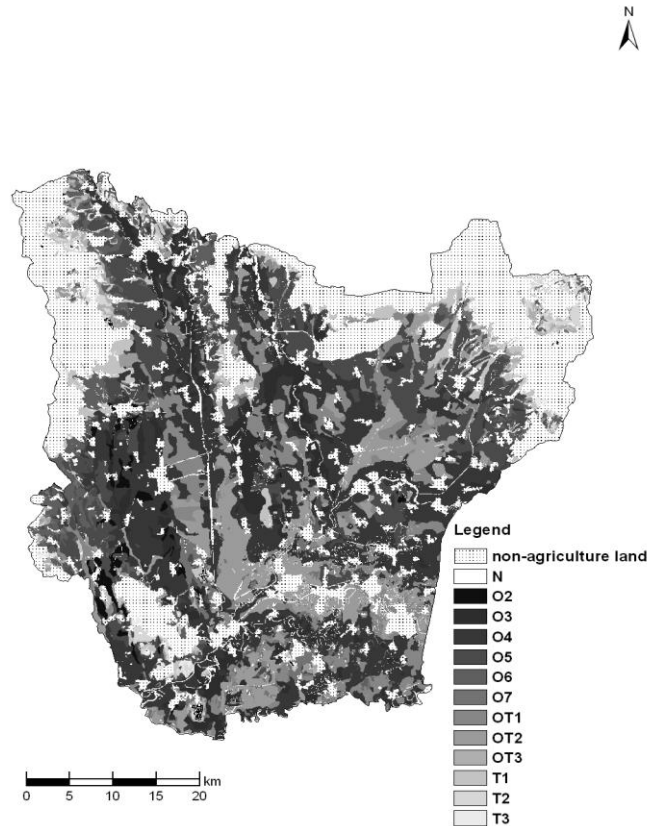


Fig. 1 – Representation of typological-productive categories of agricultural soils in East-Slovakian Lowlands

cover of soil on the Podslanská Hilly country is about the same proportion of Haplic Luvisols and Planosols. Haplic Luvisols dominate in the central and southern part of the hilly country. Represented are Stagni-Haplic Luvisols and an admixture are Luvic Stagnosols and Planosols on loess loams and polygenetic loams. Somewhere are present Albi-Haplic Luvisols and Albic Luvisols on loess loams. In the northern part of Podslanská hilly country are the Eutric or Distric Planosols and Luvic or Albic Stagnosols on the loess loams and colluvial sediments. Chernozems occupy only a small area on the eastern

edge of the Podslanská Hilly country west of the Trebišov town. The soil cover of the Podvihorlatská Hilly country consist mostly from the Planosols and Stagnosols only somewhere are the small islands of Fluvisol and Podzols. Soil type of Podzols is associated with Lithic Leptosols and Skeli-Dystric Leptosols on the material of weathered quartzites and Tertiary sediments with the marked occurrence of quartz skeleton (the Pozdišovský chrbát comb). Profitability of land for crop production are presented in Table 1. Structure of typological-productive categories of agricultural soils presented Table 2 and Figure 1.

Conclusion

The properties of the soil cover in the East-Slovakian lowland are influencing of the physical geographical regularities of the differentiation the pedosphere, especially of azonation and the barrier zonation. The conditions that are here for the soil cover differentiation very important are it substrate-morphological- hydrological and climatic conditions. The soil cover on the East-Slovakian plain is different from the soil cover of East- Slovakian hilly country. While for the soil cover differentiation of East-Slovakian plain

is applies mainly azonation (substrate-morphological-hydrological conditions) for the differentiation the soil cover of East-Slovakian hilly country is applies above all of barrier zonation and only partially azonation (Podvihorlatská hilly country). The regularities and conditions are significantly affecting the fertility of agricultural soils and land use of the landscape. From the aspect of fertility are dominated here productive category of soils O3 (very productive soils).

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