THE SOIL FAVORABILITY FOR THE MAIN AGRICULTURAL CROPS IN THE ARAD

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Abstract: *Increasing production and agricultural land fertility are directly determined by the detailed knowledge of soil processes, of evolution, and of the measure in which soils are supplied with nutrients. In principle, land evaluation is to compare the properties and characteristics of the requirements or demands of land (use) it. Farmland assessment is the basis of their classification as class, after the note of evaluation in natural conditions. In concept assessing the concept of "land" includes all environmental factors (soil, terrain, climate, hydrology, etc.), which have significant influence on use. The land evaluation for natural conditions, ecological characterization participated indicators for determining the coefficients stringent evaluation notes. The physical and chemical properties of soil samples (texture, pH, humus and N, P, K content) and biochemical were analyzed in the OSPA Arad Research laboratory, according with the national norms and standards approved by National Association of Standardization. Research of ecopedological conditions, data ordering and processing was done in accordance with the Methodology of Elaboration of Pedological Studies; (vol. I, II, III), developed by the ICPA Bucharest in 1987 and the Romanian System of Soil Taxonomy (SRTS-2003). Previous research contain numerous analytical data over a period of over 40 years, an interval in which there were numerous methodology, mapping, abd assessment of agricultural lands. As both soil features are dynamic, in close relation with solification conditions, it is necessary to re-assess physical and chemical features, nutrient supply, and soil favourability for the main crops in the Arad Plain.*

Key words: *informations, land, assessment, ecological, soils*

INTRODUCTION

Production capacity shows the way of manifestation of all vegetation factors, which act independently for the plants and determine the satisfaction level of physiological needs of those, in certain place and certain time. It refers to soil fertility (who is determined by a series of properties of soil, such as: pH, the level of nutritive elements, salt content etc.) and to the way of manifestation for the plants of the others environmental factors, beginning with the cosmically-atmospherically (light, heat, water), continuing with the geo-morphological factors and the hydrological ones, having as affect the different productivity of human work reported to the way of physiological needs satisfaction.

Traditional activity and branch of the national economy, agriculture is the main supplier of food so that can ensure food security of the nation, and raw materials for light and food industry and an important generator of new landscapes.

The soil is studied in the complexity of natural conditions (climate, relief, vegetation, rock, groundwater, age) plus human productive activity.

Given these considerations, the present work tries to present some aspects regarding the use of information in making quality cadastre (economic), information gained in pedological studies and deposited in the archives of OSPA Arad, most of them on classic support, based on SPED information system and BDUST-B system implemented by ICPA Bucharest.

MATERIALS AND METHODS

Romanian methology of assessing agricultural lands is based on a mathematical-heuristic model englobing the synthesis of knowledge in the field of different schools as well as that of native expertise (D. Teaci 1960, 1975, 1980). The ICPA Bucuresti (1987) acts in order to establish the production capacity with a view to the most important conditions in the whole environmental factors, such as: relief conditions, climate resources, hydrological conditions, and soil features in certain economic and social development conditions of society on the whole and agricultural in particular.

To calculated assessment notes, we have chosen, from the numerous environmental conditions characteristic for each land unit (UT or TEO) within our soil study only those considered to be the most important, easier and more accurate to predict (at the present level of equipment of the specialised units, less performing than in other fields of activity), i.e.:

- index 3C – annual average temperature – corrected values;
- index 4C – annual average rainfall – corrected values;
- index 14 – gleysation;
- index 15 – stagnogleysation;
- index 16 or 17 – salification or alkalinisation;
- index 23A – texture in Ap or the first 20 cm;
- index 29 – pollution;
- index 33 – slope;
- index 34 – land exposition class;
- index 38 – land glides;
- index 39 – depth of surface water;
- index 40 – floodiness;
- index 44 – total porosity in the restrictive horisont;
- index 50 – permeability class;
- index 61 – contents of total $CaCO_3$ total over 0-50 cm;
- index 63 – soil reaction in Ap or in the first 20 cm;
- index 69 – base saturation class;
- index 133 – useful edaphic volume;
- index 144 – humus supply in the first 0-50 cm;
- index 181 – stagnant-moisture excess (surface);
- index 271 – land improvement works.

Upon land assessment for natural condition, each of the indices above participate in establishing the assessment grade through an assessment coefficient that varies between 0 and 1, according to the features being totally unfavourable or optimal for use or plant demands in discussion (Annexes 3-1 to 3-18, MEPS-1987, vol. II).

The assessment grade for use and crops can be obtained by multiplying 100 times the produce of the coefficients of the 17 indices directly participating in the assessment grade:

$$Y = (x_1, x_2, x_3, \ldots x_{17})\ 100$$

Where:

Y = assessment grade

$x_1, x_2, x_3, \ldots x_{17}$ = value of coefficients (17 indices)

For example, when all indices have the value of coefficients equal to 1, the value of assessment grade is maximal, i.e. 100.

In Romanian assessment methodology, there are 24 situations covering all the uses, the different agricultural crops, and the different fruits-tree, and vine species.

RESULTS AND DISCUTIONS

The whole area under study concerns 182.080 ha of agricultural terrain.

Ecopedological conditions research, data organizations and processing were made accordingly to „ Pedological studies Ellaboration Methodology'', issued by ICPA Bucureşti in 1987, copleted by „Romanian Soil Taxonomic System (SRTS 2012)

From the geomorphologic point of view, the researched area is a part of the great physical geographic unit called Banato-Crişană plain, sub-unity Mureş-Crişul Alb interfluve field, known as Arad plain.

Mureş-Crişul Alb interfluve have a great diversity of geological units and many geomorphologic ones the most importing being: Criş plain, Curtici field, Şiria plain, Livada (Aradului) plain, Ier plain, Nădlac plain and the flood plain.

Favourability is, for the Romanian scholl of soil science, the measure in which a soil (land) meets the living demands of crop plant, under normal climatic conditions and within a proper agricultural technique.

In this sense, assessing agricultural lands from the point of view of the favourability of each piece of land points out the following.

In wheat and barley, as straw cereals, that are cultivated on a very wide area, we established, throughassessment grades, the folowing fertility classes (Figure 1) for wheat:

- 1st class, with very favourable lands, represented by the folowing Us_s: 4, 7, 8, 10, 17, 26, cover 18,75% of the agricultural land of the area under study;
- 2nd class, with favourable lands, represented by the following Us_s: 3, 9, 11, 18, 21, 22, 29, cover 22,32% the agricultural land of the area under study;
- 3rd class, with medium favourable lands, represented by the following Us_s: 1, 5, 12, 13, 19, 20, 23, 24, 25, 30, cover 31,08 % the agricultural land of the area under study;
- 4th class, with little favourable lands, represented by the following Us_s: 2, 14, 15, 16, 27, 32, cover 18,75 % the agricultural land of the area under study;
- 5th class, with unfavourable lands, represented by the following Us_s: 6, 28, 31, 33, 34, 35, 36, cover 9,09% the agricultural land of the area under study.

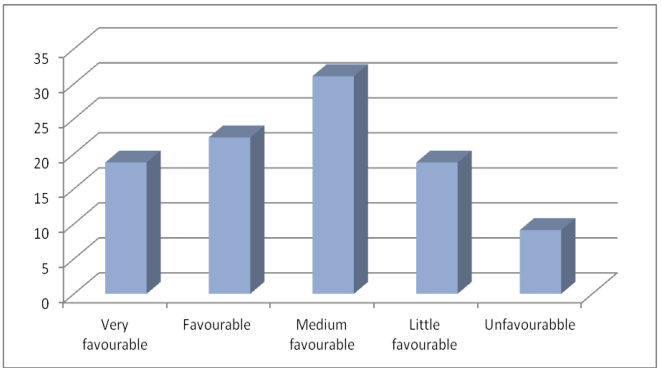

Figure 1. Favourability of agricultural lands for wheat

In maize, as the main agricultural crop in Romania, and for which they carried out most of the research in the field of land assessment and that is very environmental senzitive, land has the following favourability classes (Figure 2):

- 1st class, with very favourable lands, represented by the folowing Us_s: 4, 7, 8, 10, 11, 26, cover 13,62 % of the agricultural land of the area under study;
- 2nd class, with favourable lands, represented by the following Us_s: 3, 9, 12, 17, 18, 22, 25, cover 22,66% the agricultural land of the area under study;
- 3rd class, with medium favourable lands, represented by the following Us_s: 1, 2, 5, 13, 14, 20, 21, 29, ocupă 30,12 % the agricultural land of the area under study;
- 4th class, with little favourable lands, represented by the following Us_s: 14, 15, 16, 19, 23, 24, 27, 30, 32, cover 24,44 % the agricultural land of the area under study;
- 5th class, with unfavourable lands, represented by the following Us_s: 6, 28, 31, 33, 34, 35, 36, cover 9,09% the agricultural land of the area under study.

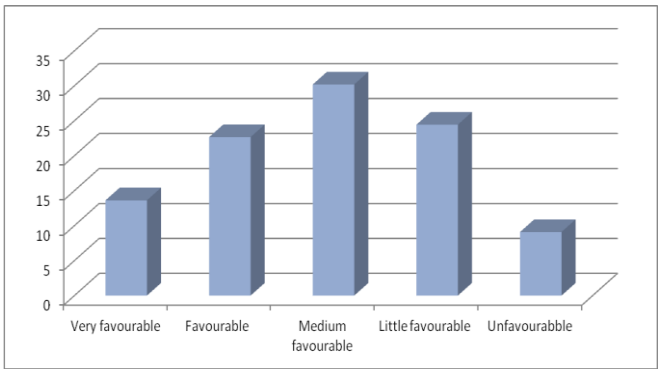

Figure 2. Favourability of agricultural lands for maize

In sun-flower, the situation is as following (Figure 3):

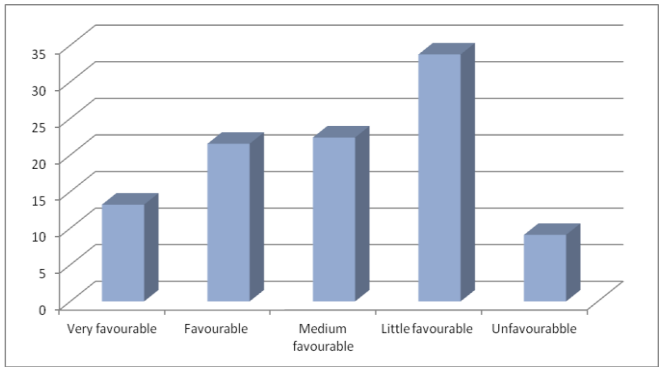

Figure 3. Favourability of agricultural lands for sun-flower

- 1st class, with very favourable lands, represented by the folowing Us_s: 4, 7, 8, 10, 26, cover 13,22 % of the agricultural land of the area under study;

- 2nd class, with favourable lands, represented by the following Us_s: 3, 9, 11, 17, 18, 22, cover 21,54% the agricultural land of the area under study;
- 3rd class, with medium favourable lands, represented by the following Us_s: 1, 2, 5, 12, 13, 14, 21, 25, 29, cover 22,40 % the agricultural land of the area under study;
- 4th class, with little favourable lands, represented by the following Us_s: 15, 16, 19, 20, 23, 24, 27, 30, 32, cover 33,75 % the agricultural land of the area under study;
- 5th class, with unfavourable lands, represented by the following Us_s: 6, 28, 31, 33, 34, 35, 36, cover 9,09% the agricultural land of the area under study.

In potato, the situation is as following (Figure 4):

- 1st class, with very favourable lands, represented by the folowing Us_s: 4, 7, 8, 26, cover 9,08 % of the agricultural land of the area under study;
- 2nd class, with favourable lands, represented by the following Us_s: 10, cover 4,14% the agricultural land of the area under study;
- 3rd class, with medium favourable lands, represented by the following Us_s: 1, 2, 3, 9, 11, 12, 17, 18, 21, 22, 25, 29, cover 30,02 % the agricultural land of the area under study;
- 4th class, with little favourable lands, represented by the following Us_s: 5, 13, 14, 16, 20, 27, 30, cover 30,46 % the agricultural land of the area under study;
- 5th class, with unfavourable lands, represented by the following Us_s: 6, 15, 19, 23, 24, 28, 31, 32, 33, 34, 35, 36, cover 26,29% the agricultural land of the area under study.

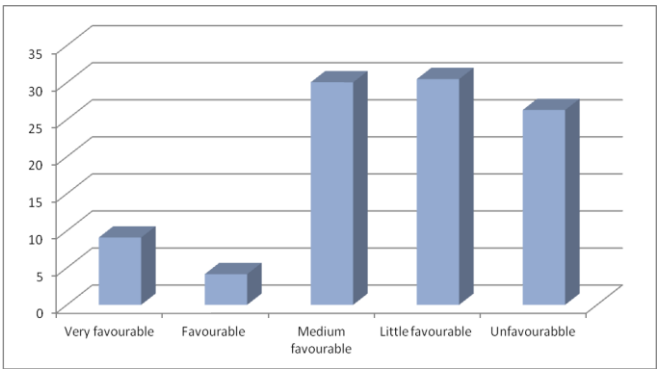

Figure 4. Favourability of agricultural lands for potato

Alfalfa, the oldest forage crop, is the most valued perennial both for the forage amounts it yields (35t/ha green mass) and particulary for its forage features (1.1150 kg/ha of digestible protein).

Within the are under study, the following assessment grades have been established in alfalfa (Figure 5):

- 1st class, with very favourable lands, represented by the folowing Us_s: 7, 8, 10, 17, 26, cover 18,52 % of the agricultural land of the area under study;
- 2nd class, with favourable lands, represented by the following Us_s: 4, 9, 18, 20, 21, 25 cover 20,17% the agricultural land of the area under study;

- 3rd class, with medium favourable lands, represented by the following Us_s: 1, 3, 5, 11, 12, 24, 28, 29, 30, cover 11,17 % the agricultural land of the area under study;
- 4th class, with little favourable lands, represented by the following Us_s: 2, 13, 14, 16, 19, 22, 27, cover 26,41 % the agricultural land of the area under study;
- 5th class, with unfavourable lands, represented by the following Us_s: 6, 15, 23, 31, 32, 33, 34, 35, 36, cover 23,72% the agricultural land of the area under study.

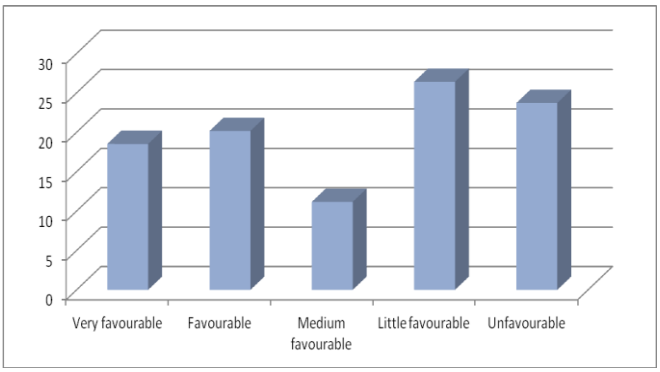

Figure 5. Favourability of agricultural lands for alfalfa

On the ground of the grades we calculated in the 13 crops, we have established, according to the present assessment methodology, 8 crops with the highest favourability (Figure 6) that can be the ground for the establishment of long term crop rotation, that embrace improving plants (gramineae and perennian legume mixtures).

As for the very favourable areas, the situation is as follows: wheat 18.75%, barley 18.75%, maize 13.62, sun-flower 13.22%, sugar beet 9.08%, potato 9.08%, hemp 21.15% and alfalfa 18.52%.

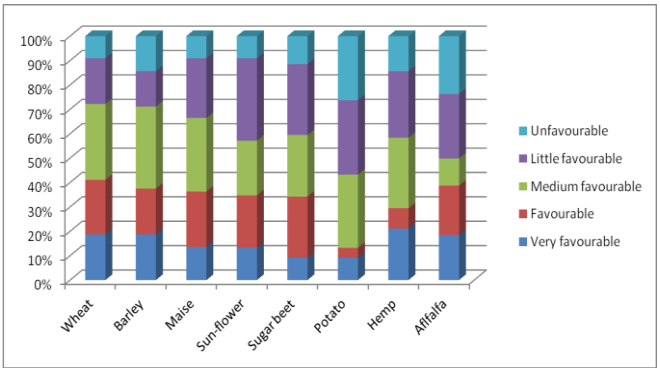

Figure 6. Favourability of agricultural lands for 8 highest favourability crops

Treating the matter of ecological demands in plants such as presented above does not substitute the careful sudy of each relationship between the factor features and environmental conditions and the demands, i.e. the effects these features have on growth and fructification of each plant apart.

Taking into account the great diversity of natural conditions and the way factors interrelate it is necessary to study environmental factors through substitution, enhancement, or

hindrance in order to avoid some absurd situation and to develop new ecological indices that allow the development of agro-environmental schemes.

CONCLUSIONS

Research on the Arad Plain allows us to draw the following conclusions:

- the area under study has 182.080 ha of agricultural terrain, covering 25 cadastre territories;
- following the ICPA Bucuresti methodology concerning the assessment and classification of lands from the point of view of suitability for the main crops (wheat, maize, sunflower, sugar beet, potato) we could establish different relationships between the present and future croplevels;
- on the ground of corrected averages in the 13 crops, through the present assessment method, we established 8 crops with the highest favourability that can be the basic elements in developing long-term crop rotation that also include improving plants (mixtures of gramineae and perennial legumes). As for the very favourable areas, the situation is as follows: wheat 18.75%, barley 18.75%, maize 13.62, sun-flower 13.22%, sugar beet 9.08%, potato 9.08%, hemp 21.15% and alfalfa 18.52%;
- the synthesisof soil and agro-chemical mapping in the area pointed out the great diversity of the levels of supply with nutrient (nitrogen, phosphorus, potassium) determined mainly by the great variability of soil types and by the agricultural reduced to a short, 2-3 crop rotation and even to monoculture, and to unilateral fertilising based on nitrogen;
- knowing natural conditions, and particularly the ecological potential of the lands (defined by MEPS 1987) for the main crops, plays an important role in defining their yielding potential;

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