QUALITY OF AGRICULTURAL LANDS IN CUCUTENI COMMUNE, IASI COUNTY

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Abstract

The quality of agricultural land is determined by rating, based on which agricultural land in Romania is classified into five quality classes. Agricultural land reclamation is based not only on soil fertility, which is undoubtedly the most important factor, but also on climate, relief and hydrology. The Cucuteni territorial administrative unit is climatically located in the temperate-continental area, with an average multiannual temperature of 8.5° C and average multiannual rainfall of about 555 mm. Following the pedological mapping, carried out on the surface of 2225 ha, 44 simple soil units from the classes Protisoils, Cernisoils, Luvisoils, Hydrisoils, Antrisoils and 8 complex soil units were identified. Based on the average rating marks, the arable area (1381.47 ha) and pasture area (514.22 ha) were included in the third quality class, with 53 and 43 bonitation points, respectively. The areas with the use of hayfields (103.83 ha), vineyards (160.46 ha) and orchards (35.79 ha) fall into the 4th quality class with rating notes between 34 and 38 points.

Keywords: agricultural land reclamation, homogeneous ecological territory, soil units, land quality classes

The quality of the land includes both the fertility of the soil and the way the other environmental factors manifest themselves towards the plants.

The diversity of the physical-geographical conditions on the Romanian territory results in the wide variation of the parameters: altitude, terrain inclination, categories of use, soil units and their quantitative and qualitative characteristics (Dumitru M. *et al*, 2011).

Munteanu I. (2005) shows that, for the full and correct definition and understanding of the soil at local level, it is necessary to examine the soil cover (of the pedosphere) on very wide geographical areas in correlation with the climatic zones and with the ever-increasing influence of the anthropic factor.

The role of the soil, not only in the promotion and development of sustainable agriculture, is unanimously accepted, in maintaining the quality of the environment, in global climate change, in conserving biodiversity, but also in developing the economy as a whole.

Blum W. and Santelises A. (1994) have shown that in order to highlight the undeniable importance of soil in the harmonious development of the economy as a whole, which can ensure safe and prosperous conditions for future generations, the functions it performs must be known.

Pedological and land reclamation study of agricultural lands, at the level of the territorial administrative units, it is executed in order to establish, delimit and inventory the ground-land units, of determining the favorability of agricultural lands by crops and of their classification on quality classes, according to the rating notes, on agricultural uses.

Through the methodologies of cadastral reclamation of agricultural lands, it can be established, scientifically, over long periods of time, the value of cadastral productions and net revenues, thus avoiding the consequences of approximations after uncertain data.

MATERIAL AND METHOD

The territory of Cucuteni commune, with an area of 2832 ha, of which 2196 ha of agricultural land and 636 ha of non-agricultural land, is located in the west of Iasi county, in the confluence area of the Suceava Plateau with the Moldavian Plain (*figure 1*).

The surface that was the object of this study is 2225 ha, consisting of 2196 ha of agricultural land (1382 ha of arable land, 514 ha of pastures, 104 ha of hayfields, 160 ha of vines and 36 ha of orchards) and 29 ha of non-productive land.

Both traditional research methods were used to emphasize the geomorphological features of Cucuteni commune (field observations and measurements, geomorphological mapping, statistical-mathematical processing, analysis, synthesis) as well as modern methods based on GIS software.

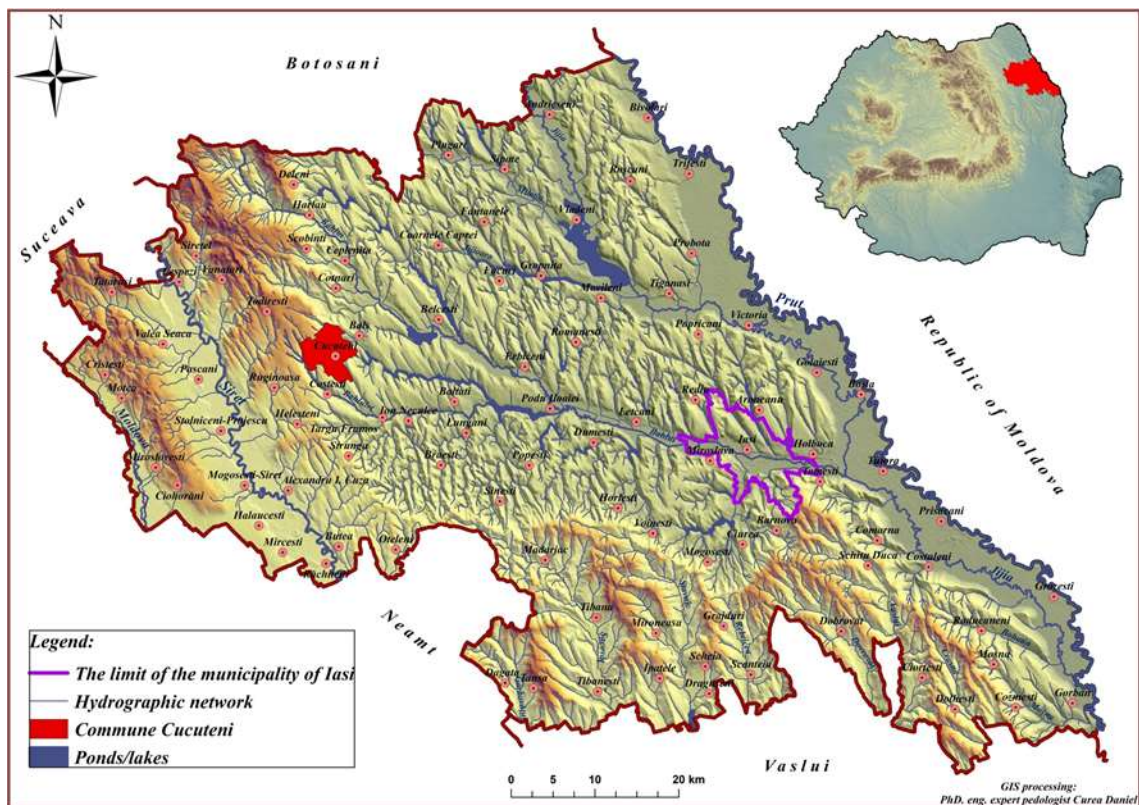[1] "Ion Ionescu de la Brad" University of Life Sciences, Iasi, Romania

Figure 1 **Geographical and Administrative Position of Cucuteni Commune**

For the pedological mapping of the surface of 2225 ha, agricultural and non-productive land, 35 main profiles, 131 secondary profiles and 162 control profiles were carried out.

The cartographic materials were obtained using TNTmips v.6.9 and ArcGIS v.10.1.

Climate maps were deduced by interpolation based on data covering the period 1950-2000 (Hijmans et al, 2005).

The evaluation and grouping of the lands by quality classes by uses was carried out according to the "Methodology for the elaboration of pedological studies" part II, I.C.P.A. Bucharest, 1987 using the BDUST software ver. 9.5.

RESULTS AND DISCUSSIONS

Land reclamation for natural conditions is carried out on the basis of specialized studies regarding the conditions of relief, climate, hydrology and, last but not least, soil conditions.

The relief has a major influence in the reclamation of agricultural lands by the degree of inclination of the land surface, landslides and by the exposure of the slopes.

The slope of the land is an important indicator when establishing the rating notes, its presence diminishes the favorability of the respective surfaces by soil erosion and affecting its properties.

The exposure of the land influences the amount of precipitation and heat imprinting certain characteristics of the soils.

Within the commune of Cucuteni, from Iasi county, the surface of 1142 ha (40.34%) has a slope of less than 5%, 746 ha (26.35%) fall within the slope range of 5-10% and 507 ha (17.89%) have a slope between 10-15% (*figure 2*).
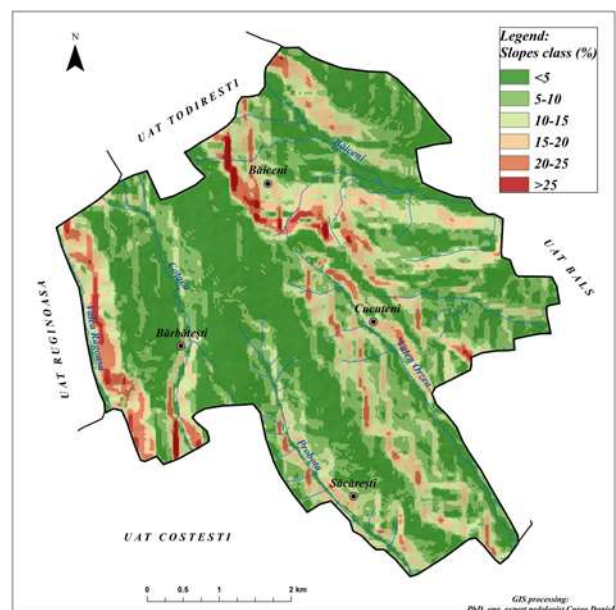

Figure 2 **Slope Map**

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The surface of 276 ha (9.74%) has a slope between 15-20%, 128 ha (4.54%) have a slope in the range of 20-25% and 33 ha (1.15%) have a slope greater than 25%.

The climate of the territory is temperate-continental with excessive nuances, characterized by large thermal variations and an uneven rainfall regime, which contributes to the onset of slope processes.

The multiannual average temperatures are between 7.9 - 9 ° C, increasing from the west of the territory to the east, being in correlation with the distribution of altitudes (*figure 3*).
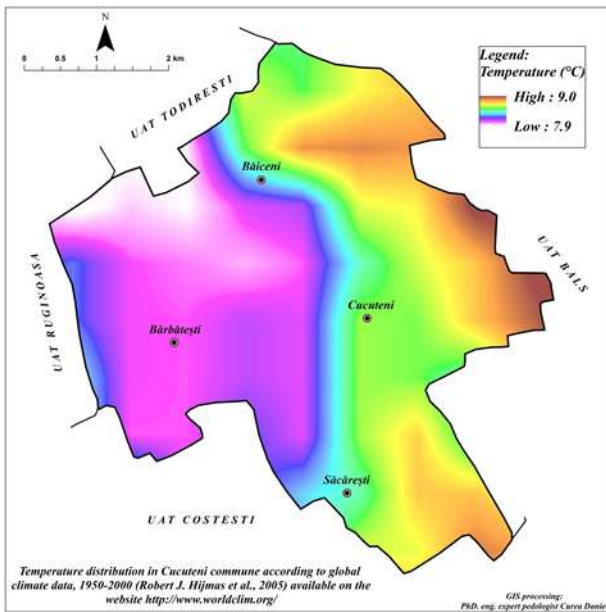

Figure 3 **Temperature Map**

Also, the precipitations are correlated with the altitudes, the multiannual average values being between 535-575 mm (*figure 4*).
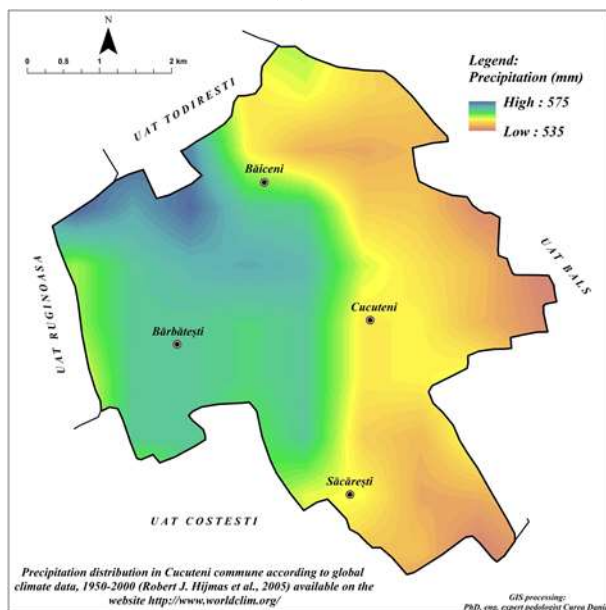

Figure 4 **Map of Precipitation**

From a hydrographic point of view, the territory of Cucuteni commune falls within the upper basin of Bahluiet, the sub-basin of Oarza valley.

The studied area is crossed by four streams (Probota, Cucuteni, Pascania and Oii), two of which originate on the territory of the commune.

The hydrographic network through the density and the depth of the minor riverbeds of the watercourses influences the indicators of bonitation: the depth of the phreatic water, the floodability and the excess of humidity at the surface.

An essential requirement that conditions the performance of agricultural land reclamation works is the existence and use of pedological maps.

Following the pedological mapping carried out on the surface of 2225 ha, from the perimeter of Cucuteni commune, 44 simple soil units from five classes (Protisoils, Cernisoils, Luvisoils, Hydrisoils, Antrisoils) and 8 complex soil units were identified (*figure 5*).
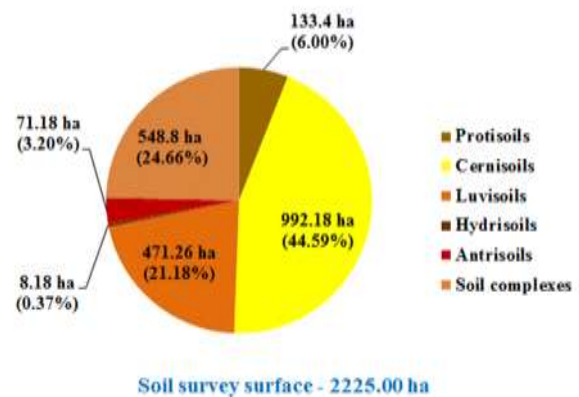

Figure 5 **Share of Soil Classes**

Soils in the Protisoils class cover an area of 133.4 ha and comprise six soil units. The Cernisoils soil class has the largest share, approximately 45% (992.18 ha) of the mapped area and comprises 23 soil units. The Luvisoils class comprises 10 soil units and occupies a total area of 471.26 ha. The soils of the Hydrisoils class occupy the smallest surface, 8.18 ha and comprise three soil units, and the Antrisoils class, with two soil units, occupies 71.18 ha.

In order to classify the lands, located in the suburbs of Cucuteni commune, by quality classes according to the bonitation notes, the 44 simple soil units and 8 complex soil units identified, they were divided, after the slope and exposure, into land units, homogeneous in terms of all

characteristics, called ecologically homogeneous territories (TEO).

The homogeneous ecological territory represents the basic unit for which it is calculated, based on the indicators, the bonitation notes, the quality classes, the favorability classes, the suitability classes, etc.

In this sense, the coefficients corresponding to the rating indicators were extracted from the Methodology for elaborating the pedological studies-part II, elaborated by I.C.P.A. Bucharest, in 1987, annexes 3-2,…, 3-18.

Analyzing the grading coefficients for the slope of the land, according to the Methodology of grading the agricultural lands, we notice that they vary within very wide limits depending on the slope. Thus, at slopes of up to 10%, annual weeds and legumes are slightly penalized by 0.1 points, while straw cereals well withstand this slope of the land. With the increase of the slopes, the eight crops taken into account become more and more sensitive to the inclination of the lands, so that on slopes of over 25% they are penalized with 0.7-0.9 points.

Also, the presence of landslides penalizes crops depending on the type and intensity of landslides. Stabilized landslides of 344 ha, representing 15.50% of the pedologically mapped area (2225 ha), can be successfully used for the cultivation of straw cereals by applying appropriate agro-improvement works, penalizing them only by 0.2 points, but they are less recommended for potato and beet cultivation, which they penalize by 0.4 points. Land affected by semi-active landslides (89 ha), active landslides (41 ha), bank landslides (32 ha) and ravines occupying 71 ha are totally contraindicated for agricultural crops, which represents about 10.50% of the pedologically mapped area.

Salinization and alkalization are important indicators that diminish the quality of agricultural land, penalizing crops at low intensity (74 ha) with values of rating coefficients of 0.7-0.9 and at high intensity (13 ha) with values of coefficients of 0.1-0.3.

Gleyzation and pseudogleyzation mild present on 399 ha, 18% of the mapped area, does not penalize the 8 crops (wheat, barley, corn, sunflower, potato, sugar beet, soybeans and peas / beans), which are taken into account when setting the rating mark for arable use, but moderate gleyzation on 20 ha (0.9%), strong gleyzation on 74 ha (3.30%) and excessive gleyzation on 42 ha (1.90%), penalizes the above-mentioned crops by 0.1-0.3 points, being an unfavorable trait, especially excessive gleyzation.

The bonitation notes for natural conditions, on crops, was obtained by multiplying by 100 the product of the coefficients of the 17 indicators, which participate directly in establishing the bonitation notes.

At the level of the soil units, the bonitation notes was calculated as a weighted average of the bonitation notes corresponding to the ecologically homogeneous component territories.

The bonitation notes for arable use was calculated respecting the regulations in force, as the arithmetic mean of the grades of the 8 most widespread crops: wheat, barley, corn, sunflower, potato, sugar beet, soybeans and peas / beans.

Thus, the surface of 1381.47 ha exploited as arable land, falls into quality classes II, III, IV and V (*figure 6*), with a weighted average grade of 53 bonitation points that includes the entire surface in the third grade of quality.
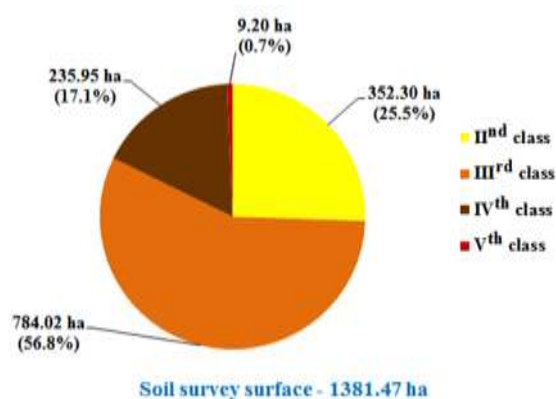

Figure 6 **Share of Arable Land by Quality Classes**

The average grade for the second class is 65 bonitation points, falling into this class 352.30 ha, which represents 25.50% of the arable area.

The average grade for the third class is 56 points, falling into this class 784.02 ha, 56.75% of the arable area.

In the 4th grade, the average grade is 28 bonitation points, covering 235.95 ha, 17.08% of the arable area.

The average grade for the 5th grade is 17 bonitation points, covering 9.20 ha, representing 0.67% of the arable area.

The pastures on the territory of Cucuteni commune, with an area of 514.22 ha, fall into quality classes II, III, IV and V (*figure 7*), with a weighted average grade of 43 bonitation points, which includes the entire surface in the third grade of quality.

The average grade for the second class, which includes 28.20 ha, 5.48% of the pasture area, is 70 bonitation points.

The third quality class includes 259.43 ha (50.45%), with an average grade of 52 points.

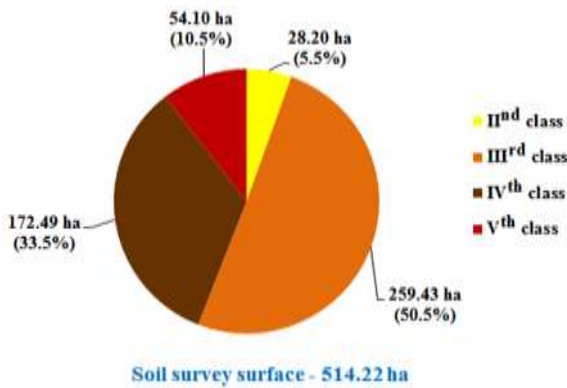The average grade for the fourth grade is 35 points, falling into this class 172.49 ha (33.54%).

Figure 7 **Share of Pastures by Quality Classes**

The lower quality class (5th) includes 54.10 ha, which represents 10.53% of the total pasture area, with an average grade of 17 points.

The lands occupied with hayfields, with an area of 103.83 ha, fall into quality classes III, IV and V (*figure 8*), with a weighted average grade of 37 bonitation points, which includes the entire area in class IVth of quality.
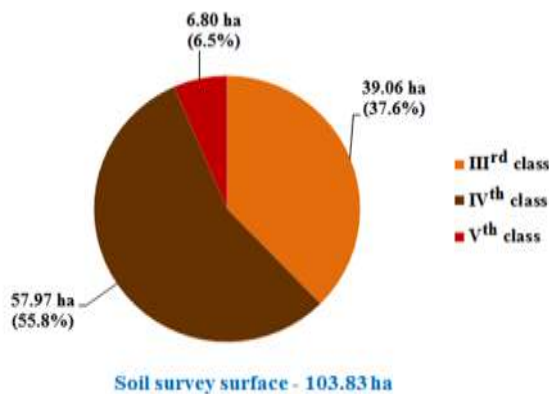

Figure 8 **Share of Hayfields by Quality Classes**

The average grade for the third grade is 47 bonitation points, falling into this class 36.06 ha, which represents 37.62% of the total area with hayfields.

The fourth quality class includes 57.97 ha, which represents 55.83% of the total area with hayfields, with an average rating of 32 points.

The average grade for the 5th class is 18 bonitation points, falling within this class 6.80 ha, which represents 6.55% of the total area with hayfields.

The surface of 160.46 ha exploited with vines, within the commune of Cucuteni, falls into quality classes III, IV and V (*figure 9*), with a weighted average mark of 34 bonitation points,

which includes the entire surface of vines in 4th grade quality.
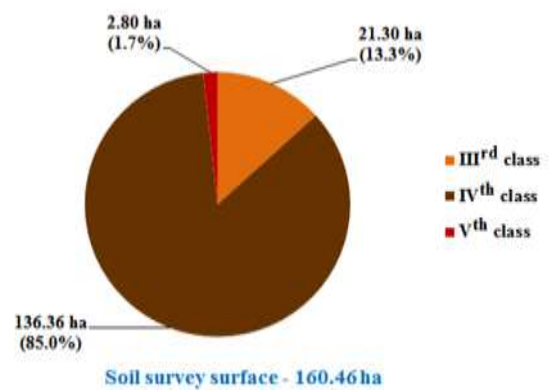

Figure 9 **Share of Vine Areas by Quality Classes**

The average grade for the third grade is 42 bonitation points, falling within this class 21.30 ha, which represents 13.28% of the total area with vines.

The 4th grade of quality includes 136.36 ha, ie 84.98% of the area with vines, with an average rating of 33 points.

The average rating for the 5th grade is 8 points, falling within this class 2.80 ha, which represents 1.74% of the area under vines.

The lands occupied with orchards, with an area of 35.79 ha, fall into the lower quality classes, III and IV (*figure 10*), with a weighted average grade of 38 bonitation points, which includes the entire area of orchards in the 4th grade of quality.
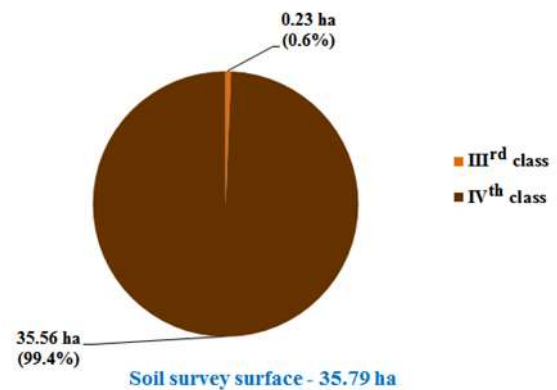

Figure 10 **Share of Orchards by Quality Classes**

The average grade for the third class is 57 bonitation points, falling within this class 0.23 ha, which represents 0.64% of the total area with orchards.

The fourth class includes 35.56 ha, 99.36% of the orchard area, with an average grade of 38 bonitation points.

CONCLUSIONS

On the mapped area of 2225 ha, 44 simple soil units and 8 complex soil units from five classes were identified. Cernisoils occupy 44.6% of the mapped area, Luvisoils 21.2%, Protisoils 6.0%, Antrisoils 3.2%, Hydrisoils 0.4% and the share occupied by soil complexes is 24.6% of the mapped area.

In the pedo-geomorphological conditions in the studied area, the indicators of grading that penalize major grading notes on uses and crops are the slope of the land, landslides, gleyzation, pseudogleyzation, salinization and alkalization, as well as soil acidity.

Of the 1382 ha area exploited as arable land on the territory of Cucuteni commune, the largest area falls into the third class, with soils of medium fertility, with a weight of about 57%, 25% fall in the second class, with soils of good fertility and 18% in classes IV and V, of inferior quality.

Over 50% of the total pasture area (514 ha) falls into the third class, 44% falls into the lower quality classes, IV and V, and only 6% into the second quality class.

Out of the total area of 104 ha, 62% of the hayfields fall into the lower quality classes (4th and 5th) and the difference into the third class, of average fertility.

87% of the area occupied by vines (160 ha) fall into the lower classes, IV and V.

The area occupied by orchards (36 ha) falls into the 4th quality class with a percentage of over 99%.

The poor quality of agricultural land in the commune of Cucuteni is also highlighted by the weighted average grade on the total mapped area of 2225 ha, for arable use, regardless of the current use, with the value of 44 bonitation points, which places this area in the third class of quality.

The conditions of soil, climate, relief and hydrology require the efficient exploitation of land, the application of modern cultivation technologies, the use of adequate systems of agricultural machinery and high quality biological material. It is also recommended to exploit the land by using crops that get higher bonitations grades, but at the same time, to help prevent and combat soil erosion and landslides.

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