YIELD CAPACITY OF THE SOILS IN RECAŞ VITICULTURE CENTRE, TIMIŞ COUNTY

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Abstract: *The object of mapping, bonitation and evaluation is the soil (the ground), the thinnest and most fragile layer of Terra. It is studied in relation to the environmental factors and conditions that influence its existence, and together with them, it forms units (habitats, biotypes, homogenous ecological territories, stations and ecosystems). Each of these units presents specific favourability for the development of different agrarian or natural phytocenoses, with specific aptitudes for being used in agriculture, forestry or in other domains. Soil mapping comprises all the observations, studies and research in the field, laboratory and office. It engulfs operations of systematic examination, identification and morphological, physical, chemical, hydro-physical and biological characterization of the soil. The aim of these operations is to use the soil as the basis for vegetal production, as material in constructions, as rural or urban space for social, economic, cultural or recreational enterprises; another aim is to draw pedological maps, as well as correlative maps (lithological, hydrological, geo-morphological, etc). The action of assessment and evaluation of the so-called quality of land resources is as old as the human activity of living off the land, i.e. on-land production of goods necessary for living. This operation of learning about the soil is made through soil mapping. Choosing the "right" place or "matching" the place with certain uses was the first concern of the agricultural man (after the stage of itinerant agriculture); this skill was learnt intuitively and passed over from generation to generation. Detailed knowledge of the current technological and productive characteristics of each plot of land is very important, as are the possibilities of changing these characteristics for the better. In this way, agricultural producers, as well as the decision-taking institutions of the state, have a useful tool for putting into practice the technical procedures for social and economic measures that will eventually lead to complete and efficient use of land resources.*

Key words: *soil mapping, bonitation, plant production, soil, agriculture*

INTRODUCTION

Soil mapping comprises all the observations, studies and research in the field, laboratory and office. It engulfs operations of systematic examination, identification and morphological, physical, chemical, hydro-physical and biological characterization of the soil. The aim of these operations is to use soil as the basis for vegetal production, as material in constructions, as rural or urban space for social, economic, cultural or recreational enterprises. Another aim is to draw pedological maps, as well as correlative maps (lithological, hydrological, geo-morphological, etc). The action of assessment and evaluation of the so-called quality of land resources is as old as the human activity of living off the land, i.e. on-land production of goods necessary for living.

As this skill of the rural toilers could not be measured and generalized, a series of learned men attempted to define and determine soil fertility by making use of various scientific methods. Thus, in the last half of the 19th century and the first half of the 20th century, three bonitation schools appeared (TEACI, 1980), namely: the German school, with THAER, BIRNBAUM and KNOOP (1820), the Russian school the representative of which is DOCUCEAEV (1870) and the American school, represented by STORIE (1934).

Detailed knowledge of the current technological and productive characteristics of each plot of land is very important, and so are the possibilities of changing these characteristics for the better. In this way, agricultural producers, as well as the decision-making institutions of the state, have a useful tool for putting into practice the technical procedures for social and economic measures that will eventually lead to complete and efficient use of land resources.

The production of agricultural plants is determined both by natural ecological factors and by the intervention of man, who can direct and correct the ecological offer he finds available.

MATERIAL AND METHODS

In order to reach the objectives of this research, we used research methods specific for the pedological domain: pedological mapping, morphological description, expeditious determinations in the field, laboratory analyses, pedological data processing, etc.

Thus, after the recently obtained field data were processed in the laboratory, we identified 9 genetic soil types in the area under research.

The profiles were placed in areas that are representative for the space under research, so that we could describe the most representative soil types and subtypes. In the profiles, the samples were taken on pedogenetic horizons, both in natural (unmodified) setting, and in modified setting.

In order to describe certain physical and hydrophysical characteristics, we sampled soil in natural setting in metallic cylinders of known volume, at the current soil humidity, in cardboard boxes (made especially for this); then we could perform the micro-morphological characterisation.

In order to make the physical, chemical and partially biological characterisation, we took samples in the modified setting. The samples were placed in bags, on every genetic horizon. We also took agrochemical samples (from the toiled layer) in order to determine certain specific chemical indices. The study of the ecopedological conditions and the morphological description of the soil were performed in conformity with "Sistemul Român de taxonomie a solurilor" ("The Romanian Soil Classification System") (1980), completed and/or modified by "Metodologia elaborării studiilor pedologice" ("The Methodology of Performing Pedological Studies" - vol. I, II, III), issued by The Research Institute for Soil Science and Agrochemistry from Bucharest in 1987.

The analyses and other determinations were performed in laboratories pertaining to the Office for Soil Science and Agrochemistry from Timişoara, and to Banat University of Agricultural Sciences and Veterinary Medicine from Timişoara. They were performed in compliance with national norms and standards, approved by A.S.R.O. (The Romanian Standards Association).

For the calculation of bonitation marks, out of the multitude of environmental conditions that characterize each terrain unit (UT or TEO) in our pedological study, we only chose the ones we considered would be most important, and also which could be measured easier and more accurately (with the current equipments of the laboratories, which are less state-of-the-art than in other fields of activity), namely:

- indicator 3C – average annual temperature – corrected values
- indicator 4C – average annual precipitations – corrected values
- indicator 14 – gleization
- indicator 15 – stagnogleyzation
- indicator 16 or 17 – salinization
- indicator 23A – texture in Ap or the first 20 cm
- indicator 29 – pollution

- indicator 33 – slope
- indicator 34 – ground exposition class
- indicator 8 – landslides
- indicator 39 – depth of phreatic water
- indicator 40 – flooding
- indicator 44 – total porosity in restrictive horizon
- indicator 50 – permeability class
- indicator 61 – total $CaCO_3$ content for 0-50 cm
- indicator 63 – soil reaction in Ap or in the first 20 cm
- indicator 69 – base saturation class
- indicator 33 – useful edaphic volume
- indicator 144 – humus supply in the layer 0-50 cm
- indicator 181 – stagnant humidity excess (ground water)
- indicator 271 – land reclamation

In the case of soil bonitation for natural conditions, all of the above-mentioned indicators form the bonitation score: each is given a bonitation coefficient that varies between 0 and 1, where 0 represents that characteristic as totally unfavourable and 1 - optimal for the use or plant taken into consideration. (Annexes 3-1 to 3-18, MESP-1987, vol. II).

Approximately half of these indicators have a single series of coefficients. The other half have several series of coefficients linked by their inderdependence with other indicators.

Thus, for average annual precipitations, the series of coefficients differ in relation to the average annual temperature; for gleyzation they differ in relation to the state of land improvement works (drained or not), rainfall and texture; for porosity they are calculated in relation to texture, for reaction in relation to saturation degree, for edaphic volume in relation to precipitations and for humus supply in relation to texture.

The bonitation score for uses and crops is obtained after multiplying by 100 the product of the coefficients of the 17 indicators that are used for this purpose.

RESULTS AND DISCUSSIONS

For pasture use (Table 1.), all soil categories obtained 81 points, thus falling into fertility class II.

For grassland use (Table 1.), the stagnic vertic preluvosol, with weak stagnogleyzation and the stagnic vertic preluvosol with strong stagnogleyzation obtained 64 points, thus belonging to fertility class IV, while the other soil varieties obtained 72 points, being in fertility class III.

Table 1.

Soil suitability for pasture and grassland

No.	Soil type	Pasture		Grassland	
		Score	Class	Score	Class
1.	Weakly stagnogleyzed stagnic preluvosol	81	II	72	III
2.	Vertic reddish preluvosol, weakly gleyzed in-depth	81	II	72	III
3.	Vertic reddish preluvosol with in-depth stagnogleyzation	81	II	72	III
4.	Stagnic vertic preluvosol	81	II	72	III
5.	Weakly stagnogleyzed stagnic vertic preluvosol	81	II	64	IV
6.	Stagnic vertic preluvosol with weak stagnogleyzation	81	II	72	III
7.	Strongly stagnogleyzed stagnic vertic preluvosol	81	II	64	IV

For growing apple trees (Table 2.), stagnic preluvosol, weakly stagnogleyzed obtained 80 points, thus being part of fertility class III, and the vertic reddish preluvosol, weakly gleyzed in-depth obtained 64 points, classifying in fertility class IV.

For growing pear trees (Table 2.) weakly stagnogleyzed stagnic preluvosol obtained 80 points, thus belonging to Fertility class III, and weakly stagnogleyzed stagnic vertic preluvosol obtained 64 points, falling in fertility class IV.

Table 2.

Soil suitability for growing apple and pear trees

No.	Soil type	Apple tree		Pear tree	
		Score	Class	Score	Class
1.	Weakly stagnogleyzed stagnic preluvosol	80	III	80	III
2.	Vertic reddish preluvosol, weakly gleyzed in-depth	64	IV	72	III
3.	Vertic reddish preluvosol with in-depth stagnogleyzation	80	III	80	III
4.	Stagnic vertic preluvosol	80	III	80	III
5.	Weakly stagnogleyzed stagnic vertic preluvosol	64	IV	64	IV
6.	Stagnic vertic preluvosol with weak stagnogleyzation	80	III	80	III
7.	Strongly stagnogleyzed stagnic vertic preluvosol	80	III	80	III

For growing wine grapes (Figure 1. and Table 3), the weakly in-depth gleyzed vertic reddish preluvosol obtained 90 points, thus being situated in fertility class II, and the strongly stagnogleyzed stagnic vertic preluvosol scored 81 points, falling into the same fertility class.

Table 3.

Soil suitability for growing wine grapes (VV)

Soil type	Score	Fertility class
Weakly stagnogleyzed stagnic preluvosol	81	II
Vertic reddish preluvosol, weakly gleyzed in-depth	90	II
Vertic reddish preluvosol with in-depth stagnogleyzation	90	II
Stagnic vertic preluvosol	90	II
Weakly stagnogleyzed stagnic vertic preluvosol	90	II
Stagnic vertic preluvosol with weak stagnogleyzation	81	II
Strongly stagnogleyzed stagnic vertic preluvosol	81	II

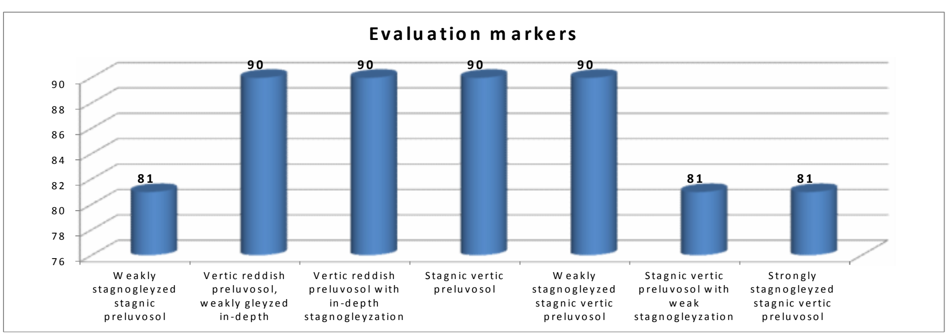

Figure 1. Graphic representation of soil suitability for growing wine grapes

For growing table grapes (Figure 2. and Table 4.), the vertic reddish preluvosol, weakly gleyzed in-depth scored 81 points, being situated in fertility class II, while the strongly stagnogleyzed stagnic vertic preluvosol scored 72 points, being situated into fertility class III.

For the culture of wheat (Table 5.), the weakly-gleyzed stagnic vertic prelovosol scored 81 points, falling into fertility class II, and weakly stagnogleyzed stagnic preluvosol obtained 81 points, falling into the same fertility class.

Table 4.

Soil suitability for growing table grapes (VM)

Soil types	Score	Fertility class
Weakly stagnogleyzed stagnic preluvosol	81	II
Vertic reddish preluvosol, weakly gleyzed in-depth	90	II
Vertic reddish preluvosol with in-depth stagnogleyzation	81	II
Stagnic vertic preluvosol	90	II
Weakly stagnogleyzed stagnic vertic preluvosol	81	II
Stagnic vertic preluvosol with weak stagnogleyzation	72	III
Strongly stagnogleyzed stagnic vertic preluvosol	72	III

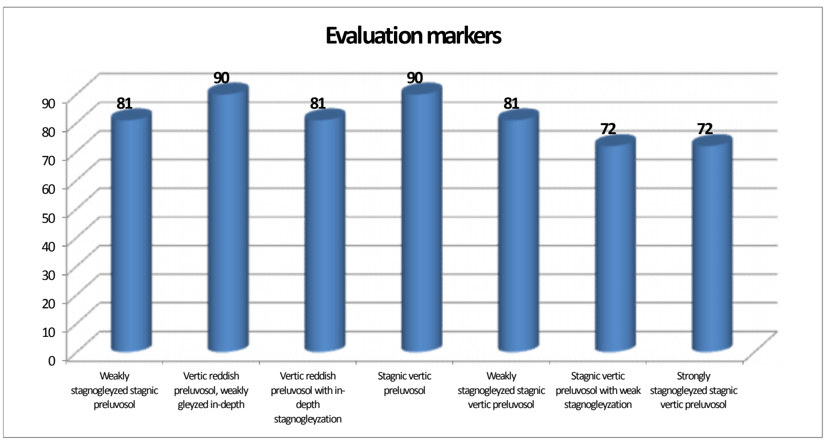

Figure 2. Graphic representation of soil suitability for growing table grapes

For growing barley (Table 5.), the weakly in-depth gleyzed vertic reddish preluvosol obtained 90 points, being situated in fertility class II, and the strongly stagnogleyzed stagnic vertic prelovosol scored 81 points and thus is situated in fertility class II.

Table 5.

Soil suitability for growing wheat and barley

No.	Soil type	Wheat		Barley	
		Score	Class	Score	Class
1.	Weakly stagnogleyzed stagnic preluvosol	81	II	81	II
2.	Vertic reddish preluvosol, weakly gleyzed in-depth	90	II	90	II
3.	Vertic reddish preluvosol with in-depth stagnogleyzation	90	II	90	II
4.	Stagnic vertic preluvosol	90	II	90	II
5.	Weakly stagnogleyzed stagnic vertic preluvosol	81	II	81	II
6.	Stagnic vertic preluvosol with weak stagnogleyzation	81	II	81	II
7.	Strongly stagnogleyzed stagnic vertic preluvosol	81	II	81	II

For maize crops (Table 6.), weakly gleyzed stagnic vertic preluvosol scored 72 points, being situated in fertility class III, while weakly gleyzed stagnic preluvosol scored 81 points, thus being in fertility class II.

For crops of sunflower (Table 6.), weakly in-depth gleyzed reddish vertic preluvosol scored 90 points, being thus part of fertility class II, and strongly-gleyzed stagnic vertic preluvosol scored 72 points, being situated in fertility class III.

Table 6.

Soil suitability for maize and sunflower crops

No.	Soil type	Maize		Sunflower	
		Score	Class	Score	Class
1.	Weakly stagnogleyzed stagnic preluvosol	81	II	81	II
2.	Vertic reddish preluvosol, weakly gleyzed in-depth	90	II	90	II
3.	Vertic reddish preluvosol with in-depth stagnogleyzation	81	II	81	II
4.	Stagnic vertic preluvosol	90	II	90	II
5.	Weakly stagnogleyzed stagnic vertic preluvosol	72	III	72	III
6.	Stagnic vertic preluvosol with weak stagnogleyzation	72	III	72	III
7.	Strongly stagnogleyzed stagnic vertic preluvosol	72	III	72	III

For growing vegetables (Table 7.), the weakly gleyzed stagnic preluvosol scored 81 being situated in fertility class II, and strongly gleyzed stagnic prelovosol scored 63 points, joining the weakly stagnogleyzed stagnic vertic preluvosol in fertility class IV.

Table 7.

Soil suitability for growing vegetables (LG)

Soil type	Score	Fertility class
Weakly stagnogleyzed stagnic preluvosol	81	II
Vertic reddish preluvosol, weakly gleyzed in-depth	90	II
Vertic reddish preluvosol with in-depth stagnogleyzation	81	II
Stagnic vertic preluvosol	90	II
Weakly stagnogleyzed stagnic vertic preluvosol	64	IV
Stagnic vertic preluvosol with weak stagnogleyzation	72	III
Strongly stagnogleyzed stagnic vertic preluvosol	63	IV

For arable land use (Table 8.), stagnic vertic preluvosol with weak stagnogleyzation and the strongly stagnogleyzed stagnic vertic preluvosol obtained 77 points, thus ranking in fertility class III, while the weakly in-depth gleyzed vertic reddish preluvosol and stagnic vertic preluvosol obtained 90 points, ranking in fertility class II.

Table 8.

Bonitation score and fertility class for AR category (arable land)

Arable land use	Score	Fertility class
Weakly stagnogleyzed stagnic prelovosol	81	II
Vertic reddish preluvosol, weakly gleyzed in-depth	90	II
Vertic reddish preluvosol with in-depth stagnogleyzation	86	II
Stagnic vertic preluvosol	90	II
Weakly stagnogleyzed stagnic vertic preluvosol	86	II
Stagnic vertic preluvosol with weak stagnogleyzation	77	III
Strongly stagnogleyzed stagnic vertic preluvosol	77	III

CONCLUSIONS

The results of our research in Recas viticulture centre allow us to have a general image of the current state of facts and to be certain that there are several conclusions which can be drawn on the matter.

☞After calculating the weighted average of the scores calculated for the agricultural uses and crops in accordance with the current bonitation methodology, we can be certain about the following classifications of the lands under study:

a) for agricultural use:

- for pastures, with a bonitation average of 81 points, they fall into fertility class II; for arable land use, with a bonitation average of 81 points, the soils in this area fall into fertility class II. In what growing table and wine grapes on these lands is concerned, the bonitation score is 86, which means that the fertility class is II. With an average of 80 points for growing fruit trees, these soils are classified into fertility class III from this point of view.

b) for crops:

- the average bonitation score for growing wheat is 83 points, which means that these soils fall into fertility class II from this point of view; the suitability for growing barley has been assessed to 83 points, thus the soils here are part of fertility class II. The soils have received 76 points in regards to growing maize, meaning that they fall into fertility type III. They are framed into the same fertility type for growing sunflower crops, having scored 74 points for this. As for growing potatoes, the soils scored 64 points, thus being in fertility class IV; for sugar beet the score is 64 points, thus the fertility class is IV. Soy crops scored 72 points, making the soils fall into fertility class III. The 84 points scored in oil make the soils fall into fertility class II, the 75 points for flax mean that the fertility class is III, and the fertility class for hemp is II, with 81 points. For alfalfa the soils scored 81 points, thus being in fertility class II, while for vegetables, with 77 points, the fertility class of the soils is III.

Taking these bonitation scores into account, we can safely say that these types of soil are best fitted for growing fruit trees, because the fertility class for them was II. Nevertheless, due to the limiting factors such as the slope or the depth where the phreatic water is found, this would be difficult to put into practice.

The scores for growing table grapes and for growing wine grapes were 86 points, thus the soils fall into fertility class II from this point of view. These crops make better use of these lands, because they use the resources of these soils to full extent, including the slope and the setting, which is mainly to the south in Recas viticulture centre. Thus, these crops are the ones that make the most of these lands, with remarkable results.

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