THE SUITABILITY OF THE SOIL FOR THE PRIMARY LAND USE IN THE ARAD PLAIN

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Abstract

The enhancement of production and agricultural land suitability depends directly on a comprehensive understanding of soil processes, evolution, and the extent to which soils receive nutrients. The fundamental purpose of land evaluation is to assess its characteristics and qualities in order to determine its optimal use. The classification of farmland is established through land assessment, following an evaluation of its natural state. The concept of "land" encompasses all environmental elements (such as soil, topography, climate, hydrology, etc.) that exert a significant impact on its utilization. Land evaluation under natural conditions involves the incorporation of ecological characteristics and indicators to establish stringent evaluation criteria. The analysis of soil samples' physical and chemical properties (including texture, pH, and humus) as well as biochemical aspects was conducted at the OSPA Arad Research Laboratory, adhering to the national norms and standards established by the National Association of Standardization. Examination of ecopedological conditions, data organization, and processing were carried out following the Methodology for the Elaboration of Pedological Studies (volumes I, II, and III), outlined by the ICPA Bucharest in 1987, along with the Romanian System of Soil Taxonomy (SRTS-2012+). Previous studies have presented extensive analytical data spanning over four decades, during which various methodologies, mapping techniques, and assessments of agricultural lands were conducted. Given the dynamic nature of soil characteristics and their close relationship with the conditions of solidification, it is imperative to reevaluate the physical and chemical attributes, nutrient availability, and soil suitability for land utilization in the Arad Plain.

• Introduction

Production capacity demonstrates the expression of all vegetation factors, which operate independently for plants and ascertain the level of physiological needs satisfaction at a specific location and time. It pertains to soil fertility (determined by various soil properties like pH, nutrient levels, salt content, etc.) and the manifestation of other environmental factors for plant growth, starting with cosmic-atmospheric factors (light, heat, water), followed by geomorphological factors and hydrological factors, influencing the productivity of human labor concerning physiological needs satisfaction.

Agriculture, a traditional sector of the national economy, serves as the primary source of food ensuring national food security, supplying raw materials for the light and food industries, and contributing significantly to the creation of new landscapes. The study of soil encompasses a comprehensive analysis of natural conditions (climate, topography, vegetation, geology, groundwater, age) in conjunction with human productive activities. Given these considerations, this study aims to explore some aspects regarding the use of information in creating a quality cadastre (economic), drawing insights from pedological studies stored in the archives of OSPA Arad, mainly in traditional formats, along with the xPed system implemented by ICPA Bucharest.

• Material and method

The Romanian approach to evaluating agricultural lands involves a mathematical-heuristic model that synthesizes knowledge from various assessment schools and Romanian expertise. ICPA Bucharest (1987) focuses on determining the yield capacity by considering crucial environmental factors, relief features, climatic resources, hydrology, and soil characteristics within specific economic and social contexts of societal and agricultural development in particular. During the assessment of the natural conditions of the land, each index shares an assessment grade represented by a coefficient ranging from 0 to 1, reflecting whether the feature is highly unfavorable or optimal for the intended land use or plant requirements considered (MESP-1987, vol. II)

• Results and discussion

Geomorphologically, the considered area is part of the great unit named Banato-Crişana Plain, within the Mureş-Crişul Alb interfluve region, known as the Arad Plain. The Mureş-Crişul Alb Interfluve area exhibits a wide range of geological and geomorphological units, notably the Crişul Plain, Curtici Field, Şiria Plain, Livada (Arad) Plain, Ier Plain, Nădlac Plain, and flood plain.

A prominent feature of the soil cover is the dynamic variability over time and space resulting from the natural processes of formation and evolution. The pedo-genetic processes have led to the development of a mosaic-like soil cover, evident in the primary soil types identified within the study area (Table 1).

For the category of land designated for arable use, areas intended for the cultivation of cereals, industrial plants, food crops, and medicinal or aromatic plants that require annual tilling when sown with annual crops or multiple consecutive years when grown with perennial crops, based on the evaluation grades derived from an average of 8 crops, have the highest rating.

Tabel 1. Main types and soil associations in Arad Plain (hectares and percentage of the total agricultural terrain)

Nr. crt.	Type	% of the studied area
1	Aluviosol	2,51
2	Chernozem	44,49
3	Phaeozem	8,45
4	Eutricambisol	22,04
5	Preluvosol	1,47
6	Vertsol	12,23
7	Gleyosol	5,32
8	Solonetz	3,49
Total		100,00

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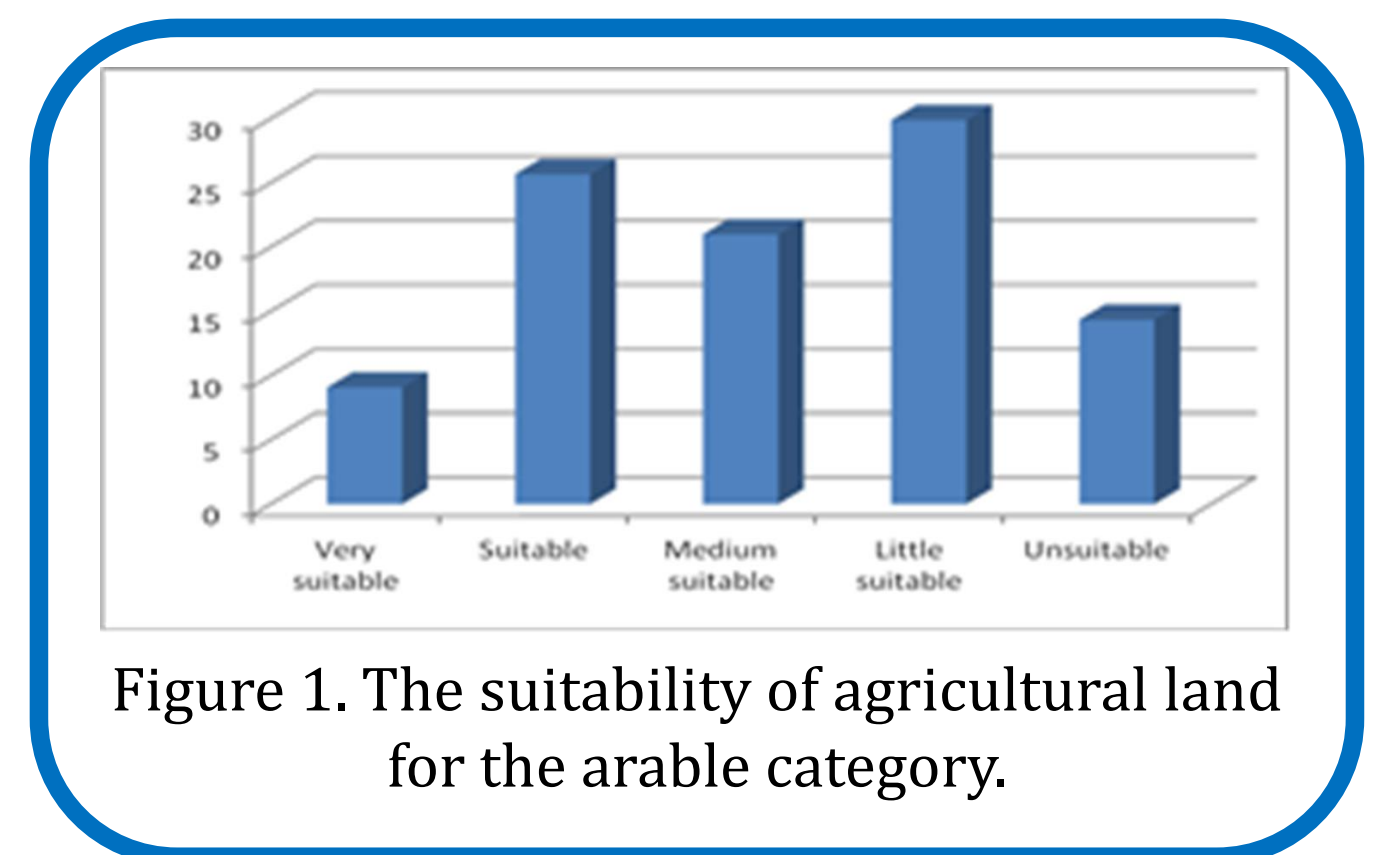

Figure 1. The suitability of agricultural land for the arable category.

Regarding the category of land allocated for pasture use, which includes grasslands either naturally occurring or converted to fallow lands every 15-20 years, utilized for cattle grazing purposes, we can categorize them into suitability classes based on the assessment grades as per the existing methodology, as illustrated in Figure 2.
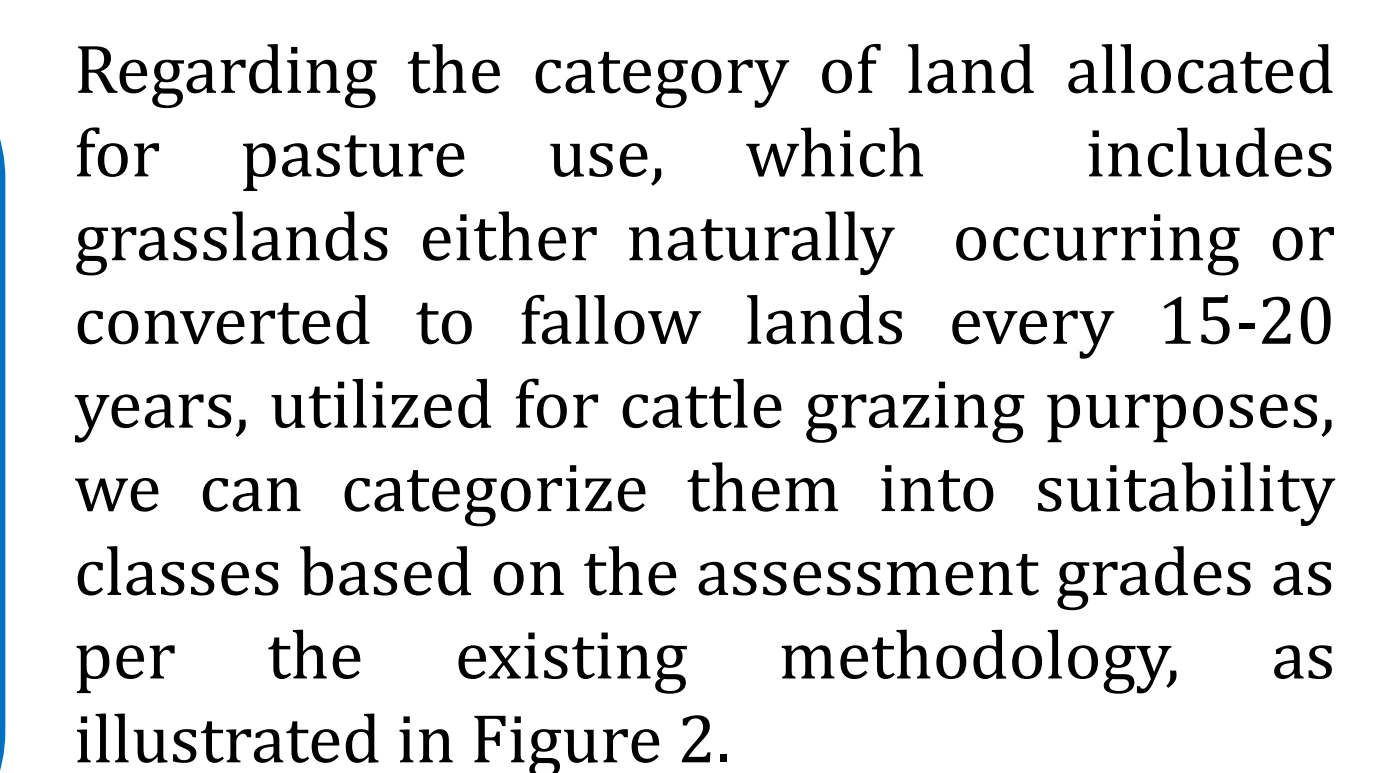

Figure 2. The suitability of agricultural land for the pasture category.

In the context of land designated for hayfield use, encompassing lands transformed into grasslands either through natural means or seeding every 15 or 20 years, where the vegetative mass (grass) is harvested for hay, we can classify them into different classes based on the assessment grades according to the prevailing methodology, as depicted in Figure 3.
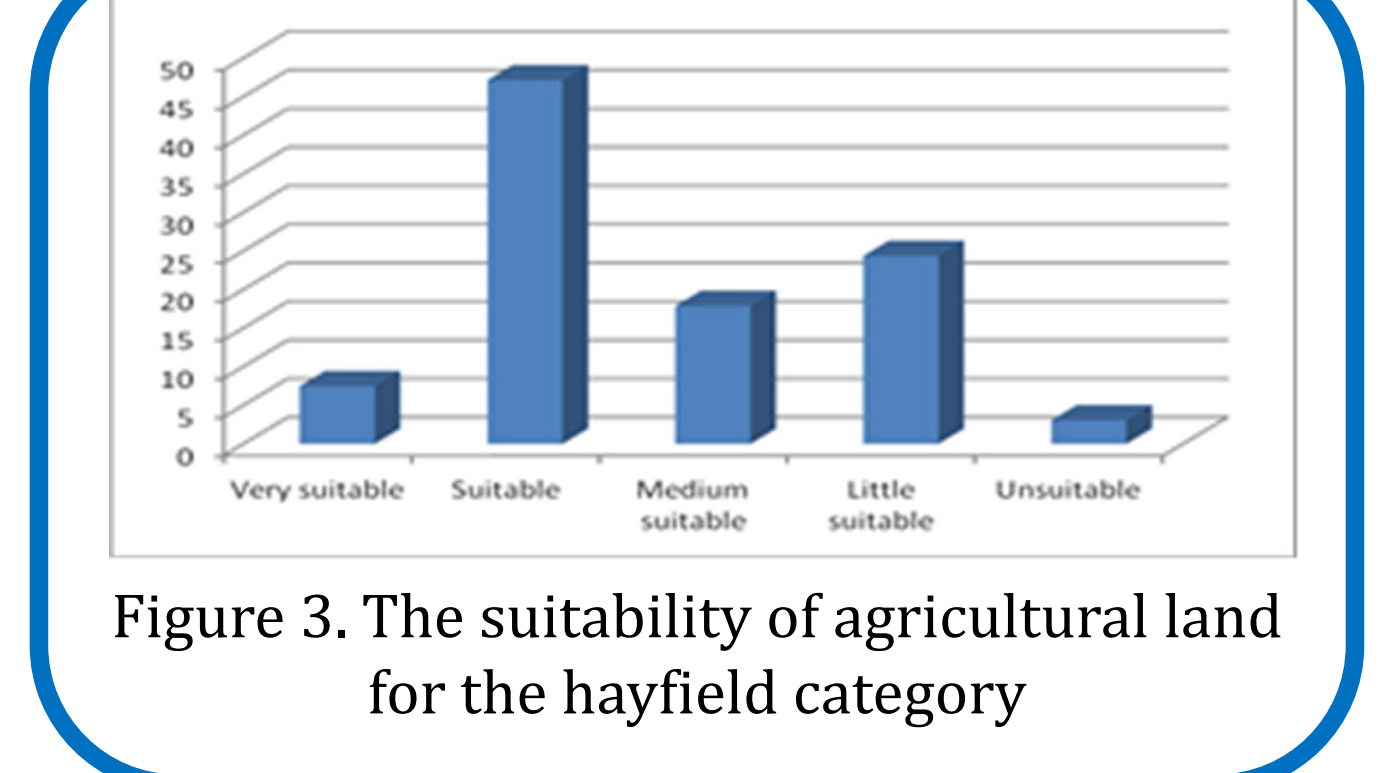

Figure 3. The suitability of agricultural land for the hayfield category

Concerning the land allocated for vineyard use, specifically those cultivated with grapevines, we can classify them into suitability classes based on the assessment grades in alignment with the current methodology, as indicated in Figure 4.
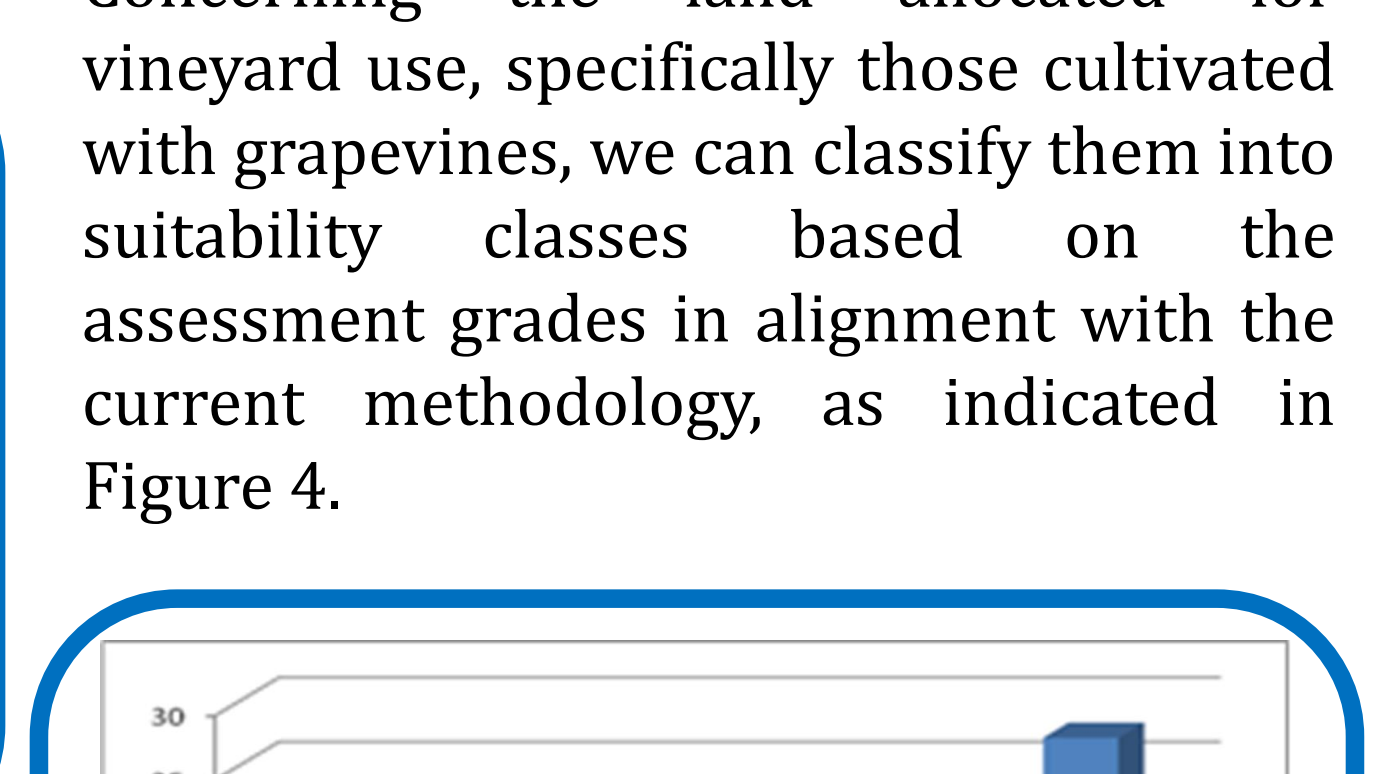

Figure 4. The suitability of agricultural land for the vineyard category.

For the orchard use category, which includes lands cultivated with fruit trees and bushes, we can categorize them into suitability classes based on the assessment grades according to the current methodology, as shown in the chart (Figure 5).
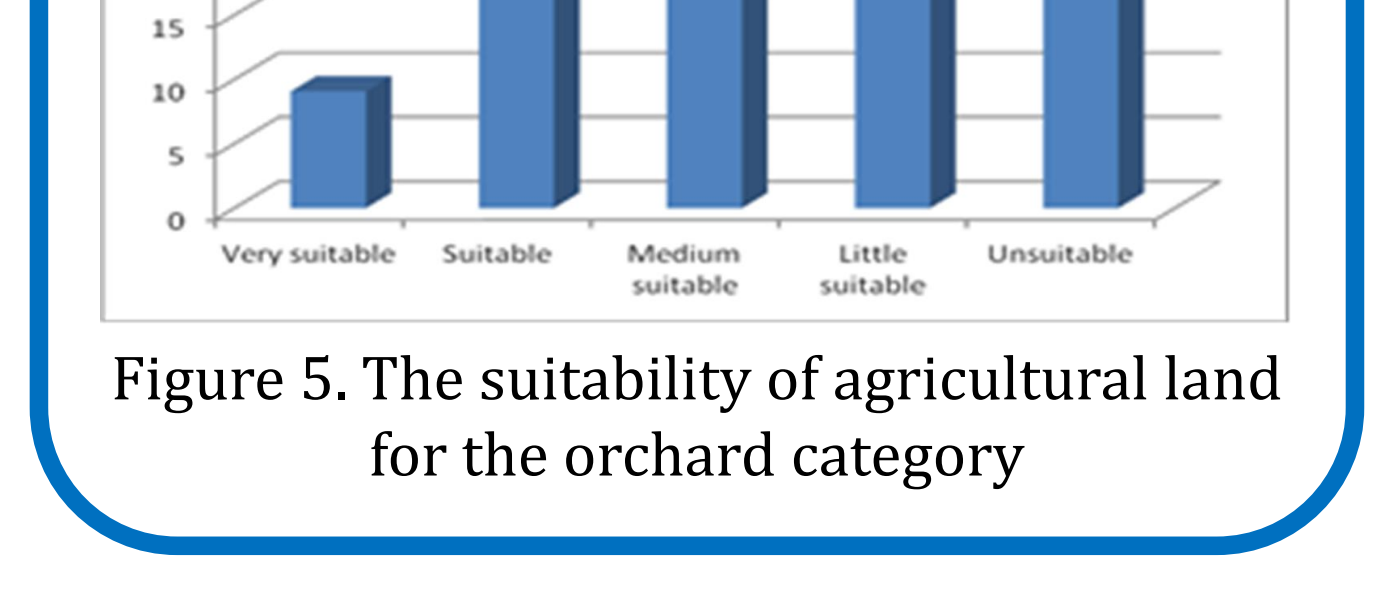

Figure 5. The suitability of agricultural land for the orchard category

• Conclusions

The research conducted on the Mureş Plain provides us with the following:
• the agricultural area under examination covers 182.080 hectares, across 25 cadastral territories;
• by applying the ICPA Bucharest methodology for evaluating and categorizing lands based on their suitability for primary crops (such as wheat, corn, sunflower, sugar beets, and potatoes), various correlations between current and potential yield levels can be established;
• understanding the natural conditions, especially the ecological potential of the lands (as defined by MEPS 1987), for primary crops significantly influences the determination of their yield potential.