FACTORS LIMITING SOIL FERTILITY IN THE MOLDOVA NOUA AREA, CARAS-SEVERIN COUNTY, ROMANIA

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Abstract*. This paper presents the main factors limiting soil fertility in the Moldova Noua area, Caras-Severin County, Romania.(1) The goals of this paper are: characterising the natural landscape, identifying and characterising soil types and subtypes, describing the factors limiting soil fertility, and presenting soil fertility improvement and protection measures. (2)The material used is represented by the main soil subtypes in the studied area. Results allowed the description of the most important factors limiting soil fertility and the suggestion of soil fertility protection, conservation and recovery solutions, i.e. agricultural and soil improvement works. (6) This was determined by the very complex soils located in a relatively moist climate area and on a strongly fragmented relief made up mainly of a wide variety of rocks. Along the valleys, there are prepodsols and different subtypes of prepodsols, together with regosols and erodosols, while on the terraces, there are stagnogley prepodsols and, in the mountain area, podzols, rendzinas and lithosols are predominant. (4) Moldova Noua is located in southern Caras-Severin County, Romania, on the Danube River, covering 146 km^2.(5) Geologically, the territory belongs almost entirely to the Meridional Carpathians, namely to the Locvei Mountains, which are made up of lime rocks and crystal shales rich in copper.(10) In lime areas altitude reaches over 700 m. (9) To study the factors limiting soil cover fertility in Moldova Noua, Caras-Severin, Romania, we had to conduct a set of laboratory analyses. (8) The studied area belongs to Moldova Noua, Caras-Severin County, Romania, and is characterised by varied geological and physical and geographical conditions, which generated a complex soil cover represented by 6 types and 77 subtypes of soil: Luvisols, measuring 932.06 ha (15.23%) of the studied area; Entianthroposols, measuring 0.63 ha (0.01%); Chernozems, measuring 3,977.24 ha (65%); Phaeozems, measuring 1,001.77 ha (16.37%); Pelosols, measuring 18.35 ha (0.30%); and Vertosols, measuring 188.8 ha (3.09%).(7) The aide range of factors influencing soil fertility caused a wide variety of soil subtypes: this diversity is of considerable importance for each crop from the perspective of crop favourability and suitability.(13)*

Keywords: *limiting factors, soil, fertility, acidity, texture, moisture excess, erosion, slope.*

INTRODUCTION

Moldova Noua is located in southern Caras-Severin County, Romania, on the Danube River, covering 146 km^2.(11,14)

The town is made up of five populated centres: Moldova Noua, Orasul Nou, Moldova Veche, Macesti and Moldovita. The first centres are neighbourhoods of the town, while the last two are localities belonging to Moldova Noua. The town is crossed by the rivers Baron and Bosneag. (15)

Geologically, the territory belongs almost entirely to the Meridional Carpathians, i.e. to the Locvei Mountains, which are made up of lime rocks and crystal shales rich in copper. In lime areas altitude reaches over 700 m. (12)

Geomorphogenetically, it is an exhaustive relief, i.e. a "Codru Moma type relief". Petrographically, it was formed on crystal foundation sporadically covered by Mesozoic and Neozoic sediments with fragmentary extension. The sedimentary cover in the north is made up of slopes with large relief forms: Culmea Varadului and Cracul Inalt, crossed by subsequent valleys evolving towards north-south. (3)

MATERIAL AND METHOD

The main limiting factors influencing the soil cover are acidity, low humus supply, texture, compactness, land slope, surface erosion, ground moisture excess, surface moisture excess and flooding.

To counteract these limiting factors that are also restrictive elements because they affect the yielding potential of the soils in the area, we need to take different measures (presented in another paper).

To study the factors limiting soil cover fertility in Moldova Noua, Caras-Severin, Romania, we had to conduct a set of laboratory analyses.

RESULTS AND DISCUSSIONS

The studied area belongs to Moldova Noua, Caras-Severin County, Romania, and is characterised by varied geological and physical and geographical conditions, which generated a complex soil cover represented by 6 types and 77 subtypes of soil: ***Luvisols***, measuring 932.06 ha (15.23%) of the studied area; ***Entianthroposols***, measuring 0.63 ha (0.01%); ***Chernozems***, measuring 3,977.24 ha (65%); ***Phaeozems***, measuring 1,001.77 ha (16.37%); ***Pelosols***, measuring 18.35 ha (0.30%); and ***Vertosols***, measuring 188.8 ha (3.09%).

In the field and in the laboratories, we measured the main limiting factors influencing the soil cover fertility: acidity, low humus supply, texture, compactness, land slope, surface erosion, ground moisture excess, surface moisture excess and flooding.

Soil reaction is a limiting factor influencing about 35.83% of the studied area because of the low values of the pH. Within the area, there are the following limitation groups: no limitations on 4,790.27 ha (78.28%); low limitations on 1,152.61 ha (18.84%); moderate limitations on 175.97 ha (2.88%).

Humus supply is one of the fundamental features of soil fertility due to its influence on physical, chemical and biological features, which largely determines soil yielding level: reduced limitations on 435,65 ha (7.12%) and moderate limitations on 503.82 ha (8.23%).

Soil texture as physical feature is determined by the nature of the parental material, by the nature and type of pedogenesis processes and by its intensity of materialisation. Thus, because of the ***coarse texture***, there are the following limitations: no limitations on 224.80 ha (3.67%); reduced limitations on 6.28 ha (0.10%); and moderate limitations on 4.50 ha (0.07%). Because of the ***fine texture***, there are the following limitations: no limitations on 514.05 ha (8.40%); reduced limitations on 5,278.31 ha (86.27%); and moderate limitations on 90.91 ha (1.49%). Since texture is one of the features difficult to change in time, we need to choose the proper time for crop sowing and maintenance.

As for **soil compactness** in the studied area, there are the following situations: no limitations on 200.06 ha (3.27%); moderate limitations on 1,140.57 ha (18.64%); and severe limitations on 4,778.40 ha (78.09%).

Land unevenness is caused by level oscillations in the area, with the following situations: reduced limitations on 3,969.70 ha (64.88%); moderate limitations on 2,091.54 ha (34.18%); and severe limitations on 57.61 ha (0.94%).

Land slope as a relief element has the following limitations: very severe limitations on 45.11 ha (0.74%); severe limitations on 84.58 ha (1.38%); and reduced limitations on 241.43 ha (3.95%).

Surface erosion and erosion hazard correlated with the land slope and the agricultural system practiced has the following limitations: moderate limitations on 129.69 ha (2.12%); and reduced limitations on 241.43 ha (3.95%).

Moisture deficit has the following effects: no limitations on 553.38 ha (9.04%); reduced limitations on 2,271.85 ha (37.13%); moderate limitations on 3,163.93 ha (51.71%); severe limitations on 129.69 ha (2.12%).

Ground moisture excess has the following limitations: moderate limitations on 130.14 ha (2.13%); and reduced limitations on 41.20 ha (0.67%).

Surface moisture excess has moderate limitations on 441.88 ha (7.22%).

Flooding influences significantly land use and particularly crop safety, and has the following limitations: very severe limitations on 195.89 ha (3.20%); and severe limitations on 603.32 ha (9.86%).

CONCLUSIONS

In this paper, after a detailed presentation of the natural landscape made to explain the soil phenomena and the way phenomena and processes can be influenced by man, we pursued two distinct aspects of the yielding activity: identifying and characterising soil types and subtypes, and identifying limiting factors of soil fertility.

The aide range of factors influencing soil fertility caused a wide variety of soil subtypes: this diversity is of considerable importance for each crop from the perspective of crop favourability and suitability.

We pointed out asset of limiting factors such as soil reaction, humus supply, soil texture and compactness, land unevenness and slope, surface erosion, surface and ground moisture deficit and excess, and land flooding – the most representative and easy to measure factors.

Forestation works are part of the complex of works and measures meant to control ground and surface excessive erosion and that suit the soils; the same measures are to be taken on slope-dike areas within diked precincts.

Moisture deficit – a high one during the last years because of the low rainfall regime – was one of the causes of phosphorus deficiency.

In the context of conservation and increasing agricultural land yielding capacity, we identified fertility limiting and/or restrictive factors. They were grouped depending on the source of degradation and from the perspective of the emergency of the improvement works.

BIBLIOGRAPHY

CANARACHE A., 1997 - Însuşirile fizice ale solurilor agricole din Banat, Lcr. şt. Ale S.N.R.S.S. Timişoara.

G. CĂBĂROIU, L. NIȚĂ - Land quality classes and natural landscape of the mining area Valea Mănăstirii 2, Gorj County, The 9th International Symposium "Young People and Agriculture Research" Timisoara, 29 November 2013Research Journal of Agricultural vol. 45(4), www.rjas.ro/

DUMA-COPCEA ANIŞOARA, MIHUȚ CASIANA, OKROS A., 2012 - Land evaluation for different cultures, the city Recas, Timis County, Scientific Conferences wich International Participation, ISSN 1841-8317, CRAIOVA ROMANIA, ISSN CD-ROM 2066-950X

GOIAN M., IANOŞ GH., 1993 - Cercetări asupra evoluţiei solurilor Câmpiei de Vest, Lcr. şt. U.S.A.B. Timişoara, vol. XXVII (partea I), 1993

IANOŞ GH., PUŞCĂ I., GOIAN M., 1997 – Solurile Banatului-condiţii naturale şi fertilitate, Editura Mirton, Timişoara, 1997

MIHUȚ CASIANA, RADULOV ISIDORA, 2012 - Științele Solului. Ed. Eurobit, Timișoara, 2012;

MIHUȚ CASIANA, NIȚĂ L.D., 2018 - Atmospheric factors used in the characterization of soil resources, Research Journal of Agricultural Vol 50, No 1 (2018), pag. 114-120, https://www.rjas.ro/issue_detail/44

MIHUȚ CASIANA, ANIȘOARA DUMA-COPCEA, L. NIȚĂ, SIMONA NIȚĂ, VIORICA DUMITRESCU, 2016 - The economic efficiency of the perimeter of soils Pojejena, Caras-Severin, planted with corn and wheat, International Symposium „*Trends in the European Agriculture Development*", - 27-28 May, edition IX a, Timişoara 2016, http://www.rjas.ro/volume_detail/38

MIRCOV VLAD DRAGOSLAV, POP GEORGETA, C. MOISA, A, COSMA - climatic risk determined by the pluviometric regime regstered in the bana area during 1961-2010. proceeding of the 4l International Symposium „Actual task on Agricultural Engineering". Opatija, Croatia, 2013, ISSN1884-4425, pag. 364-374 http://atae.agr.hr

OKROS ADALBERT, POP GEORGETA, NITA SIMONA, RADULOV ISIDORA, MICU LAVINIA MADALINA, MIRCOV VLAD, DICU DANIEL DORIN, 2016 - Agricultural systems in the western part of Romania, Journal of Biotechnology, Volume 231, Supplement, 10 August 2016, 05-09.05.2016 Riga Letonia 3,14

A OKROS, L NIȚĂ, SIMONA NIȚĂ, D DICU, D BEUTURĂ, ASTRID SIMONE GROSZLER - Soil resources of the Domaşnea Commune, Caraş-Severin County. Research Journal of Agricultural Science . 2017, Vol. 49 Issue 1, p169-174. 6p. www.rjas.ro/

OKROS A., POP GEORGETA, 2014, The influence of the western plain topoclimate on cereal and cereal derivative production quality and quantity, Research Journal of Agricultural Science, 46 (4), 2014

OKROS ADALBERT, CASIANA MIHUȚ, LUCIAN DUMITRU Niţă - Yield capacity of THE soils in Recaş viticulture centre, Timiş county, Research Journal of Agricultural vol. 44(3), pag. 95-10, www.rjas.ro/

ȚĂRĂU D., 2006, Cartarea, bonitarea solurilor și evaluarea terenurilor, ed. Eurobit, Timișoara, pag. 234-242

ROGOBETE GH. – *Ştiinţa solului*, Editura Mirton, Timişoara, 1994

RUSU I., NIȚĂ L., ŞTEFAN V., CASIANA MIHUȚ, LAȚO K., 2004, Pretabilitatea solurilor din Câmpia Banatului pentru diferite folosinţe şi culturi de câmp. Lucrări ştiinţifice. Facultatea de Agricultură, Vol. XXXVI. Ed. Eurobit Timişoara, 2004