PRESENT ENVIRONMENT AND SUSTAINABLE DEVELOPMENT, VOL. 6, no. 2, 2012

THE EROSIONAL-ECOLOGICAL STATE OF THE SOILS IN THE PRUT-DNIESTER INTERFLUVE (REPUBLIC OF MOLDOVA, SOUTH-WEST OF UKRAINE)

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Key words: eroded soils, microwashing, ravines, morphometric indices, linear erosion.

Abstract. In the article we determined distribution of eroded soils, their connection with the morphometric indices of relief, defined parameters of linear erosion, the intensity of their growth, classified ravines and their impact on surrounding area. Outlined measures to reduce the intensity of erosion processes.

Introduction

The territory of the Prut-Nistr interfluve is part of the Central and Eastern Europe. The natural conditions here are similar to those of the European countries: Romania, Bulgaria and so on.

The dismantling of this territory, a great non conformity of the sloping terrains and their intensive valorization of the 60'-80' of the last century determined the development of the erosion processes and land slides These problems are severe, especially in contemporary agriculture.

1.Results of the research and discussions

The studies on the eroded soils and their connection to the morphological parameters of the relief were conducted on key-terrains. We noticed that there is a connection between the slope's inclination and the surface of the eroded soils (the correlation coefficient is of 0,9). This can be expressed by means of the formula:

$P = a - bl^2 + c$

where:

P – surface of the eroded soils, in %

l – slope's inclination in degrees

a, b, c – coefficients of the regression equation

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A well expressed dependency between the length of the slope and the surface of the eroded soils was not noticed. In most cases, we noticed the tendency of increase of the eroded soils' surface according to the growth of the slope's length up to 800 meters, and then gradually a decrease; this fact is probably linked to the reduction of the slope drainage. The correlation coefficient is of 0,76. The dependency of the slope's length and of the eroded soils' surface can be expressed by the following equation:

$S = a L^h$

where:

S – surface, %

L – slope's length, in m.

A – coefficient

The „h" parameter shows the dimension of the washing in function of the slope's length increase.

As mathematical models that express the connection between the geomorphologic indices and the surface of the eroded soils, we have:

$Y = ax + b$ (I)

$Y = ax^2 + bx + d$ (II)

$Y = ax^b$ (III)

$Y = c (1 – e – bx)$

where:

Y – surface of the eroded soils

a, b, d – empirical parameters, that fully characterize the physical-geographical complexes of the given territory. The universal method of determination of the "a", „b" and „d" parameters is the method of minimal squares (Plohinschi, 1970).

The connection between the slopes' exposure and the surface of the eroded soils is expressed by the interconnection coefficient (Urbah, 1964): most part of the eroded soils is on the NV – V – NE exposure slopes. This is because the southern slopes have an inclination with $1,5^o – 2,0^o$ smaller compared to the northern ones.

Linear erosion (ravines) takes place in the majority of cases on the slopes with a length of more than 300 meters and on the distance of 150–200 m from the inter-basinal line (with inclination of $2^o – 3^o$). Soils on these slopes are scantily fertile, especially on the middle of the slopes.

Ravines are widely spread on the undulating plain of the Southern Moldova, on the Dniestrean Height. The coefficient of their density is of 0,7 – 1m^2, of the affected surface– 1,45 ha/km^2 and of the density – 2,4 ha/km^2. The indices of the surface erosion are 0,8 – 1,0 ha/km^2. The minimum number of ravines can be found in the plain regions of the Northern Moldova, where the linear density is of 0,23 km/km^2, of eroded surface – 0,35 ha/km^2. Geomorphologic particularities,

development stages and morphometric indices are at the base of the ravines classification.

According to the relief dependency, we can distinguish between: slope ravines (of the valleys, dales) and bottom ravine (of the valleys bottoms). They have a smaller inclination. According to the hydrological regime: dry ravines and ravines with water flows.

Field researches showed that in the last 25 years, the average annual increase of the slope ravines was of 0,66 – 1,27 m, with a maximum of 7,5 m (especially in the spring-summer season). In the years with a lot of snow and snow melting though, – in the winter season – the increase intensity of the bottom ravines reaches on average to 4 m per year per ravine.

The proportional link between the increase of the ravines and the slope's inclination, the water collection surface and the intensity of precipitations is determined. The corresponding correlation coefficient reaches to 0, 87 – 0,9.

It is determined that annually, on the given territory, about 700-800 microravines form, with a length of 60-70 km and a surface of 300 ha; in this situation, the surface of degraded terrains increases by 450-500 ha (these terrains border the ravine network). It was determined that 3-5 ha of degraded soil of ravines correspond to one hectare of ravine surface. Based on the experimental results, the authors propose improvement methods of the eroded surfaces (construction of stable ecological agri-landscapes etc.)

Conclusions

1. Natural landscapes of the Prut-Dniester interfluve became highly anthropized in the last decade and the erosional processes of the land intensified significantly. In many localities, the ecological situation of agri-landscapes became critical and it was characterized by the authors by mathematical methods.

2. The intense valorization of terrains with an inclination of more than 3^o determined the severe washing of the soils and the development of ravines, the deformation of slopes, the diminishing of the soils' productivity and the deterioration of the ecological situation on a whole.

3. On the territory of the Prut-Dniester interfluve, there are more than 55 thousands ravines (general length – over 13 thousands km). The increase of the number of ravines and the development of the erosion put out of use nearly 100.000 ha of agricultural fields and the dismantling of territory increased by one third (the average density of the ravine network – 0,39 km/km^2, 1,6 unit./cm^2, 1,5 – 1,7 km/km^2). Bottom ravines increase more intensely (up to 5m/year). All these processes cause the decrease of the underground waters level and the aridization (drying out) of the soil (at a 65 km distance from the ravine).

4. Design of the improvement measures for the diminishing of the erosional processes is done taking into account natural and anthropic factors (ravines morphometry, lithology, precipitations regime etc.)

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