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# AGROCHEMICAL CHARACTERIZATION OF SOILS FROM OLT COUNTY

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**Keywords*: agrochemical characteristics, soil, humus, nitrogen, phosphorus.***

## ABSTRACT

*In order to characterize from the agrochemical point of view the soils from Olt County, there were considered agrochemical studies conducted in the county by OSPA Olt in the period 2008-2012, on the entire surface of the county at all land use categories. In the period subject to the agrochemical study, soil samples were collected from agrochemicals plots with different surfaces according to usage and were analyzed: the pH, humus content, nitrogen, phosphorus and potassium. After analysis it was found that:*

*- Soil humus content is low and very low to cca.48% of agricultural land, requiring large expenses with additional fertilization;*

*-The presence of large areas of acidic soils (about 45% of agricultural land) limits yields per unit of area;*

*- Low and very low-supply in mobile phosphorus (cca.57% of agricultural land) limiting production in all cultures and affects crop quality.*

## INTRODUCTION

The soil is considered as the basis of any natural source of productive and sustainable agricultural system, while being exhaustively and more complex than air and water, representing the essential support of life. Dynamics of soil, or complex changes that occur in it, is evidenced by the many processes that are in constant change, until it reaches a certain steady state (Dumitru Elisabeta, 2004).

Once with the increased of tillage agricultural technology systems, especially mechanization and irrigation in order to increase productivity and, at the same time, protecting the soil against degradation, also appeared the need to develop studies on physical, chemical and biological soil condition and its quality.

Today it is widely recognized that there are neither practical and nor can promote the agricultural technology systems that improve, enhance and preserve soil quality status without knowing the local specific (Mocanu R., 2011). In this study we performed analysis on soil agrochemical properties in the period 2008-2012 in order to characterize soils from the agrochemical point of view and establish the degree of fertility.

Olt County is located on two main geomorphologic units: Getic Piedmont (north) and the Romanian Plain (south), representing the 2 major landforms that are found within the county: hills and plains. The climate is temperate continental, with slight Mediterranean influence, with a touch wetter in the north and drier in the south. Annual average temperature of the coldest month (January) is between -2° and -3°C, and annual average temperature of the hottest month is between 22° and 23°C. The average annual amount of rainfall increases from south (below 500 mm), to north (600 mm) and fell more in the form of rain.

## MATERIAL AND METHOD

In order to agrochemical characterize soils from Olt county, there were considered agrochemical studies conducted in the county by Olt OSPA in the period 2008-2012 over the entire county in land use categories: 388 603 ha of arable, 433 903 ha agricultural, 32867 ha of pasture, 12433 ha of vineyards and orchards.

In period subject to the agrochemical study, soil samples were collected from agrochemical plots with different areas depending on mode of use, according to ICPA. On

samples taken the following tests were performed: pH, content of humus, nitrogen, potassium and phosphorus.

## RESULTS AND DISCUSSIONS

Agrochemical properties of soils are a key factor in determining the degree of fertility, so their productive potential and also to develop measures to improve agrochemical and increasing fertility through the use of chemical and organic fertilizers. The main agrochemical properties that are used to characterize soil fertility are: soil reaction, humus content, the degree of provision in phosphorus, potassium and nitrogen, the nitrogen index (Dodocioiu Ana Maria, 2009).

Analyzing soil reaction, in Olt County in 2010, situation is as follows:

***Table 1***

**Agricultural soil reaction from Olt county at 31/12/2010 ( after OJSPA Olt)**

| Utilization | Soil reaction | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | heavily acidic | | moderately acidic | | weak acidic | | Neutral | | weak alkaline | | moderately alkaline | |
| | Ha | % | ha | % | Ha | % | ha | % | ha | % | ha | % |
| Arable | 19607 | 5,02 | 168648 | 43,18 | 148650 | 38,06 | 18357 | 4,70 | 33667 | 8,62 | 1640 | 0,42 |
| Pasture | 531 | 1,71 | 7234 | 23,32 | 13904 | 44,82 | 2274 | 7,33 | 6018 | 19,4 | 1061 | 3,42 |
| Hayfield | X | x | 357 | 56,00 | 259 | 40,67 | 21 | 3,33 | x | x | x | x |
| Vineyard vines | 536 | 7,02 | 2487 | 32,6 | 2771 | 36,32 | 1022 | 13,4 | 780 | 10,2 | 34 | 0,44 |
| Orchards | 1145 | 15,7 | 1926 | 26,36 | 1719 | 23,52 | 607 | 8,31 | 1303 | 17,8 | 607 | 8,31 |
| Agricultural | 21819 | 4,99 | 180652 | 41,33 | 167303 | 38,27 | 22281 | 5,10 | 41768 | 9,55 | 3342 | 0,76 |

***Table 2***

**Evolution of agricultural areas in terms of soil reaction since 1987 until 2010 in Olt (% of agricultural land)**

| Soil reaction | 1987 | 1997 | 2005 | 2010 |
|---|---|---|---|---|
| heavily acidic | 1,21 | 4,24 | 4,99 | 5,31 |
| Moderately acidic | 35,59 | 45,01 | 41,33 | 42,73 |
| weak acidic | 54,47 | 36,90 | 38,27 | 38,02 |
| neutral | 3,38 | 4,34 | 5,10 | 5,24 |
| weak alkaline | 5,19 | 8,44 | 9,55 | 7,89 |
| moderately alkaline | 0,16 | 0,67 | 0,76 | 0,81 |

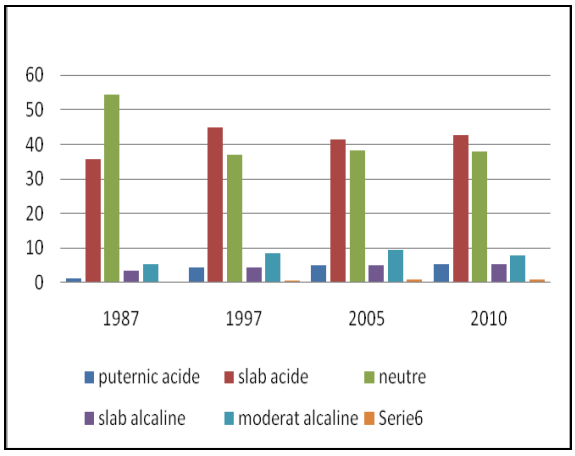


**Figure 1. Evolution of agricultural areas in terms of soil reaction since 1987 until 2010 (% )**

The data in table 2 shows that around the 21 819 ha agricultural area, ie 4.99% are strongly acidic soils, 180 652 ha, representing 41.33% are moderately acidic soils, 1,167,303, representing 38.27% are slightly acid soils and only 22 281 ha, representing 5.10% are neutral soils and 41768 ha, representing 9.55% are mildly alkaline soils.

Analyzing the soil reaction during the period 1987 - 2010, that, due to missing regular improvement agrochemical works, the percentage of strongly acidic soils increased by 1.21 to 5.31%, of the moderately acidic increased also from 3.59 to 42.73%, while the percentage of slightly acid soils has decreased from 34.47 to 38.02 due to transition to strong and medium acid category.

In general the acid reaction is characteristic to luvisoils; neutral reaction is specific to cambisoil, and the alkaline to salsodisoils and some alluvisols. The reaction of soil solution influences the fertilizers absorption by crops.

Neutral or weak alkaline reaction favors the absorption of ammonia nitrogen fertilizers, while acid reaction favors the absorption of nitric forms.

An acid soil promotes the absorption of phosphorus fertilizer forms sparingly soluble, whereas phosphorus fertilizer forms easily soluble, instead, are passing in the sparingly soluble compounds.

Saturated soil in base as well as the neutral reaction, but with a high $CaCO_3$ content promotes the absorption of slightly soluble phosphorus fertilizer.

Mineral potassic fertilizers on bases saturated soils can lead to decalcification these soils and administration of potassium fertilizers on acid soils produces a stronger acidification of soil solution. Strongly acidic soil reaction, coupled with a low base saturation, causes the appearance in soil solution of quantities of mobile aluminum, which exceeding the tolerance of plants, becomes toxic.

Soil reaction directly influence plant growth, so that both the crop and the plants from spontaneous flora exhibit certain preferences to soil reaction solution, but the most preferred reaction by crops is weakly acid, neutral or slightly alkaline.

Plants from the spontaneous flora used as reaction indicator are *Oxalis acetosella* (sorrel rabbit) indicates acidic reaction, *Anemone nemorosa* (easter flower) indicates slightly acidic-neutral reaction. Crops that support soil acidity are: rye, potatoes, oats, lupine, etc.

An essential component of soil is humus, which confers it a certain degree of fertility. Humus and soil organic matter represents permanent reserve of soil nutrients (Borlan, 1988, 1999).

After humus content, soil supply status data is presented in Table 3 and Figure 2.

***Table 3***

**State of soil humus supply in Olt at 31.12.2010 - OJSPA Olt**

| Utilization | The humus supply | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | extremely small | | very small | | small | | medium | | large | |
| | ha | % | ha | % | Ha | % | ha | % | ha | % |
| Arabile | 1640 | 0,42 | 12772 | 3,27 | 164664 | 42,16 | 209696 | 53,69 | 1797 | 0,46 |
| Pasture | 1080 | 3,48 | 5004 | 16,13 | 15585 | 50,24 | 9353 | 30,15 | x | x |
| Hayfield | 42 | 6,67 | 53 | 8,33 | 256 | 40,00 | 265 | 41,67 | 21 | 3,33 |
| Vineyard | 84 | 1,10 | 356 | 4,67 | 5354 | 70,17 | 1836 | 24,06 | x | x |
| Orchard | 57 | 0,78 | 1022 | 13,98 | 3710 | 50,78 | 2391 | 32,72 | 127 | 1,74 |
| Agricultural | 2903 | 0,66 | 19207 | 4,39 | 189569 | 43,37 | 223541 | 51,14 | 1945 | 0,44 |

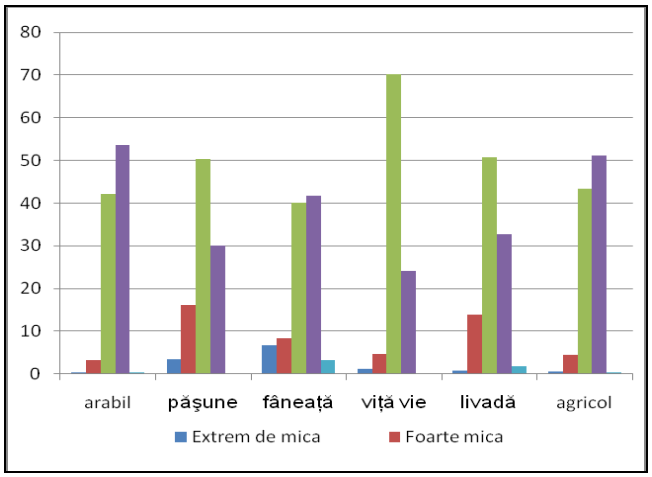


**Figure 2. State of soil humus supply in Olt at 31.12.2010, according to utilization**

Insurance state of soils humus in the County of Olt is relatively low, since, as is apparent from the data in Table 3, over 48% of the agricultural area of the county has a degree of provision extremely small, very small and small humus, about . 50% have a medium degree of provision and only 0.44% has a high degree of assurance.

Phosphorus participates directly in the formation of plant cells and tissues, contributes to the roots, stimulates fructification processes, accelerating rate of assimilation of nitrogen and potassium, and increases plant resistance to frost and drought.

***Table 4***

**The state of soil phosphorus supply in Olt at 31.12.2010- OJSPA**

| Utilization | Phosphorus supply | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | very weak | | weak | | medium | | good | | very good | |
| | ha | % | ha | % | ha | % | ha | % | ha | % |
| Arable | 69482 | 17,79 | 153806 | 39,38 | 75809 | 19,41 | 70927 | 18,16 | 20545 | 5,26 |
| Pasture | 5156 | 16,62 | 9694 | 31,25 | 7185 | 23,16 | 6105 | 19,68 | 2882 | 9,29 |
| Hayfield | 221 | 34,67 | 251 | 39,33 | 91 | 14,33 | 17 | 2,67 | 57 | 9,00 |
| Vineyard vines | 3752 | 49,17 | 2866 | 37,57 | 348 | 4,56 | 348 | 4,56 | 316 | 4,14 |
| Orchard | 3125 | 42,77 | 3215 | 44,00 | 453 | 6,20 | 354 | 4,84 | 160 | 2,19 |
| Agricultural | 81736 | 18,69 | 169832 | 38,85 | 83886 | 19,19 | 77751 | 17,79 | 3960 | 5,48 |

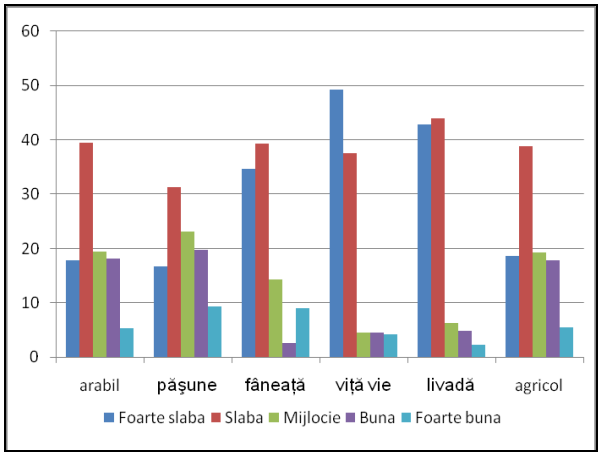


**Figure 3. State of soil mobile phosphorus supply in Olt at 31.12.2010, according to utilization**

Analyzing the supply of soil phosphorus in Olt County, as shown in the table 4, 18.69%, respectively, 81 736 hectares are weak soils supplied, 169 832 ha representing 38.85% are poorly supplied soils and 19, 19% and respectively 83 836 hectares are medium soils and soils well supplied and very well supplied represents only 23.47%.

Potassium participates in the assimilation of carbohydrates, lipids; starch plant provides greater resistance to diseases, pests, frost, drought and increase the quality of fruit and vegetables. The Olt county land supply with this element is shown in Table 5.

***Table 5***

**The state of mobile potassium soil supply in Olt at 31.12.2010- OSPA Olt**

| Utilization | Soil supply with mobile potassium | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | weak | | medium | | good | | very good | |
| | Ha | % | ha | % | ha | % | Ha | % |
| Arable | 5077 | 1,30 | 96705 | 24,76 | 204697 | 52,41 | 84090 | 21,53 |
| Pasture | 893 | 2,88 | 8491 | 27,37 | 11782 | 37,98 | 9856 | 31,77 |
| Hayfield | 42 | 6,60 | 68 | 10,67 | 287 | 45,00 | 240 | 37,67 |
| Vineyard vines | 2040 | 26,74 | 2323 | 30,44 | 2002 | 26,24 | 1265 | 16,58 |
| Orchard | 1442 | 19,73 | 1933 | 26,45 | 2386 | 32,66 | 1546 | 21,16 |
| Agricultural | 9494 | 2,17 | 109520 | 25,05 | 221154 | 50,59 | 96997 | 22,19 |

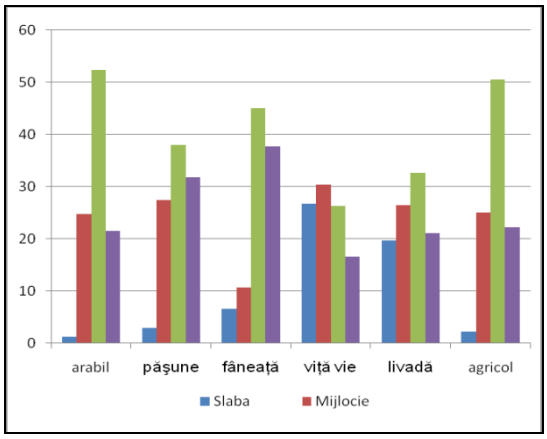


**Figure 4. The state of mobile potassium soil supply in Olt at 31.12.2010, according to utilization**

As shown in the table above, soil supply with potassium from Olt County is better than the phosphorus and humus supply, only 2.7% of the agricultural area of the county and respectively 25.05% represent low and medium soils supplied, while 73% of the surface is represented by soil well and very well supplied with assimilable potassium.

Nitrogen is found in every cell of the plant, where it participates in the synthesis of chlorophyll, protein substances, of various enzymes and ferments as well as vitamins.

From the point of view of the degree of provision of nitrogen, after calculating nitrogen index, the situation is very similar to the level of supply of humus. Thus, 48.18%, respectively, 210 624 hectares is represented by weak soils supplied, 51.42%, or 224,769 hectares is represented soil medium supplied and only 0.40%, respectively, 1 772 hectares is represented by soils well supplied with nitrogen.

***Table 6***

**State of supply of agricultural soil with nitrogen in Olt County 31.12. 2010 - OSPA Olt**

| Utilization | Soil supply according to the value I.N. | | | | | |
|---|---|---|---|---|---|---|
| | poor | | medium | | good | |
| | ha | % | ha | % | ha | % |
| Arable | 179349 | 45,92 | 209501 | 53,64 | 1719 | 0,44 |
| Pasture | 21669 | 69,85 | 9353 | 30,15 | - | - |
| Hayfield | 351 | 55,00 | 265 | 41,67 | 21 | 3,33 |
| Vineyard vines | 5794 | 75,94 | 1836 | 24,06 | - | - |
| Orchard | 3461 | 47,36 | 3814 | 52,19 | 32 | 0,45 |
| Agricultural | 210624 | 48,18 | 224769 | 51,42 | 1772 | 0,40 |

## CONCLUSIONS

From the data presented are worthy highlighted the following issues:

- The presence of large areas of acid soils (about 45% of agricultural land) limit the productions per unit area.
- Supply of low and very low phosphorus (cca.57% of agricultural land) limiting production in all cultures and affect crop quality.
- The content of soil humus is small and very small to cca.48% of agricultural land, requiring large expenses with additional fertilization.
- Most of the soils have low structural stability due to lack of calcium in the soil colloidal complex, being prone to crust formation and are vulnerable to work wet conditions soil.
- Steep slope of land coupled with their low fertility requires reduction of arable land and increasing other categories of use (orchards, pastures or forests).

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