

RESEARCH OF AGRICULTURAL SOIL QUALITY PARAMETERS CORRELATION

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Abstract: Soil is a prerequisite for life. It is a place of global and local circulation of matter and energy, a living space for plants, animals and people as well as a place and means of plant production. In order to use soil in the right way and for the right purposes, it is necessary to get acquainted with the composition, structure of the soil and the parameters that affect its quality.

The paper presents the quality parameters examination of one hundred agricultural soil samples, pH in N_2O , pH in KCl, soil moisture, $CaCO_3$, humus, nitrogen, N_2O_5 and K_2O content. The correlation of pH value in H_2O , the correlation of pH in KCl and the correlation of examined parameters of agricultural soil quality were investigated. Soil fertility control is the basis for rational use of fertilizers based on the results of soil chemical analysis in order to achieve high, stable and quality yields of cultivated plants, with the application of economy and protection of the human environment and the biosphere as a whole.

Key words: soil, quality parameters, correlation, improvement measures

1. INTRODUCTION

The soil is characterized by fertility, expressed through the different presence of necessary substances (macro and microelements), water and gases. The production of a part of organic matter in natural or controlled aquatic environments does not provide even the approximate needs of humanity in food and fossil fuels.

In this case, the cultivation of plants (agriculture, forestry) represents the soil as one of the most important natural resources, an invaluable asset of all mankind, not a single generation, group or individual [1].

Soil is polluted or degraded in several ways:

- Modern processing and use for agricultural purposes;
- Erosion and reduction of forest resources;
- Exploitation of mineral and mineral wealth;
- Excessive irrigation;
- Construction of facilities;
- By deposition of matter from the air;
- Waste disposal;
- Waste gases and dust.

When pollutants enter the soil in any of the above ways, their further fate depends on a number of physical, chemical and biological factors whose influences are intertwined.

The form of the compound in which these pollutants are found is also a very important form of the soil itself.

Land protection includes preserving the health and soil function, preventing damage, monitoring the condition and changes in the quality of the soil and repairing damaged parts of the soil and locations.

The first step in soil protecting and preserving its natural roles and preventing the degradation process is to monitor the situation and detect changes in its composition, to establish a monitoring system or permanent soil monitoring.

This implies continuous monitoring of certain soil indicators in order to collect information on condition changes and characteristics of the soil and to determine the shape and intensity of decomposition [2].

Soil quality is a complex expression for the general condition of the soil, considering the way of use and the basic functions of the soil. The most responsible indicators of land quality include the following groups:

- Parameters of soil properties;
- Soil process parameters;
- Soil quality parameters;
- Soil protection parameters.

Considering the way of use and the general function of the soil, there are following indicators of land quality:

- soil fertility,
- soil productivity,
- potential soil productivity
- anthropogenic impact and soil quality indicator,
- soil damage,
- soil sensitivity,
- mean concentration of a substance of geogenic or pedogenic origin,
- critical load indicator by the yield of one or more substances from one or more sources of pollution, on the state of soil quality,
- indicator of critical concentration of one or more substances from one or more sources of pollution,
- minimum set of information, as an indicator of soil quality,
- complete set of information, as an indicator of soil quality,
- substances which are especially dangerous in the soil,
- salinity of the soil,
- alkalinity of the soil,
- acidity of the soil,
- digestibility of certain plant substances [2].

The following parameters were tested for soil quality analysis:

- Humus
- Nitrogen
- Phosphorus
- Potassium
- Calcium
- pH value and
- Soil moisture.

The basic parameters of soil fertility and methods used for testing in the Agricultural Advisory and Expert Service of Užice are:

- pH value - Potentiometric method
- Soil moisture, % - After the entry into force of the Ordinance
- CaCO₃, % content - Volumetric determination
- Humus content, % - Volumetric method according to Tyurin
- Total nitrogen content, % - Computer based on humus content
- Easily accessible phosphorus content - Engen method with optical density reading on spectrophotometer
- Easily available potassium content - Engen method with flame photometer concentration reading [3].

1.1 Linear regression

Regression analysis is a set of statistical methods that reveal whether there are connections between the observed phenomena. The basic task of regression analysis is to predict the behavior of a dependent variable (Y) using known values of one or more independent variables (X), or to determine a non-random function, g such that $g(X) = Y$. Simple regression is a regression method that considers the relationship between one dependent variables Y and one independently variable X. A simple linear regression model can be expressed by the relation:

$$Y_i = a + bX_i + \epsilon_i, \quad i = 1, 2, \dots, N(1)$$

where are:

- Y_i i-th dependent variable,
- X_i i-th value of independent (explanatory) variable,
- a and b unknown constants, regression parameters and
- i stochastic term, random error or residuals. [4]

Simple linear regression analysis - correlation of pH in H₂O, pH in KCl and soil quality parameters

Table 1:Equations of pH correlation in H₂O and soil quality parameters

Correlation	Equation of regression	R ²
pH and moisture	$Y=0,2801X+2,2166$	0,0122
pH and CaCO ₃	$Y=0,0226X+0,0232$	0,8477
pH and humus content	$Y=0,441X+0,5257$	0,8614
pH and P ₂ O ₅	$Y=2,9055X - 10,809$	0,1752
pH and K ₂ O	$Y=11,211X - 29,5$	0,1622
pH and N content	$Y=0,1488 - 0,6325$	0,0716

Table 2:Equations of pH correlation in KCl and soil quality parameters

Correlation	Equation of regression	R ²
pH and moistures	$Y=0,2904X+2,4416$	0,0131
pH and CaCO ₃	$Y=0,155X-0,5165$	0,0779
pH and humus content	$Y=0,4375X+0,9822$	0,8510
pH and P ₂ O ₅	$Y=2,8279X-7,5205$	0,1666
pH and K ₂ O	$Y=10,899X-16,748$	0,1539
pH andN content	$Y=0,0224+0,0454$	0,0716

Based on the obtained equations of simple regression analysis, it is concluded that the amount of humus in the soil mostly depends on the pH value in H₂O and in KCl. Other parameters show a direct but negligible dependence.

CONCLUSION

Soil fertility depends on agrochemical properties of soil such as favorable pH reaction (neutral, low acidic and low alkaline), balanced humus content (achieved by organic fertilization and plant residues plowing in an amount equal to mineralization of organic matter), content of biogenic elements, soil biogenicity organic stocks and organic fertilizers, nitrogen release, phosphorus and other biogenic elements, etc.), etc.

In maintaining and increasing natural fertility as improvement measures are used: proper crop rotation, application of organic and mineral fertilizers, proper tillage, crop residues plowing, green manure, legume cultivation, soil repair measures (calcification, humification, application of trace elements, etc.) and soil analysis as a basis for cost-effective fertilization and soil fertility regulation.

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