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SOIL EROSION RESEARCH ON DETERMINING THE EXTENT OF THE POTENTIAL DANGERS OF MOUNTAIN-BROWN SOILS OF THE QUBA-KHACHMAZ ZONE OF AZEBAJDZHAN

ИССЛЕДОВАНИЕ ПОЧВЕННОЙ ЭРОЗИИ ПО ОПРЕДЕЛЕНИЮ СТЕПЕНИ ПОТЕНЦИАЛЬНЫХ ОПАСНОСТЕЙ ГОРНО-КОРИЧНЕВЫХ ПОЧВ КУБА-ХАЧМАЗСКОЙ ЗОНЫ АЗЕРБАЙДЖАНА

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Abstract. On the plots under sowing of field crops traits for which you can define the degree of soil erosion are projective cover and height plants. Enthusiastically steepness of slopes the ability to use crops as indicators of soil erosion reduces soil erosion degree of natural grassland can be estimated based on existing dependencies between the grass plants and extent of soil erosion. Strong enough erosion degree soils of sloping meadows can be recognized for environmental regimes of vegetation habitats.

Аннотация. Посевы полевых культур могут быть использованы как участки, на которых можно определить степень эрозии почв, в качестве контроля определяют такие показатели как проективное покрытие и высота растений. Эффективность использования злаковых на склонах для снижении степени эрозии почв естественных пастбищ можно оценить на основе существующих зависимостей между состоянием растительности и степенью эрозии почв. Степень развития дернины наклонных лугов определяется экологическим режимом растительных мест обитания.

Keywords: disturbed, humus, erosion, bioclimatic, compaction, steppe.

Ключевые слова: нарушенный, перегной, эрозия, биоклиматический, уплотнение, степь.

In the context of Azerbaijan the process of erosion has become a large development, calling for a washout, erosion and deflation, etc. types of unwanted consequences of destroying the aggregate properties of soils. It is expressed most clearly in the soils, cultivated in rainfed conditions in the example object. The aim of achieving completeness solvable problems of land management, erosion or potentially dangerous erosion should be deeply know every plot of land in the region, its features that can influence the choice of crops in the zoned territory, the method of irrigation or private receptions machinery. Therefore, it is possible only as a result of deep surveys the territory. We should also recognize that the stronger are affected by erosion of the soil, the more they differ from their non-washed analogues on chemical, granulometric composition and physico–chemical

properties, water, air and thermal regimes of biogenic and other indicators, the totality of which affect their fertility and erosion resistance.

The moves and discuss the results of the study

As a result, undertaken under the direction of prof. B. G. Aliyev [1] research jointly with experts of the Polish Institute of technology revealed that soil erosion is reduced humus content. However, the margin when 0–50 cm layer in non-washed mountain–brown stepped soils is 168 t/ha, in a very poorly washed–away — 156 t/ha, poorly washed–away — 135 t/ha, medium washed–away — 108 t/ha, heavily washed–away — 65 t/ha, and in very heavily washed–away — 32 t/ha. In eroded soils not only decreases the total humus content, but also decreases the contents of mobile forms of humic acids. According to the author, these changes are the stronger, the more are affected by erosion of the soil. It is believed that the decrease of humic acids leads to lower fertility, conservation of soil resistance to deterioration. This same decline, in General, proportional to the reduction of nitrogen in the soil. Shortage of available forms of nitrogen is one of the important reasons for the decline of fertility of eroded soils. Regularity also reveals decreasing r_20 in medium washed–away soils by 30% and heavily washed–away — more 50%. Reduction of organic phosphates and phosphorus forms insoluble increase leads to deterioration of phosphorus nutrition of plants. In eroded soils are often reduced content of potassium. Thus, its agrochemical characterization of soil washed away are substantially different from non-washed. Hence arises the need for differentiated fertilization in soil with varying degrees of erosion [1–2].

Results of laboratory studies found that eroded soils differ significantly from non-eroded on physical properties. In the eroded soils decreases the content of water–resistant structural aggregates. And so, if in the upper horizon of non-washed mountain–brown stepped soils water–resistant content of the aggregates is 52% very poorly washed–away — 48%, poorly washed–away — 42%, medium washed–away — 30%, heavily washed–away 18%, and in very heavily washed–away — 8%. The number of units of less than 0.25 mm increments (see Table 1).

Table 1.

DIAGNOSTIC INDICATORS OF VARYING DEGREES OF EROSION
THE MOUNTAIN–STEPPED BROWN SOILS

The degree of erosion and its designation	*Power horizons a + b*	*Gross margin, t/ha*			*water–resistant aggregates more than 1 mm*	*Yield kg/ha*
		humus	*nitrogen*	*phosphorus*		
Non-eroded	75	168	10.5	6.4	52	28.5
Very little eroded	70	156	8.8	5.8	48	26.2
Weakly eroded	60	135	7.6	5.0	42	22.3
Moderately eroded	45	108	5.6	3.2	30	15.8
Heavily eroded	30	65	3.8	2.3	18	9.8
Very heavily eroded	Less than 15	32	1.9	1.2	8	6.4

Non-eroded soils are distinguished from eroded visible differentiation of soil profile and greater capacity. Well allocated arable and 2 layers. In the past appears gray–brown shade effect of alluvion horizon. Subsurface layer is visibly detectable seal and meet the selection of carbonates. Structure of silt-clotted, and Virgin soil–clotted well expressed. The degree of erosion for each soil type is set, depending on which part of the soil profile washed away or deformed horizon from which topsoil is emerging, what is the average percentage yield compared to harvest on nejerodirovannyh soils, and the steepness of slope in degrees. The degree of erosion of soil also depends on the shape of the slope, its length and exposure, the correctness of management, anti–erosion of sustainability, which includes

a variety of mechanical, chemical and physical properties. Therefore, on the slopes of the same slope soils can be one, but different subtype of erosion.

The average harvest is a very important indicator in determining the degree of erosion.

In the field soil fertility was determined visually by morphological hallmark of a soil profile and as plants on this site. From the data Table 1. It can be seen that as the degree of erosion decreased the power of the horizon a + b and reserve of humus within certain limits.

It should be noted that the supply of humus (in tones) is calculated taking into account the nitrogen and phosphorus. In addition, data on crops as listed in the classification of eroded soils, somewhat understated. Our nursery (2008–2010) studies have shown that the harvest of winter wheat at very little eroded mountain–brown soils in the rolling average is reduced to 10% for medium-up to 25% of eroded, and the heavily eroded — up to 75% compared to crops on soils which non-eroded and approved the results of long-term researches of experts of Institute for land reclamation and grassland of the NDP. To achieve this goal, the potential dangers of erosion mapping based on local characteristics of soils, we adopted the following grouped by degree of soil erosion.

Soil erosion degree, which is set depending on the steepness and slope exposure, the depth of local bases, erosion degree, the nature of the underlying rocks, belonging to one or other agricultural lands.

Graduation steepness of slopes for arable land were taken as follows: 0–1; 1–3; 3–5; 5–8; 8–12 and more than 12. Other land: 0–1; 1–3; 3–5; 5–8; 8–12; 12–20; 20–30; 30–45 and more. On the slopes following graduation be taken exposure: North, Northeast, Northwest, East, West, South West, South East and the South. Where depth graduation local bases were taken following erosion: 0–20; 20–50; 50–100; 100–150; 150–200; 200–300; 300–400; 400–500; 500–600; 600–800; 800–1000 m and more. According to the degree of erosion of different categories of eroded land kept as soil one degree of erosion and their complexes.

Also take into account the nature of the underlying rocks and their density. For each of the selected groups and categories of eroded land have been given recommendations on their use and application of counter–erosion activities. As the above selection basis relied eroded land are soil maps that reflect all the contours of eroded soils and farmland. While used and supporting special cards steepness, exposure, slopes and depth of local bases of erosion [1, 3].

In recent years there has been significant growth in the areas of eroded soils that required for thorough research and allocation of eroded land, which was not previously considered. Consequently, the question arises of the diagnostic study of indicators for measuring the degree of erosion of soil. Sometimes use indicators that determine risk of erosion. For example, in some cases, assessment of erosion of arable soil set based on the data distribution of arable land on the slope. Of course, the steeper slopes, so all things being equal on them increases the degree of soil erosion. However, these are not always equal terms, so the soil more steep slopes may be less inclined than are affected by erosion (Table 2.) as can be seen from the table, in the north–eastern part of the Greater Caucasus arable land on terrain conditions are more favourable than the South–East or South of the Greater Caucasus. Therefore, the soil cover is relatively less eroded. This is largely due to the relatively higher conservation soil stability, favourable rainfall and soil–protective role of vegetation.

Soil erosion studies in Azerbaijan showed that factor exposure slopes more often affects distribution of eroded soils than the steepness of slopes.

So when surveyed in the forest zone of mountain–brown stepped soil on one of the areas with a slope of 15–20° on the southern slope of the heavily eroded soil, were found on the slopes of the Northern exposure with a slope of 15–20° — weakly eroded. It was found a great influence on the distribution of soil exposure. So on the slopes of the Northern exposure when slopes 8–12° mountain–brown stepped soils wash is 19.2 m/ha, while similar conditions southern exposure reaches soil washout 45.8 m/ha. If on the slopes of the southern exposure medium and heavily eroded soils occupy 41.2% of the area, on the slopes of Northern exposure in similar circumstances — just 9.8%.

Table 2.

DISTRIBUTION OF ARABLE LAND ON THE STEEPNESS OF THE SLOPES AND SOIL EROSION ADMINISTRATIVE AREAS OF THE NORTH–EASTERN PART OF THE GREATER CAUCASUS

Control areas	*Total area, ha*	*The steepness of the slopes*			*Eroded from the entire arable land*	
		Cooler 1°, ha/%	*Including steeper*		*Total, ha/%*	*Including a strong and very badly–eroded, ha/%*
			5°, ha/%	*8°, ha/%*		
Quba	20402	1502873.7	1038550.9	2898 14.2	13465 66.0	2845 13.9
Kusar	31586	2348574.4	1914760.6	46.2514.6	22066 69.9	4333 13.7
Davaci	19421	1541879.3	1169560.2	3420 17.6	14829 76.4	3127 16.1
Siyazan	10767	9708 90.2	714263.3	2138 19.9	8708 80.9	1942 18.0
Khachmaz branch	39624	1422535.9	327 0.8	—	11890 30.0	538 1.4
Total	121800	7786463.9	4866940.0	1308110.7	70958 58.0	12785 10.5

Square units of each category and groups of eroded land have been calculated, taking into account the genetic soil types. As a result, became possible be explication of eroded land of Azerbaijan. In explicating contains data on the number of each type of eroded soils varying degrees of erosion on slopes or another surface, consisting of various agricultural land. Further synthesis of erosion of land is to bring them into the Republican maps, where, with the aim of zoning activities rise shows the dependence of the soil cover. To highlight eroded territories the following gradation of the basis for the allocation of eroded land. Based on the data mapping of eroded soils, as well as the cameral works compiled map of soil erosion of the Azerbaijan Republic with the following application [4]:

1. Area lack of erosion:

–do not subject to erosion under forests;

–not prone to soil erosion, natural haymaking and occupied marsh vegetation;

–soil, confined to such lands, as deposits, gardens.

2. Area subject to erosion. Depending on the amount of soil with varying degrees of destruction of genetic horizons lands are divided into five groups:

–*Very little eroded soils*, where poorly washed–away a difference constitute no more than 10% and heavily washed–away soils are not available.

–*Weakly eroded soils*, where the total area of eroded differences is 25%. Area poorly washed–away — 20%, medium washed–away soil — not more than 5%, and heavily washed–away soils are not available.

–*Moderately eroded soils.* Only up to 50% of eroded soils. Square of contours with moderately eroded soils reaches 30%, weakly eroded — to 15% and heavily eroded — up to 5% and very heavily eroded is 10%.

–*Heavily eroded soils.* Soils erosion degree is about 75% of the total area. Of these, heavily eroded — 40%, moderately eroded — to 25%, and very heavily eroded — 10%.

–*Very heavily eroded soils*. Eroded area accounted for more than 75%. Very heavily eroded — up to 50%, moderately eroded, heavily eroded — more than 25%.

Given our experience, we fully share the views of F. S. Kozmenko, G. A. Presnyakova, S. S. Sobolev, K. Alekperova, M. N. Zaslavsky that coloring the top layer of soil can be taken as the rate of erosion.

Non-washed — colour dark brown, humus content — 5%, nitrogen — 0.30%, phosphorus — 0.22% capacity acquisitions — 35 mg–equivalent per 100 g of soil, the number of water–resistant units over 1 mm 52%.

Very poorly washed–away. Horizon and washed not more than 20%, the color of the soil a little different from non-washed *(dark brown).* Humus content in the upper horizon is 4.6%, nitrogen — 0.28%, phosphorus — 0.19%, absorption capacity — 32.5 mg–equivalent per 100 g of soil, the number of water–resistant units over 1 mm 48%. Yields below 10% than that of non-washed.

Poorly washed–away. Horizon from 20 to 50% washed soil color *brown,* humus content — 4%, nitrogen — 0.24%, phosphorus — 0.16%, absorption capacity — 28.8 mg–equivalent per 100 g of soil, the number of water–resistant units over 1 mm 48%. Yields below (from 10 up to 25%) than non-washed soils.

Medium washed–away. Horizon and washed away completely. soil color is *light brown,* humus content — 2.8%, nitrogen — 0.18%, phosphorus — 0.10% absorption capacity — 23,8 mg–equivalent to 100 g of soil, the number of water–resistant units over 1 mm — 30% yields below from 25–50% than that of non-washed.

Heavily washed–away. Wash off the horizon b_1, the color of the yellowish soil *with brownish tinge.* The content of humus — 1.2%, nitrogen — 0.08%, phosphorus — 0.05%, absorption capacity is 14.5 mg–equivalent to 100 g of soil, the number of water–resistant units over 1 mm — 18%, yield — from 50 to 75% (Table 3).

Very heavily washed–away. Rinse off completely the soil layer on the surface of exposed, loose and hard woods.

General provisions for the classification of eroded soils are the following: selection of diagnostic indicators to determine degrees of erosion of soil, suitable quantity allocated to degrees of erosion soil standards to ascertain their degree of erosion. Brown soil erosion degree stepped is invited to determine to reduce genetic horizons and reduce the content of humus in the horizons of *a + b.* Very little eroded it is recommended to classify the soil in which compared to non-eroded observed reduction of the horizon *a* up to 20% and 10% to humus to loosely eroded respectively 10–25%, to moderately eroded 25–50%, heavily eroded — 50–75%. These graduation offered, taking into account the variation in the humus content in soil and non-washed laboratory error definitions. Determination of the degree of erosion of soils based on quantitative change in humus content in the surface layer of soil — is an accurate and objective method that can be used in exposed soil mapping of mountain–brown stepped soils close to him on the genesis of soils.

Table 3.

THE DEGREE OF SOIL EROSION

The degree of erosion	*Genetic erosion horizons, %*	*Reducing the stock of humus, %*	*The condition of crops*
Very little eroded	(a) up to 20	< 10	Good
Weakly eroded	(a) 20–50	10–25	Slightly below average
Moderately eroded	(a) fully	25–50	Average
Heavily eroded	b about 50	50–75	Bad
Very heavily eroded	b fully	> 75	Very bad

Natural hayfields and pastures, is constantly covered with vegetation, considered the most effective form of conservation lands. However, due to the deprivation of the protective cover on the slopes increased run-off of soil, which contributes to erosive process.

In their geographical distribution of erosion on pasture appear in a certain area of subordination, which is confined to certain areas and bio–climatic is a product of the evolution of the bio–climatic Wednesday.

Depending on the degree of development of erosive process, the nature of vegetation and soil generic breeds, each selected type of erosion is divided into subtypes and variants.

Grouping of eroded soils of the Republic covers the main natural–landscape zones, taking into account the landscape and climatic conditions of each zone.

Highland climate differs harsh long protracted winter snow and frost. Summers are short and cool. The average annual temperature does not exceed 3.2–4.1°, and the coldest month (January) range from −4.6–7.9 °C, the temperature of the warmest month (July) is low, ranging from 12.9–13.7 °C; the sum of temperatures above 10° very low and average does not exceed 800–600. Duration of the frost–free period 1–2 months, vegetation period lasts 90–120 days. Average number of approximately 610–1210 mm, moisture ratio 1.52–1.22, total solar radiation (annual) changes within 144–156 kcal/cm^2. For the climatic indicators of the whole territory of the Highlands refers to wet (MD < 0.45) and cold (ΣT > 800) climatic type.

Floristic composition of the vegetation is extremely heterogeneous and varies with altitude. In the most elevated part of the vegetation canopy cover not provided–groups rocky scree (lichens, algae, etc.) For the Alpine meadows are typical dense sod meadows with cereal–sedge components. Subalpine meadows are presented cenoses cereals, grasses, thickets of rhododendron, and in relatively dry parts of the meadow–steppe communities. The main soil types are: mountain-meadow, mountain-forest-meadow and mountain–meadow–steppe. Agricultural production is weak, the zone largely occupied by wealthy summer pastures and mowed lands and are the basis for the development of transhumance (sheep) and fodder production.

Alpine and subalpine meadows, the main area which is occupied by pastures, soil erosion is the factor, which is closely linked areas. Stripped of protective vegetation, soil sloping land can't absorb the snow and rain water. This leads to an obsession with surface runoff which enhances ripple rivers. As a result of violations of the hydrological regime of the territory, which is due mainly to the removal of forest and grassy vegetation, knocking in the rivers of the mountain areas often seen very strong fluctuations in the volume of river flow. A large loss of water runoff regime of rivers worsens as snow, and especially snow–rain power. This, in its turn, reduces irrigation capacity of rivers on the territory of the foothill plains, necessitates the use of large irrigation and reclamation work [5].

Erosive processes that resulted from the degradation of the vegetation of pasture, contributing to a sharp drop in the productivity of pastures. Therefore, soil erosion and deterioration in the quality of grass–processes are closely linked. A well–developed natural grass cover markedly increases the resistance of soils and erosion of the leachate may run off. Development processes of erosion affects not only the quantitative indicators of pasture plants, but also leads to a restructuring of phytocoenosis. From the total area of 2402.3 hectares of mountain pastures over 1985,8 thousand hectares or 82.7% are prone to erosion. Pastures depending on subband and exposure of the slope wash soil varies ot 50 to 125 m^3/ha. From these studies derives great economical importance is the study of pasture erosion in mountainous areas and the development of techniques to prevent and fight against it. When developing differential measures for the improvement and rational use of pastures, there is always a need for classification and grouping of grazing land for their quality status. It should be noted, however, that classification pasture erosion has now developed enough. Moreover, even the phenomenon of erosion on pasture do not found a definite place in the common grouping of erosive processes, although the nature of the manifestations of pasture erosion is very much different from other types or categories of erosion.

Usually gives grouping soils grazing on a degree as they are destroyed. In the forms of accelerated erosion caused by human activities, have a lot in common. However, according to and from the reasons caused the manifestation of erosion, these forms have their own characteristics. The character manifestation of soil erosion of mountain pastures pretty sharply differs from erosion on cultivated hillsides. Erosion processes on the pastures start to develop normally, since damage to the turf [3, 5-6].

Mountain pasture soil destruction process has no similarities with the formation of gullies and potholes. The length of the pits not always exceeds their width, and availability under lower–powered soil layer waterproof dense rocks brings not on no growth pits deep. Further growth in the size of erosion pits usually occurs through the broken walls, sliding down the slope of sod places preserved woven roots and reminiscent of education in the second stage of its development. Raised near each other erosive pits are often steep walls and expands, incorporate among themselves, forming patches or streaks of eroded soil. As the further destruction of the soil occurs more or less gradual alignment of bugorchatogo through the shedding of microrelief, and under the influence of sloping runoff. This specificity of the appearance of erosion on mountain pastures requires, firstly, providing pasture erosion in independent or category subtype, secondly, development of appropriate soil classification according to their level of erosion. Based on long-term observations, taking into account the peculiarities of the destructive processes of soils under the influence of the unrestrained grazing of livestock, it is proposed that the draft classification pasture erosion on erosion degree (Table 4). This includes the sequence of dernennogo deformation process layer.

Table 4.

CLASSIFICATION OF PASTURE EROSION ON HILLSIDES

Stage	*The degree of*	*Indicators*
Trampling	Very weak	*The total area of paths:* < 10% of the account area
	Weak	10–25%
	Average	25–50%
	Strong	50–75%
	Very strong	75%

Research indicates the possibility of using cultural vegetation cropland and grass native grasslands in order to clarify the erosive soil survey data.

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