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HISTORY AND MODERN METHODS OF SOIL RATING

E. K. Karimov

Associate Professor , Bukhara Institute of Natural Resources Management

Soil grading is a comparative assessment of effective soil fertility. It is effective fertility that includes weather factors, as well as the composition and properties of soils, which determine the productive capacity of the latter.

The purpose of grading is to compare productivity and identify the most favorable soils for various crops.

Soil grading is based on the simultaneous and conjugate use of quantitative indicators of the composition and properties of soils and agroclimatic conditions, which are in a close correlative relationship with productivity.

The first version of the soil grading methodology was compiled in 1958 г. acad. S.S. Sobolev and considered at the First Congress of Soil Scientists in Moscow (1958 г.), and then at the First All-Union Meeting on the Classification and Agrochemical Characteristics of Soils, held at the Soil Institute named after. V.V. Dokuchaev in 1959 г. Subsequently, the methodology was approved at an extended meeting of the scientific council of the Soil Institute named after. V.V. Dokuchaeva in 1963 г. and approved by the USSR Ministry of Agriculture for experimental testing under agricultural conditions. production. After testing the methodology for soil grading in a number of areas and receiving feedback and wishes on it from local soil scientists at research and educational institutions in 1967 г. was compiled under the leadership of S.S. Sobolev “All-Union instructions for grading (qualitative assessment) of soils.” Since this instruction was intended to help soil scientists carry out soil assessment on schedule and is essentially basic, it is given below with minor abbreviations and additions.

Work on soil grading, just like in soil and agrochemical research, is divided into three periods: 1) preparatory-office, 2) field and 3) office -analytical. The main task of the preparatory-office period is to study the literature about the soils of the region, region, their grading, collect materials on the productivity of agricultural crops, establish a correlation between the natural characteristics of soils and productivity and compile on this basis a preliminary grading scale of the most important soils of the region, region or republic.

1. Type and subtype of soil and area occupied by it.

2. Mechanical composition; particle content 0.05-0.01, <0.01 and < 0,001 мм; rockiness (m3/ha or weak, medium, strong according to available materials).

3. Parent and underlying rock (genesis, loess , two-membered sand and clay sediments, the presence of clay layers in the sand within the root-inhabited stratum, rubble , depth of underlying dense rocks, etc.).

4. Thickness of humus-colored horizons (A 1 and A+B) and thickness of the arable layer.

5. Humus content (%) and its reserve (t/ha).

6. Degree of cultivation (virgin lands, developed, highly cultivated, moderately cultivated , poorly cultivated, deteriorated, artificial and transformed).

7. Degree of erosion (weak, medium, strong, very strong).

8. Degree of solonetsity or salinity (depth of occurrence of the solonetzic horizon; concentration and depth of occurrence of harmful salts; their reserves in the layer 0,5 м, 0 -1 м, etc.).

9. Degree of gleyization , depth of gleyic horizon and continuous gleyization horizon ; thickness of the peat layer, degree of peat decomposition, type of peat (high-moor, transitional, lowland, floodplain).

10. Depth of groundwater or perched water, degree of drainage of reclaimed swamps; chemistry and degree of mineralization of groundwater in the area of secondary salinization.

11. Boiling depth and degree of leaching .

12. pH of salt extract.

13. Hydrolytic acidity.

14. Contents of the Republic of Kazakhstan (gross and moving reserves (t/ha).

15. The amount of absorbed bases or absorption capacity; degree of soil saturation with bases.

16. Absorbed sodium content, etc.

17. Physical properties: soil density, soil solid phase density, humidity, porosity , water permeability (if any).

In Germany, Rothkegel, one of the main authors of the Law on Soil Accounting, the scoring of which remains mandatory to this day, provided for taking into account the granulometric composition when assessing soil quality; origin of the soil; stage of soil development (7 in total), characterized by the characteristics of the arable humus horizon, the transition zone to the soil , soil-forming rock, groundwater (their level and impact on the soil profile)

In the UK, assessing the quality of agricultural products. land is produced in order to ensure the effective use of mineral fertilizers, and all tasks of monitoring and managing soil fertility are solved in this direction, including water and chemical reclamation, the use of more advanced soil treatments, organic fertilizers and plant protection products.

In the USA, according to the grading classification of the Soil Conservation Service, agricultural lands in this country are divided into 8 classes depending on the soil, climatic , geomorphological and hydrogeological conditions.

Calculation of the soil quality score using the method of T.A. Grinchenko The calculation is based on finding the integral indicator of various properties (the content of humus, mobile phosphorus and exchangeable potassium depending on the type of soil, pH and hydrolytic acidity, the degree of soil saturation with bases) and its mathematical description, selection mathematical model for transforming soil properties, taking into account the desirability of their impact on the overall level of soil fertility

Calculation of the soil fertility score using the TsINAO method. This method evaluates soil acidity, the content of humus, phosphorus, potassium, calcium, magnesium, basic microelements, the amount of absorbed bases and the degree of soil saturation with bases.

Calculation of the total soil score, GIZR method The calculation is based on GIZR materials, which provide for the determination of the total soil score relative to cultivated crops and the standard yield score

Calculation of total soil fertility, B.P.Nikitin method The main assessment score of soil fertility is determined by plant nutrition elements. The effect of other factors is taken into account through correction factors, among which one limiting factor may be sufficient.

Soil fertility is measured in conventional units, which correspond to the amount of nutrients required to create rye biomass with a grain yield of 1 quintal of dry matter. It has been established that on average nitrogen 5,0 кг, phosphorus - 0.9 and potassium - 4.1 are consumed for these purposes. These values are accepted as reference values when converting the productivity of various crops into a unit of fertility (u.p.).

Soil assessment according to I.I. Karmanov I.I. Karmanov developed formulas for calculating quality points used in irrigated and rain-fed conditions.

Assessment of soils according to T.N. Kulakovskaya et al. Kulakovskaya et al. [24, 25] to characterize fertility use the relative index of a complex of agrochemical properties (pH, phosphorus, potassium, humus) as an index of cultivation as the arithmetic mean value of the relative indices of the indicators used :

1. Calculate the relative index (I_{rel}) for each indicator used to assess fertility:

$$И_{отн} = \frac{X_{факт} - X_{мин}}{X_{опт} - X_{мин}},$$

where X_{fact} is the actual value of the indicator,

X_{min} and X_{opt} are the minimum and optimal values of the indicator for a given soil.

The authors of the method established the following minimum values of agrochemical indicators: pH $_{KCl}$ - 3.5, P_2O_5 and K_2O content - 2 mg /100 g of soil, humus - 0.5%. For peat-bog soils, the minimum value of the P_20_5 and K_2O indicators is 10 mg/100 g of soil. If the value of the actual indicator is more than optimal, the relative index is taken as 1.0.

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