simulation model for the different production areas of sugar beet lets you search for objective function and thus justify the parameters of technical equipment TC ZTSB.

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Solved stochastic method of accounting the natural razreshennoho of time to fund technological system functioning Other cleaning saharnoy beet in sootvetstvuyuschey statystycheskoy ymytatsyonnoy model.

TIME Foundation, stochasticity, Saharan beet, tehnycheskaya snap, ymytatsyonnoe Modeling, Efficiency, parameters.

The methods of stochastic influence account of the naturally settled fund of functioning time in technological system of sugar beets harvesting in a corresponding statistical simulation model are exposed.

Fund of time, stochastic, sugar beets, technical equipment, imitation modeling, efficiency, parameters.

UDC 631.4 + 526 (075)

EVALUATION OF spatial heterogeneity HRUNTOVOHOPOKRYVU PLAIN-steppe

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The proposed evaluation of spatial heterogeneity of soil lowland areas with typical black earth. For her study used data from the field mistsevyznacheni depth of the carbonate horizon in the soil profile. The concept of "heterogeneity factor" state of soil and the proposed procedure for its calculation. Practical use of "heterogeneity factor" is effective in implementing precision farming technology, with many years of agronomic research, and to adjust the detailed soil maps.

Mikrozapadyny, ground cover, black, carbonate, coefficient of heterogeneity.

Formulation of the problem. Right-bank Forest Steppe in Ukraine on flat terrain unique role in shaping the landscape and

of soil mikrozapadyny play. Their nature and characteristics of the operation has not investigated [1], and importance in the formation of soil and its agricultural use underestimated [7-9]. Especially important to consider the role mikrozapadyn fields, where the long-term agronomic research. In Soil overwhelming emphasis on well visible in relief mikrozapadynam ("saucer") depth of 1-2 meters. They examine the redistribution of moisture precipitation, moisture levels most of the surrounding valleys and plains territory, filtering ground water. Takes into account the complexity of agricultural production in these fields by prolonged waterlogging bottom and slopes of valleys and through different soil properties on their morfoelementah [7-9]. Such mikrozapadyny widespread in left-bank forest-steppe of Ukraine, forming a complex with the soil hydromorphic complexes, alkaline, solodized and saline soils and have been well studied [2, 5]. However, our research shows that common mikrozapadyny and Right-bank Forest Steppe of Ukraine [6]. And here mikrozapadyn soils are formed mainly under the influence of waterlogging precipitation, that redistributed in relief, involving elyuvialno ilyuvialnoho process [4, 7-9]. But soils and lowland areas are clearly visible without mikrozapadyn shown in the "classic" soil maps as typical black, were mixed on water regime and properties. Our research showed that the forest-steppe plains even nanorelyef essentially turns the water regime of soil, resulting in such mikrozapadynah mikropidvyschennyah and formed different soils on the level of classification of species, genus and even sometimes - subtype and type. This makes the otherwise evaluate existing soil maps lowland areas steppe zone and the possibility of their use.

Analysis of recent research. Studies conducted in the fields without the expressed microrelief which long held agronomic and soil experiments at a research farm "Velykosnitynske" NUBiP Ukraine in Fastovsky district of Kiev region (Fig. 1).

To investigate the heterogeneity of soil defined on detailed grounds map economy as a "typical black soil", we used the values of the depth of carbonates as one of the most important diagnostic features at mapping soil steppe that affects many properties of soils, and most importantly - the level of variability [6]. In addition, the depth of the carbonate horizon is an integral factor of soil water regime in the long perspective. Sampling of soil for analysis took place on the square17 hectares increments around 50 meters. Global coordinates of points measured by GPS-receiver. Soil samples were taken through a manual drill10 cm to a depth 200 cm. The presence of carbonates in the soil was determined by boiling the soil of 10% hydrochloric acid. Mapping analysis of research carried out on the PC with the software Surfer.

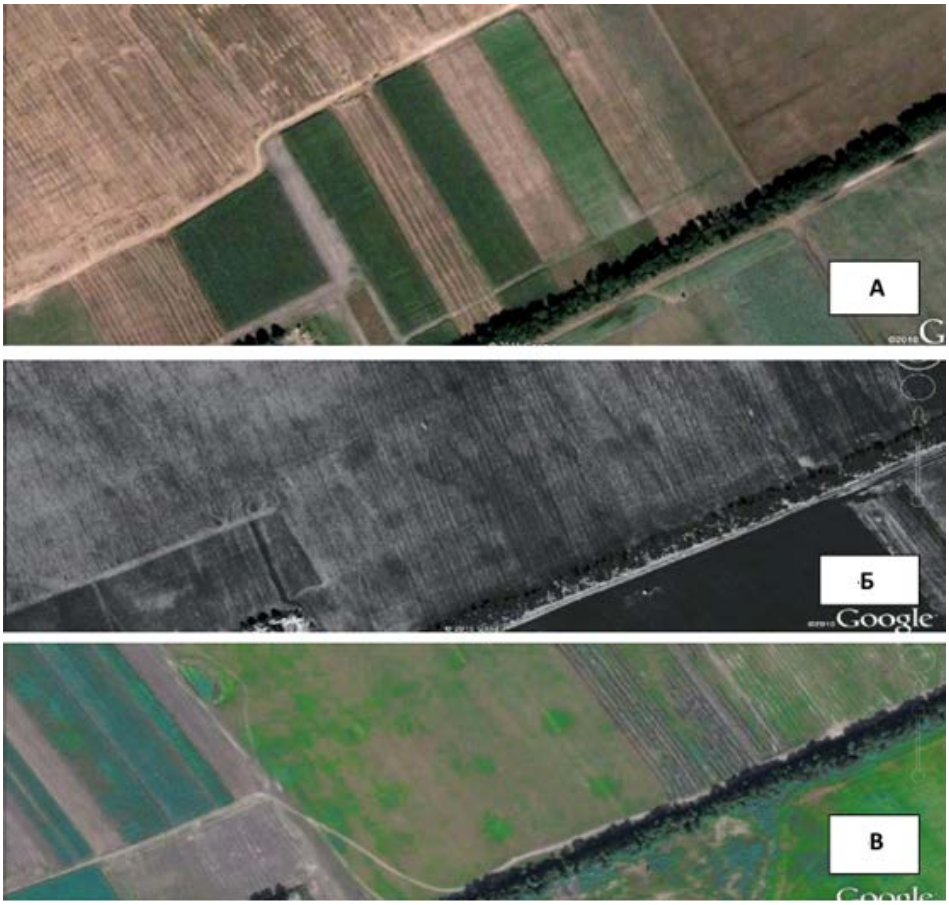

Fig. 1. Space picture (mapping service Google Earth) research field in the growing season (A), the Pre-period (B) and after harvest (B).

Results. Typical black usually characterized by carbonate horizon depth of about 40-

60 cm However, the research area we determined the depth of carbonates was in the range of 35 to 200 cmAnd at two points they were found and deeper 200 cm (Our previous studies have shown that shallow but well defined mikrozapadynah carbonates can even leach into the depths of 3-5 m and more [9]). It is important to bear in mind that in this area exceeded heights of individual elements nanorelyefa were within 20-
30 cmAlthough it can be assumed that in preparing for the field of long-term agronomic experiments done leveling the surface. The results of the state of soil are reflected in a plan to contour the depth of the carbonate horizon (Fig. 2, A) the location of sampling points of soil, as well as a three-dimensional image (Fig. 2, B) with the release of soil according to legend: 1 - black vysokoskypayuchi typical 2 - black typical (modal or reference), 3 - black hlybokoskypayuchi typical 4 - black vyluhovani 5 - meadow black soil, 6 - meadow black soil on bezkarbonatnyh lesah.

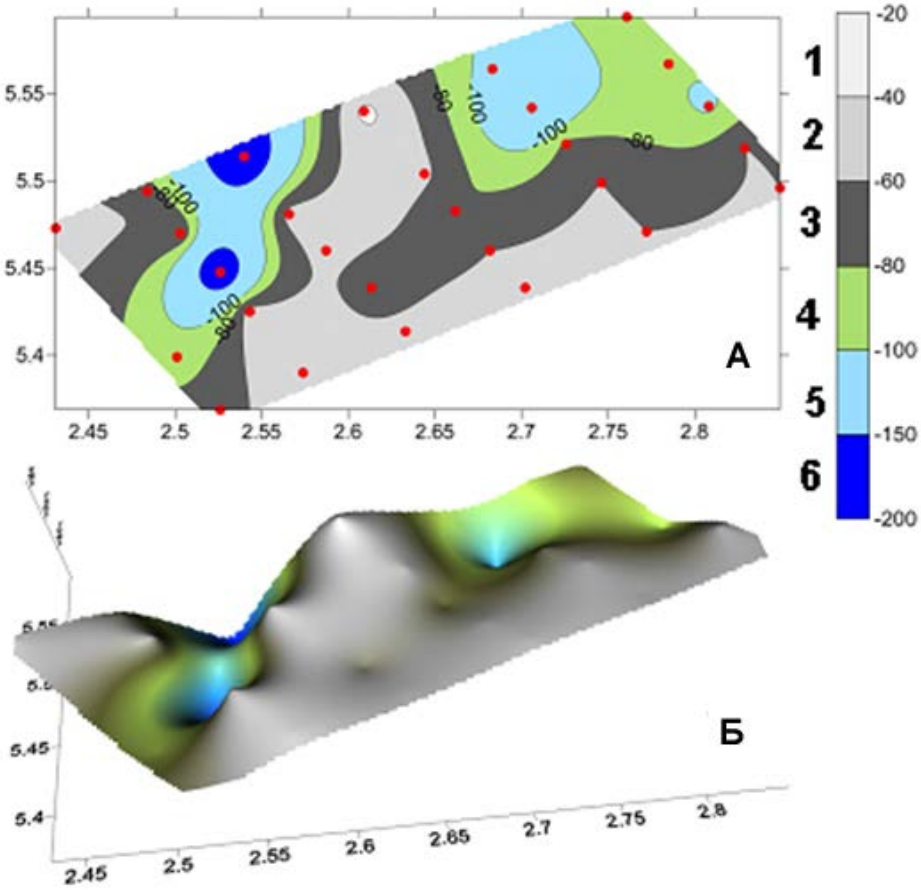

Fig. 2. The soil research plots diagnosed by the depth of carbonate horizon: A - two-dimensional image, B - D image.

As such cartograms showing the spatial heterogeneity of soil as this indicator and by the complex properties of these soils. In the construction of cartograms performed field interpolation data. The task of

spatial interpolation - get (with the minimum possible error) value of spatial variable (in this case - the depth of carbonates in the soil profile) at arbitrary points in space field through processing and analysis values measured in a limited number of selected points. To assess the value of a variable at the point where it is not measured, using various methods of spatial interpolation. To distinguish between two basic approaches to interpolation: deterministic and geostatistical. Determined interpolation methods approximate the unknown variable parametric function, the form of which is specified explicitly (eg polynomial) or implicitly (condition of minimal curvature). Parameters are selected so as to optimize the criterion of best approximation of the points of the sample (eg, least squares). Geostatistical methods (kryhinh) use the statistical properties of the measured data, assessing spatial autocorrelation and considering it in the interpolation. Deterministic interpolation methods are often not suitable for the construction of cartograms agrobiological soil properties based on field data limited number of sampling points. For example, the method of "inverse distance" mode accurately interpolyatora often has the effect of so-called "bovine eye" - cartograms of concentric contour lines around sampling points.

In our case, when choosing a method of interpolation was carried out so-called "cross-check", the essence of which is that the original data set randomly removed one observation and then using the data remaining and the selected interpolation algorithm, calculate the analytical value of the sample and residuals at the point of observation. This process is repeated a given number of times and generates a specified number of errors interpolation. The analysis of these errors can draw conclusions about the accuracy of interpolation. Cross checked can be considered an objective way of assessing the quality interpolation methods, and used to compare the quality of selected methods. To build cartograms depth of the carbonate horizon in this case used geostatistical method, kryhinh.

Soils with a depth of more carbonate horizon 100 cm diagnosed on the basis of our previous studies mikroponyzhen this economy [7-9] as meadow-black, although this requires further clarification on water regime, morphological characteristics and physical and chemical properties.

Relative area that take appropriate ground cancellation, presented in Fig. 3. It is important to note that the typical black (reference) cover about 30.4% of the total area of the field, that the current large-scale soil map does not reflect the real ground cover area. Obtained in this research area conclusions about the spatial heterogeneity of soil, detailed studies on production fields in other economies (published our part before) in different parts of Kyiv and Cherkasy regions, as well as

analysis of detailed satellite images of fields in different phases of the growing season allows us to conclude that the spatial heterogeneity of soil is an essential feature of its formation and functioning in plain forest steppe Right Bank Ukraine. A large-scale soil maps existing only schematically reflect the prevailing soil formation processes in a particular field.

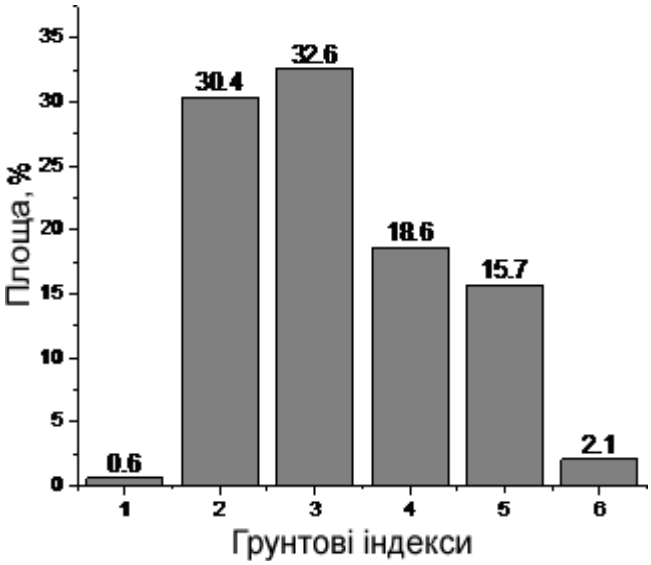

Fig. 3. Distribution of soils with different indices (indices ground specified in the text).

This conclusion is important for the agricultural land use in the region, especially when using precision farming technology. At the same time it is very important to clarify the methods of organizing and conducting stationary perennial agronomic research. Ignoring this spatial heterogeneity of soil will lead to a significant reduction in the reliability of patient studies. In this regard, proposed to introduce the concept of factor heterogeneity of soil k_n. The calculation of this factor should be carried out under the assumption that soil indexes that are close to the average of the indices on a particular field, have a lower impact on the variability of soil condition, and removed from the average of the significant "distance" - more. Consequently, the area of the field with indexes located closest to the average value of the index must be positive and less "weight". Because soil index deviation from the mean value are taken to the square. In addition, the greater the land area of the field with a specific index, different from the average, the greater the impact this has on site variability of soil:

$$k_n = \frac{\sum_{i=1}^{n}\left(s_i(i-\bar{\imath}^2)\right)}{\bar{s}\,\bar{\imath}^2}. \quad (1)$$

where: $i = 1, 2, .., n$ - The number of ground sites with different indices; Σ - sum; - The average index of soil present in the field;$\bar{\imath} = \frac{\sum_{i=1}^{n} i}{n} s_i$ - The

area of land and index-m; $\overline{S}$ - The average land area with various indexes.

When finding value $\overline{S}$ take into account that the construction of cartograms variability of soil was performed using the interpolation algorithm. In this regard, the average value of the land area of different indices is the formula:

$$\overline{S} = \frac{\sum_{i=1}^{n} s_i \frac{s_i}{s_{\min}}}{\sum_{i=1}^{n} \frac{s_i}{s_{\min}}}, \qquad (2)$$

where: e - the amount; $s_{\min}$ - Part of the field and m-index the minimum area.

Fig. 4 shows (as an example) ground cover areas of the field, where there are soils with indices 1, 2 and 3.

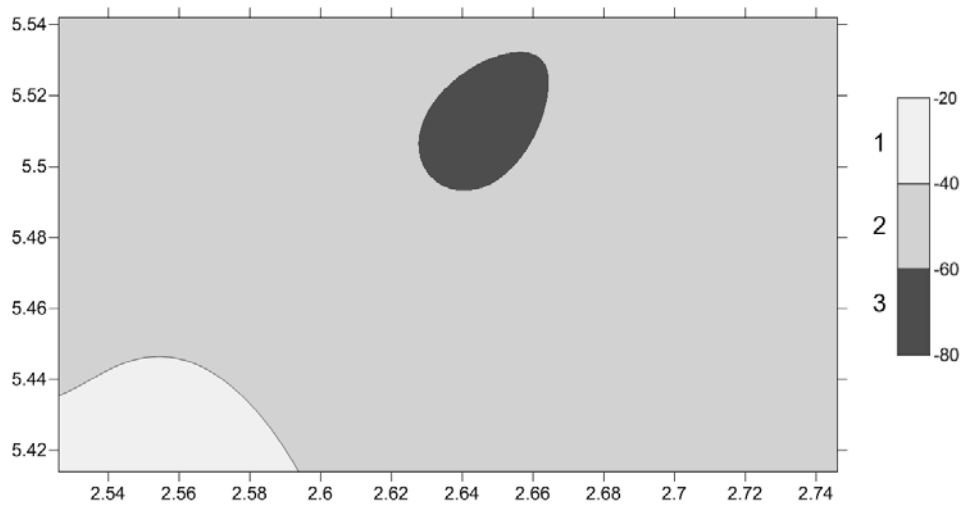

Fig. 4. The plot of the field of soil indices.

Apparently, soils with indices 1 and 3 occupy a relatively small area, and is the dominant soil index 2. Visual analysis indicates that this piece of ground has low variability of soil. This just shows calculated by formulas (1) and (2) the coefficient heterogeneity of soil that was - k_n = 4.6. The calculations factor heterogeneity of soil for a number of experimental fields showed that the values k_n in the range of 0 to 30 state variability of soil can be considered low for values k_n = 30-50 - Central and k_n > 50 - high. For soil cover in Fig. 3 heterogeneity cover ratio was 63, that variability is high. This classification will continue utochnyuvatymetsya the accumulation of experimental data. Thus, the proposed method allows us for the first time to quantify the spatial heterogeneity of soil and use this figure in the practice of agricultural

production, precision farming, soil mapping, as well as organizing and conducting multi agrobiological research.

Conclusions

Studies show that the soil plain forest steppe is heterogeneous not only because of the presence of well defined in relief mikroponyzhen (mikrozapadyn) with napivhidromorfnymy even hydromorphic soils, but also because of the great diversity of cover on the plains caused nanorelyefom. The redistribution of atmospheric moisture on the surface area of such relief leads to concentration of moisture in stealth nanozapadynah its filtering deeper into the soil profile, leaching of carbonates and other soil products at significant depth.

k_n

In connection with the detected heterogeneity of soil is necessary to clarify the existing large and detailed soil maps, especially for areas where crops are grown valuable or implemented precision farming system. Great value and the problem is fixed during the years of agronomic research, where the reliability of the results greatly depend on the consideration of spatial heterogeneity of soil research plots.

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Predlozhennaya evaluation of spatial inhomogeneities of the soil hiding ravnynnыh territories with typychnыmy chernozemamy. Justification for EE yspolzovanы polevыe mystsevyznacheny Data IZ hlubynы zalehanyya carbonate horizons in soil profiles. Introduced concept of "Factor inhomogeneities" STATUS hiding the soil and proposals ego calculation procedure. Practical Using "Factor discontinuities" in the Introduction эffektyven technology zemledelyya accurate at agronomically mnoholetnyh organization of research, as well as when adjusting detalnыh pochvennыh cards.

Mykrozapadynы, soil cover, chernozemы, karbonatnost, Factor inhomogeneities.

Evaluation of soil cover spatial variability of plain territories with typical black soil is offered. The field site-specific data of carbonate horizon depth in the soil profile is used for it justification. A concept of "Coefficient of Variability" is provided and the methods of it calculation is offered. The practical use of "Coefficient of Variability" is effective for precision agriculture, for providing of long-term agronomical researches and also for adjustment of detailed soil maps.

Micro sinkholes, soil cover, black soil, carbonate, coefficient of heterogeneity.