УДК 627.25:631.43

THE INFLUENCE OF SLOPE TERRACES APPLICATION AGAINST ANTIEROSION STABILITY AND AGROPHYSICAL PROPERTIES OF GREY FOREST SOILS

M. Berezhniak, Ie.Berezhniak, PhD, AssociationProfessors

National University of Life and Environmental Sciences of Ukraine

O. Voizekhivska, PhD, AssociationProfessor

Taras Shevchenko National University of Kyiv

In paper was shown positive impact of terraces application for decreasing of areas with water erosion processes and optimization parameters of agrophysical properties of gray forest soils.

Key words: *agrolandscape on slopes, terraces, snow layer, erosive processes, bulk density, soil structure.*

Introduction. In recent years, the actual task of soil science of Ukraine is a research of water and wind erosion. One of the more effective way is the waterworks using,especially water terraces application, which are help to storage and accumulate on the surface the fine soil particles, which were washed.[2 3].

Object of investigation and methods. Research of effectively of terraces using we are conducted in stationary plots under supervision of laboratory of land use management and soil conservation (National Scientific Centre). The stationary is situated in Kyiv Svyatoshin district around 25 km from Kyiv. This is a Kyiv Forest zone soil region. The amount of total research land area is 158 ha. Inside the area we researched two different slopes and ravine with trees, which did not increased a size. The slope exposure is east with base erosion level 52 m. For the main aim to stop a water erosion processes were built a waterworks complex (terraces, grass water streams, water accumulate reservoirs). On slope (7–10°) were built shafts terraces with function to accumulate thawing snow water and water of rains with concentrated water streams, which safety moved to lowland [5].

The observations in experiments conducted at the two-element of shaft terraces – the upper “pond” and lower “pond”for the comparison no terraces plateau. In our opinion, this experiment scheme can characterize erosion resistance of earthen structures (Figure).

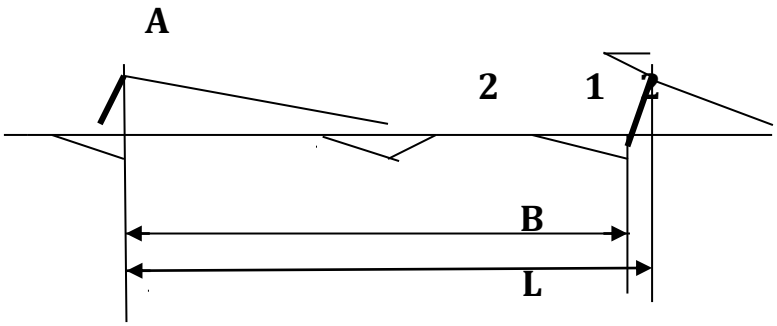

Fig. Scheme component of the national fabrics haft-terrace

L – the distance between the center line of shaft 50 m; B - line width, which is cultivated; A – part of steep shaft with legumes; 1 - upper pond, 2 - lower pond.

Research conducted by the following methods: the snow depth measure – by snigomir vagoviy VS-43, the depth of freezing point – bymerzlotomir Danilina, the soil moisture –by thermal-weight method, the soil loss –with measurement of water ravine by Sobolev, the soil density – by cutting rings and soil structure –by Savinov.

The purpose of research. To research and analyze the impact of visual-shaft terraces on sloping agricultural landscapes to reduce erosion and agrophysical properties of gray forest soils.

Research results and its discussion. The application of terraces on slope promotes change of water regime area, because detained rain and thawing snow water. In February and March after thawing a snow no observed soil losses on the length of the slope. The total observation of experiment plots after intensive rains fall (in the first decade of June were 85 mm) showed that there was no noticeable stream erosion. Only in one terrace with soil surface were noticed microstream erosion, approximately 1.37-1.54 t/ha. We decided that the reason of it was soil cultivation by disk harrow. Also, we didn’t notice a ravine growth under forest. It

shows the efficiency of erosive constructions – creation terraces on slope and forest belts.

Using terraces on sloping lands changes the water regime of the area, delaying the rain water and snow melt. Winter and spring period in years of investigation was characterized by low rainfall and often thaws, when the snow meltedalmost completely. An average snow surface in the observation territory was uneven. At the end of winter the snow density was 0.397 g/cm^3 and the height of snow on the various elements of the terrace was 6.3 cm on the variant of "lower pond" and 7.3 cmon the variant of "upperpond". The depth of soil freezing was respectively 80 and 71 cm [1].

It was established, that all the terraced slopes observed the same pattern of distribution of moisture on the elements of the shaft-terrace – increasing the amount of water in the upper pond compared with other elements of terraced slopes. Additional moisture area on the slopes of ridges, terraces ranging from 17.5% to 23.3% depending on the distance between them. On the slopes 3-5° productive moisture reserves after the spring snowmelt in 0-150 cm soil layer ranges from 143 mm to 151 mm in the first to the sixth terrace. On the terraced slopes 7-10º, compared to the slopes 3-5º, well defined water accumulated role of top rate areas and only the "body" of the shaft-terrace. Due to the lateral horizontal movement a film-capillary water there is increasing stocks of productive moisture in the area rate at 8.5%, compared to without terraces slope [4]. This demonstrates the effectiveness of shafts, terraces for greater regulation of the flow, and hence the suspension erosion.

We know that the intensity of the erosion is largely dependent on agrophysical soil properties and conditions of use of agricultural land. Investigation of the physical parameters of gray forest soils has shown a positive effect of the shaft-terraces on the soil density and structural composition of soil. The soil density of the upper layer 0–10 cm was optimal 1,25–1,27 g/cm^3, and the lower 10-30 cm – was lower 1,34–1,41 g/cm^3, as compared to plateau, accordingly creating conditions for a better soil water infiltration (table). Regarding the

structural composition should note the trend better soil structure in upper layer of terraces, where the structural coefficient was 1,86–1,85 and on the plateau – 1.54.

Agrophysical properties of gray forest soil at the different parts of terraces

Experimental plots	Soil layer, cm	Soil density, g/cm^3	Totalmacroaggregatescontents (drystructure), %			Coefficient of structure
			>10 mm	10–0,25 mm	< 0,25 mm	
Plateau	0–10	1.24	28.5	60.6	10.9	1.54
	10–30	1.54	35.8	60.0	4.20	1.50
The upper “pond”	0–10	1.25	28.7	65.0	6.30	1.86
	10–30	1.34	37.0	58.4	4.60	1.40
The lower “pond”	0–10	1.27	27.1	64.9	8.00	1.85
	10–30	1.41	47.5	50.3	2.20	1.01

Conclusion. According to the researchnoteda decreaseof small soil particles andmoisture accumulationon the elementsterraced slopes, as well as improvingtrendrevealedstructural compositionand optimizing thesoil densityof grayforestsoil in a root layer.Datashould be usedfor monitoringdangerousslopeerosion andagricultural landscapesof Kyiv regionfor developmentandimplementation of soilmanagementon them.

References

1. Бережняк Є.М. Екологічна оцінка водно-ерозійних процесів на ґрунтах Правобережного Лісостепу України: Монографія / Є.М. Бережняк. – НУБіП. – К.: Вид-во ТОВ «НВП Інтерсервіс», 2014. – 280 с.

2. Булигін С.Ю. Формування екологічно сталих агроландшафтів / С.Ю. Булигін. – К.: Урожай, 2005. – 300 с.

3. Пилипенко О.І. Системи захисту ґрунтів від ерозії / Пилипенко О.І., Юхновський В.Ю., Ведмідь М.М. – К.: Златояр, 2004. – 435 с.

4. Полупан М.І. Природний механізм захисту схилових ґрунтів від

водної ерозії / М.І. Полупан, С.А. Балюк, В.Б. Соловей, В.А. Величко, П.О. Волков. – К.: Фенікс, 2011. – 144 с.

5. Тараріко О.Г. Каталог заходів з оптимізації структури агроландшафтів та захисту земель від ерозії / О.Г. Тараріко,В.М. Москаленко. – Київ: Фітосоціоцентр, 2002. – 64 с.