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DESIGNING A LAND DEVELOPMENT PROJECT FOR PROTECTING LANDS FROM DEGRADATION IN THE FOOTHILL AREAS

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Abstract. This article presents the causes of land degradation in foothill areas and gives solutions aimed at preventing degradation processes. In particular, were mentioned the most effective types of crop rotation through the organization of planned earthworks on slopes and horizontals in the catchment areas of rainfed lands.

Keywords: Foothills, rainfed land, precipitation, degradation, erosion, soil formation, crop rotation.

Introduction. If the land area of the world is 148.9 billion hectares, then 4.7 billion hectares are agricultural lands, of which 1.6 billion hectares are arable lands, and rainfed lands account for 1.3 billion hectares (81% of arable lands). 60 percent of agricultural products grown under various conditions in the world are produced through dry farming. The most effective methods of farming without irrigation are carried out in the temperate region of Europe, followed by the subtropical and humid tropical regions of North America, and the foothill regions of Central Asia. Nowadays, degradation processes are mainly occurring in the lands where carried out rainfed land farming. Taking this into account, it is important to develop scientifically based land development (construction) measures aimed at preventing such negative processes as the occurrence of degradation processes, including erosion in the rainfed lands of foothill regions.

LITERATURE REVIEW AND METHODS. Taking into account that the agricultural crops on the rainfed land areas of the arable lands in the foothills are cultivated only with the moisture collected due to the precipitation in the soil layers, dry crops are planted only in lands with an average annual rainfall of more than 200 mm. Based on the location of soil regions, rainfed lands are divided into sub-humid, semi-arid, arid lands.

Brown and dark gray soil is located in the highlands and is supplied with moisture, typical gray soil is distributed in the foothills of the middle regions and is poorly supplied with moisture and light-colored gray soils in the lower region considered as arid lands that are not supplied with moisture [4].

Based on the land fund, the total land area of the Republic of Uzbekistan as of January 1, 2024 is 44,892.4 thousand hectares, of which 25,748,6 thousand hectares are agricultural lands, 4,028.6 thousand hectares are arable lands and 783.5 thousand hectares of land are rainfed lands (Table 1).

Table 1

Distribution of rainfed lands in the Republic of Karakalpakstan and regions

№	Regions	area, thousand ha	share of total rainfed lands, %

1.	Republic of Karakalpakstan		
2.	Andijan		
3.	Bukhara		
4.	Jizzakh	244	31,1
5.	Qashkadarya	257,9	32,9
6.	Navoi	30,9	3,9
7.	Namangan		
8.	Samarkand	180	23
9.	Surkhandarya	39,4	5
10.	Sirdarya		
11.	Tashkent region	31,3	4
12.	Fergana		
13.	Khorazm		
Total		**783,5**	**100**

Note: National report on the state of land resources of the Republic of Uzbekistan, as of January 1, 2024..

Occurrence of water or wind erosion situations in foothill regions shows that the agricultural lands in these areas are prone to erosion due to the natural and climatic conditions and it is widely observed that it coincides with the banks of ravines, rivers or streams in these lands, as well as along the channels that throw floods.

The foothill lands of Parkent district, Tashkent region are considered to be mostly ravines (76.1%), and the occurrence of degradation processes in these lands is increasing year by year.

In the territory of the Republic, the lands with varying degrees of water erosion are more than 4 million hectares or 19% of the non-irrigated lands (including rainfed lands and pastures). In some regions (Samarkand, Kashkadarya, Surkhandarya and Tashkent), these indicators reach 50-80%.

Information about different degrees of erosion of agricultural land in the territory of the Republic (Table 2).

Land transformation for perennial tree plantations in rainfed lands is mainly carried out at the expense of rainfed land crops and lands not used for agriculture.

Despite the fact that a number of activities are currently being carried out according to the Resolution № PQ-277 of the President of the Republic of Uzbekistan dated June 10, 2022 [1] and Resolution N.50 of the Cabinet of Ministers of the Republic of Uzbekistan dated February 2, 2023 [2], land degradation processes remain an urgent issue. In addition, large-scale works are being carried out against the degradation processes in foothill areas. However, in recent years, the amount of precipitations that exceed the norm or, in most cases, fall in areas where precipitation does not fall, and the emergence of imbalances have caused scientists a number of difficulties in combating degradation.

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Information on land exposure to water erosion in the Republic of Karakalpakstan and regions

Lands with varying degrees of soil erosion	total land area, thousand ha	By regions		
		irrigated, thousand ha	not irrigated (rainfed lands) thousand ha	pastures, thousand ha
water erosion	**4100**		**700**	**3400**
strong	1480		310	1170
medium/avarage	1580		210	1370
weak	1140		180	960

It is considered appropriate to carry out a number of measures to combat land degradation in foothill areas:

– creation of improved autumn-winter pastures in foothill areas by planting seeds of natural plants;

– enclosure of severely degraded pastures and rapid rehabilitation through seed production for overplanting;

– cultivation of drought-resistant crops for fodder production;

– planting trees and shrubs on small terraces to increase the fertility of eroded soils;

– planting of trees and shrubs on hillside slopes and terraces;

– improvement of lands in arid conditions by creating pistachio plantations.

According to the conducted research, it is appropriate that land protection from degradation in foothill areas includes such issues as proper organization of livestock grazing, correct determination of the method and direction of its movement, planting grass and weeds.

Also, it is appropriate to carry out the following large-scale works on the degraded lands in the foothill regions:

A digital land use map will be created and launched into production to account for tree plantations on degraded lands.

optical and multispectral imaging of degraded lands will be carried out using drones, will be conducted the inventory of these lands and development of the topographic and cartographic materials

development of scientifically based recommendations for combating land degradation, its prevention and use in agriculture [2].

RESULTS. Assessment of natural conditions for agriculture, first of all, should begin with the identification of the features that may limit the agricultural use of landscapes. Such characteristics of landscapes are related to their relief, soils, and groundwater conditions. It is advisable that the assessment of landscapes for rainfed agriculture (dry farming) be carried out also according to the 3 components that are considered the most important from an agricultural point of view: climate, soil, relief.

Failure to organize planned earthworks along slopes and horizontals in water catchment areas of dry lands, removal without taking into account the intensity of

erosion processes in catchments may lead to increased soil washing and formation of ravines.

Land degradation is also affected by precipitation (rain, hail) and snowmelt. Because under their direct influence, water flows appears on the slopes and with its force occurs degradation. Other climatic factors, that is, temperature, air humidity and wind do not affect this phenomenon very much. The coefficient of water flow is determined according to the following formula:

$$P=K/R$$

Here, P is the coefficient of water flow;

K – the volume of water flowing at the soil level (mm);

R – the amount of precipitation (mm).

Depending on the amount of rain, the rate of precipitation and the total time of precipitation, the amount of water flowing from the surface of the slopes and the amount of degradation can be determined in advance. The greater the amount of the above-mentioned factors, the greater the extent of land degradation. Also, the distribution of the amount of rain during the year is of particular importance. Because the uneven distribution of rainfall leads to land degradation. Especially when there are heavy rains (in April and May), the ability of the soil to absorb water and transfer it to the lower layers decreases sharply. As a result, occur floods, the degree of land degradation increases.

In recent years, the amount of precipitations that exceed the norm or, in most cases, fall in areas where precipitation does not fall, and the emergence of imbalances have caused scientists a number of difficulties in combating degradation (Table 3).

Amount of precipitation in Tashkent region in recent years, mm.

Table 3

Year	Month												Annually
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2018	8.5	60.1	70.4	50.5	16.2	9.5	-	0.7	0.0	45.9	57.5	52.9	**372.2**
2019	74.5	30.6	47.1	146.2	0.8	55.6	0.0	0.0	2.6	4.6	38.4	39.1	**439.5**
2020	32.1	95.9	24.1	83.0	47.6	3.4	6.8	17.4	0.9	0.0	54.3	19.5	**385.0**
2021	19.9	38.1	90.0	32.5	12.4	0.1	0.5	0.1	-	28.9	24.1	41.9	**288.5**
2022	48.8	52.4	189.3	9.1	44.8	21.7	0.0	0.2	0.0	51.1	100.9	23.8	**542.1**
2023	52.4	89.2	39.9	37.6	8.2	0.0	3.2	16.6	3.5	25.8	47.9	55.1	**379.4**

Note: based on information from the hydrometeorological service agency.

If we look at the foothills, including the highest point of the dry hills, we see a slope in the opposite direction. The line connecting the points of the slopes is called the water distribution line (Picture 1).

Foothills are an example of this. These water distribution lines cover a clearly defined area. The water collected here flows to the lowlands. That is why it is called a catchment area, or stream.

Different types of slopes can be found in these areas. The slope of the skew is determined by the following formula:

$$J=H/L$$

here J is the slope of the skew (measured in degrees);

H – is the difference between the upper and lower parts of the slope;

L – is the horizontal location of this part of the slope.

On straight slopes, land degradation is stronger mainly in its lower part. Because the volume of water flowing down the slope increases more and more.

Picture 1. Water distribution lines connecting the points of the slopes.

The slope of the area in front of the watershed is 0.05o, the process of soil washing is slow, but in this area occurs the water flow, causing the erosion process to increase in the lower areas. These areas are used in various fields of agriculture. For example, it can be used for dry farming in watershed areas.

DISCUSSION. In each of the above mentioned areas are applied separate water erosion control measures.

The level of water collected in the foothills should always be 10-15 cm below the edge of the riser, and the collected water should be absorbed into the ground and distributed along the length of the step [3]. Depending on the slope of the hillside and the composition of the soil type, the distances between steps should be as follows (Table 3).

On lands with the slope of 0,02-0,12 m are taken sloped steps, on lands up to 0,12-0,25 m of slope are taken flat ones and on lands with more than 0,25 m of slope are taken steps with a ditch.

Table 3

The distances between the steps depending on the slope of hillside and the composition of the soil type, m.

The slope of the hillside	Soil composition	
	Medium and heavy	Light
0,02	38	50
0,03	30	41
0,04	27	38
0,05	26	35
0,06	25	30
0,08	24	26
0,10	20	24
0,12	18	22

System of arrangement of erosion areas in the water catchment:

P3—Watershed front area. S3-Pre-barrier area. G3-Hydrographic area. Dr—bed washed area. Br-The coastal area. L-Small ravines. A-The upper part of the barrier area. B-The lower part of the same area

The watersheds, expected to be subject to erosion, can be divided into the following 3 sub-regions:

1. Watershed's front area
2. Barrier area.
3. Hydrographic area.

In an eroded catchment area, the hydrographic area occupies an average of 15%, the pre-barrier area 30-35%, and the watershed's front area 50%.

CONCLUSION. In the prevention of land degradation in foothill regions, are organized planned earthworks in catchment areas of dry lands along slopes and horizontals. For example, as we mentioned above, the slope of the scew is determined, and in crop rotation in dry conditions one field is left in a clean plough while grain crops are planted in the remaining ones. In crop rotation, the previous crop is important. In dry conditions, a clean plough is a good predecessor.

As a result of our research it is detirmined that the types of crop rotation used in dry lands: grain-clean plow, development of short rotation schemes of various systems of alfalfa crop rotation, ensuring that the level of water collected in these areas is always 10-15 cm below the edge of the riser and that the collected water is absorbed into the ground and distributed along the length of the step, prevent of land degradation.

REFERENCES:

1. Resolution of the President of the Republic of Uzbekistan № PQ-277 of June 10, 2022.
2. Decision of the Cabinet of Ministers of the Republic of Uzbekistan №50 of February 2, 2023
3. Landshaftli yer tuzish. - Toshkent, TIQXMMI bosmaxonasi, 2019. 116 b.
4. Ziyonet.uz https://library.ziyonet.uz/ru/book/34799.