Scientific Papers. Series A. Agronomy, Vol. LXII, No. 1, 2019
ISSN 2285-5785; ISSN CD-ROM 2285-5793; ISSN Online 2285-5807; ISSN-L 2285-5785

SOIL DEGRADATION - A PRIMARY FACTOR IN THE DECLINE OF FERTILITY AND WAYS TO RECOVER IT

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Abstract

The paper presents the results obtained from an agrochemical study carried out in a site affected by soil degradation phenomena, being known the fact that the dramatic decrease of the agricultural production is due primarily to the deterioration of the soil fertility status, even though the rest of the technological chains of production are respected. The study was carried out, determining and analyzing the main soil agrochemicals, and the results obtained are a starting point for their improvement. Based on these results, it is possible to launch and carry out various actions to restore soil fertility, which will lead within a reasonable time, to obtain the expected, constant qualitative and quantitative productions.

Key words: *soil degradation, abasement fertility.*

INTRODUCTION

Soil fertility is a decisive factor in the sustainable development and performance of agriculture. Being a complex soil, fertility provides the physico-chemical and biological conditions in the optimum, necessary for the growth and development of the crop plants, permanently supplying water and nutrients simultaneously to the proper development of vegetative phenophases. (Borlan & Hera, 1984)
The depreciation of soil fertility has as causes, a multitude of factors, recalling here the export of nutrients with the crops, which is not compensated by fertilization, but also the accentuation of the acidification or saltiness phenomena - which attract a whole range of disturbances in soil chemistry, erosion phenomena etc. (Cârstea, 2000)
The acidification of soils is mainly due to the unilateral application of nitrogen fertilizers on the same surface in large quantities and scientifically unfounded. These soils degraded by acidification are characterized by processes of alteration, leaching, debasification and migration of colloids and can often present deficiency or excess of moisture, but also of nutrients, implicitly (Davidescu, 1981).
As agro-pedo-ameliorative measures of these soils, some are important in achieving higher crop yields, such as calcareous refining, organic and / or mineral fertilization, as well as technological sequences such as scarification and the practice of suitable crop rotations.

MATERIALS AND METHODS

The research was carried out within a family association, Letcani village, in Iasi county, in 2016 and aimed at identifying the areas affected by acidification phenomena on the agricultural holding, by laboratory analysis of the soil samples taken and the issuance of possible good practices, to avoid accentuation of the deficiencies in the ionic composition of soils, with damaging repercussions on soil fertility and agricultural production.
The land stage consisted of the identification of the territory, marking the crates under analysis, the harvesting and labelling of soil samples.
The laboratory stage consisted in the preparation of soil samples for analysis.
There were determined: the pH in the aqueous extract, the mobile phosphorus content by the Egner-Riehn-Domingo method in acetate extract - ammonium lactate (P-AL), the available potassium content in the acetate-lactate extract ammonium, the determinations being made to the atomic absorption flame photometer (K-AL).

RESULTS AND DISCUSSIONS

Analysing the pH values for the selected areas, it was found that for all three sites, this indicator had values ranging from 5.4 to 6.8, including the soils analysed from the moderate acid to the weak acid to neutral.

For the Bedreag site, with a surface area of 20.7 ha, it was found that the pH ranges from 5.4 to 6.8, the distribution being 25% of soils with pH from 5.4 to 5.8, 50% soils with a pH between 5.8 and 6.4 and 25% of soils show a pH of 6.4 to 6.8 (Figure 1).

For the Vorontoia site, with a surface area of 30.45 ha (Figure 2), the pH distribution is 17% of surfaces with pH between 5.4 and 5.8 and 83% of the surface with a pH of between 5.8-6.4.

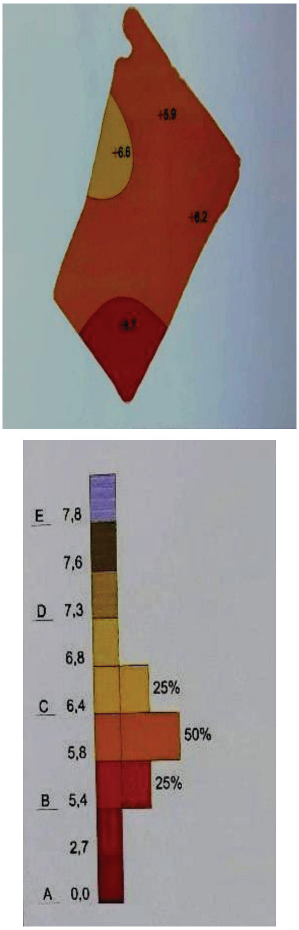

Figure 1. PH values, for Bedreag site

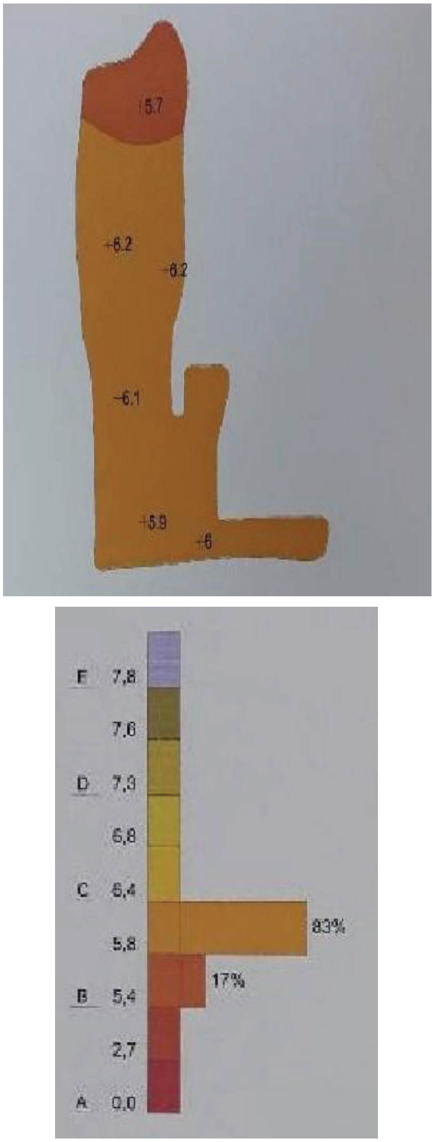

Figure 2. PH values, for Vorontoia site

For the site located in Toloaca, with an area of 11.81 ha, the pH ranges from 5.4 to 5.6 per 33% of the surface and from 5.6 to 6.8 on 87% of the surface.

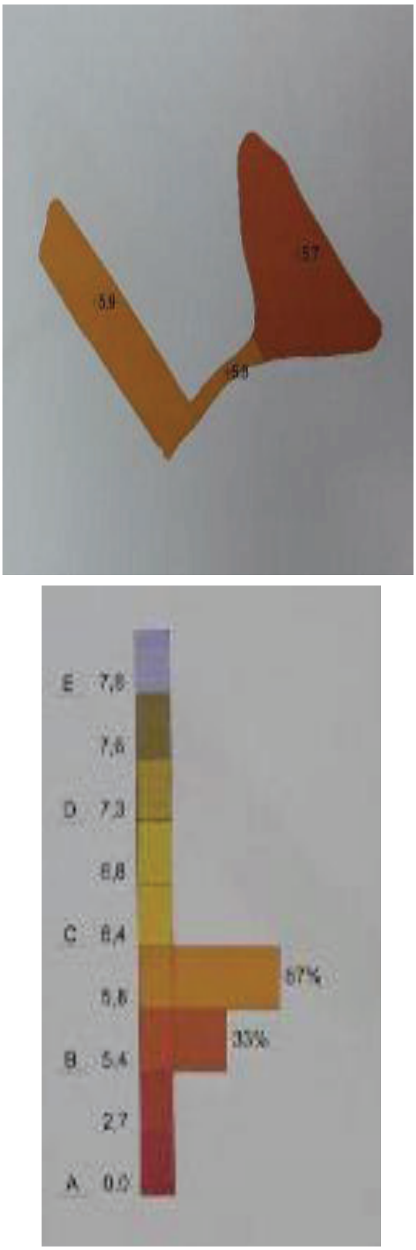

Figure 3. PH values, for Toloaca site

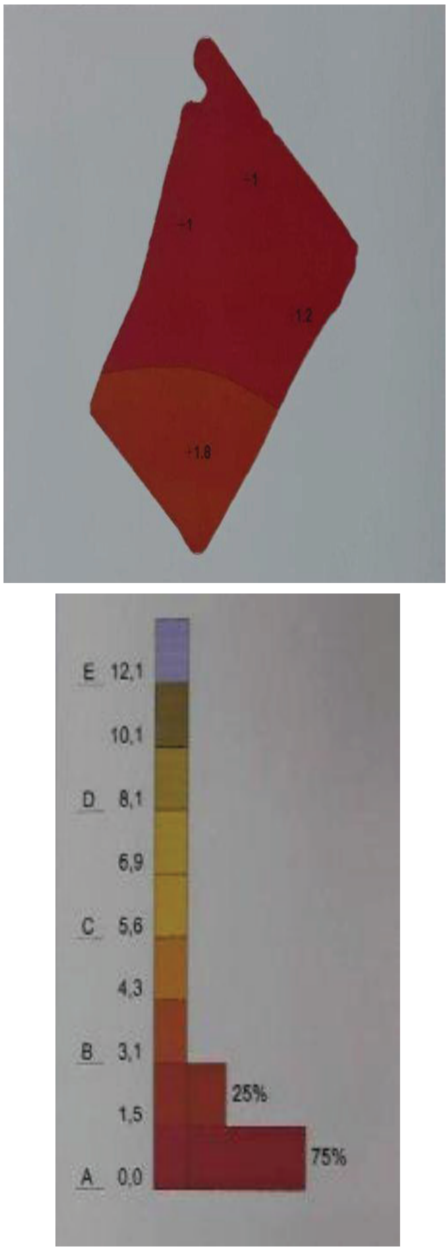

Figure 4. P-AL values (mg/100g sol), for Bedreag site

The soil response influences the accessibility of plant nutrients. In this sense, the acidic reaction of soils, when the pH falls below 5.8, causes the phosphorus to be demodulated, basic phosphates of iron and aluminium, of which phosphorus is difficult or not at all accessible to plants.

This can be highlighted in all locations, with mobile phosphorus contents ranging between 0 and 1.5 mg P-AL/100 g soil - poor supply - on 75% of the surface for the Bedreag site, 50% for the Vorontoia site and, respectively 33% for Toloaca (Figures 4, 5, 6)

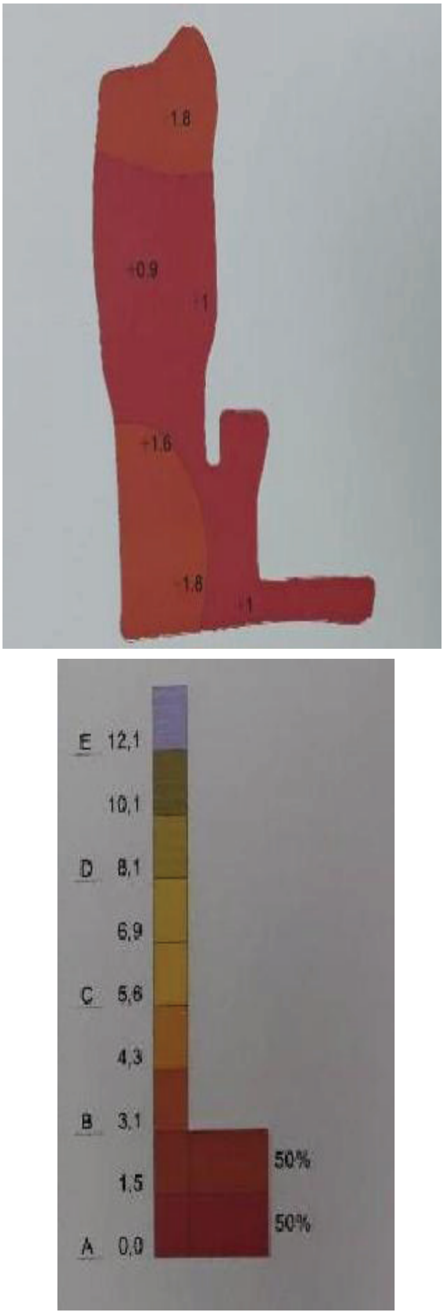

Figure 5. P-AL values (mg/100g sol), for Vorontoia site

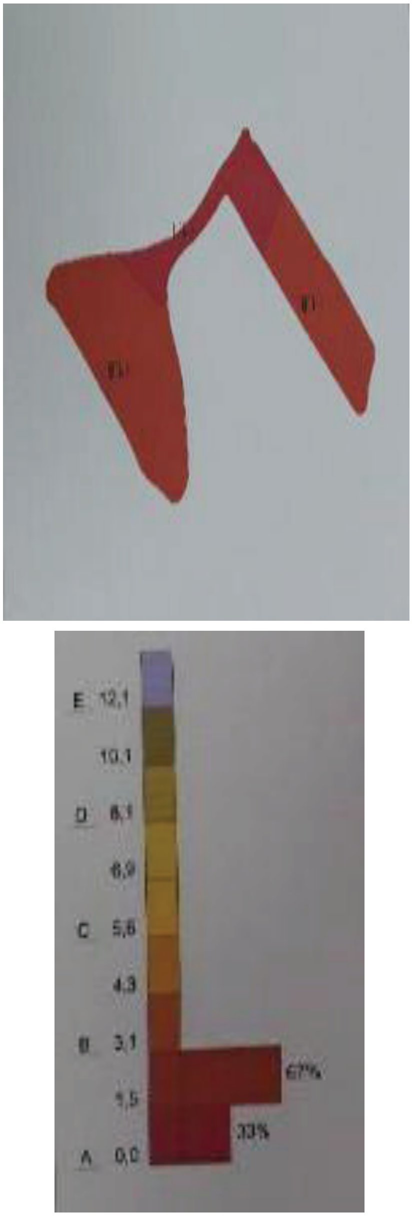

Figure 6. P-AL values (mg/100g sol), for Toloaca site

Another nutritive element that is in direct relationship to soil pH is the available potassium. Its undesirable capacity, in case of acidification of the soil, to pass from the soil solution into exchangeable forms, then in unchangeable forms and finally in fixed forms, represents a shortcoming for the agricultural crops, and thus it cannot be assimilated.

The analysis of the laboratory results on potassium revealed that on all the studied

surfaces the available potassium has suffered, the resulting amounts being insufficient for a balanced nutrition of the plants.
In the case of the Bedreag site, the values of the mobile forms of potassium are between 5 and 10 mg K-AL, mg/100 g soil - 50% of the surface and between 10 and 13 mg K-AL K mg/100 g soil, which the specialised literature considers to be a low and medium supply with this element (Figure 7).

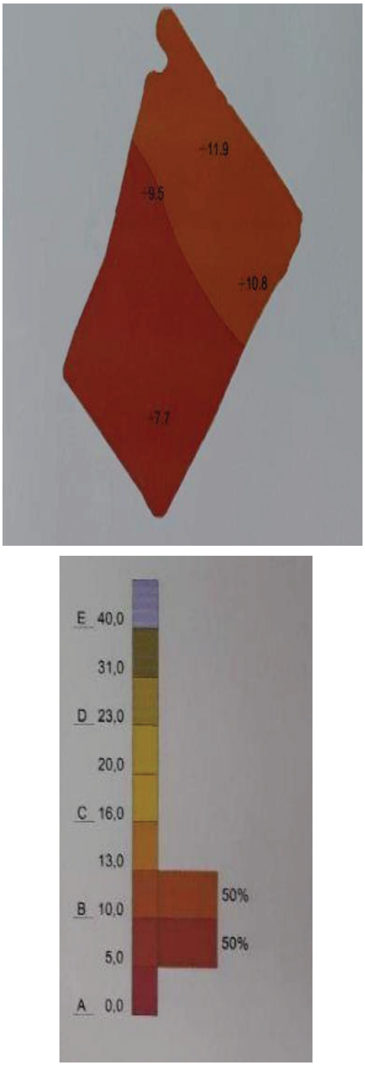

Figure 7. K-AL values (mg/100 g sol), for Bedreag site

For the Vorontoia site, the accessible potassium is approximately the same, occupying 67% of the surface with values of 10-13 mg/100 g soil, 17% of the surface with values ranging from 13 to 16 mg/100 g soil and another 17% of the surface with significantly higher values, respectively 16-20 mg K-AL/100 g soil (Figure 8)

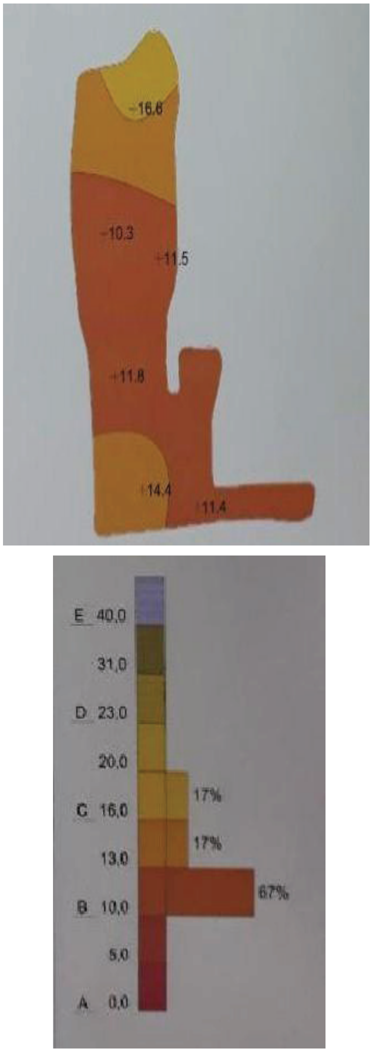

Figure 8. K-AL values (mg/100 g sol), for Vorontoia site

Figure 9 shows that in the Toloaca site the content of the mobile potassic forms is between 10 and 13 mg K-AL mg/100 g of soil per 100% of the surface, a totally inadequate quantity for assuring quantitative and qualitative production.

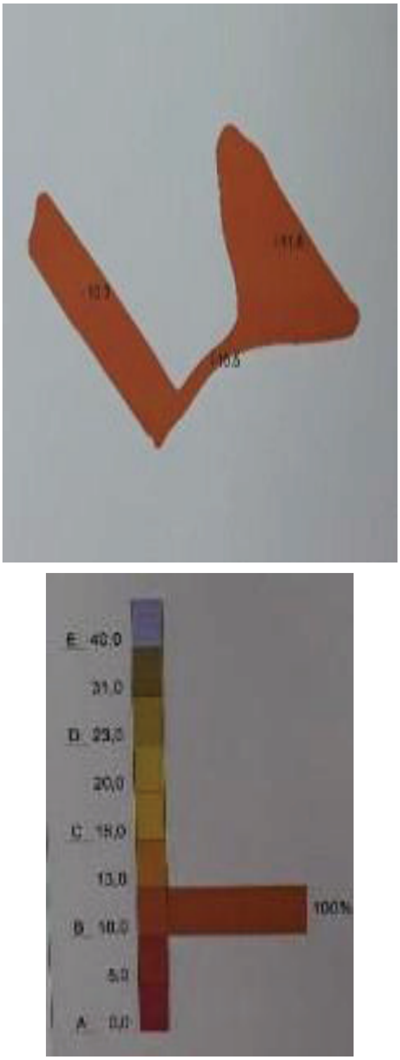

Figure 9. K-AL value (mg/100g sol), for Toloaca site

CONCLUSIONS

The obtained results highlight the necessity of periodic determination of the soil reaction state, in order to prevent degradation occurring in soil chemistry, respectively for the preservation of phosphorus and potassium, in accessible forms and in optimum quantities.

The pH values below 5.8 determined the dramatic decrease in the accessible phosphorus content, which also attracts the retardation of potassium, their synergistic relationship being known.

Above the pH values of 6.4, the assurance status with phosphorus and potassium is significantly improved, tending towards optimal concentrations.

As measures to counteract the harmful effect of acid pH, the use of calcareous amendments is indicated and for the increase of soil fertility, the administration of organic and chemical fertilizers in optimal economic doses and judiciously chosen assortments.

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