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Monitoring Of Flooded And Waterlogged Agricultural Land Of The Stavropol Territory.

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ABSTRACT

The article presents the monitoring of agricultural land prone to flooding and waterlogging for the years 2000 - 2016, in the context of the administrative regions of the Stavropol Territory. The analysis of the obtained monitoring studies for all types of agricultural land and the degree of their flooding is given. Monitoring of waterlogging on agricultural land is carried out in order to identify areas of already flooded land with the establishment of their boundaries and areas, determine the degree of degradation, identify the causes of waterlogging, forecasting the development of flooding processes and the development of measures to restore them and engage in agricultural circulation.

Keywords: monitoring of agricultural land, flooding and waterlogging, rational use.

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INTRODUCTION

Flooding of land is a rise in the level of groundwater (groundwater) to the surface of the earth, caused by natural or anthropogenic factors and leading to water saturation of soil soils. The result of flooding is a change in the physical and physico-chemical properties of soils and waters, the conversion of soils, a change in the species composition and productivity of vegetation.

Flooded areas are land on which the level of groundwater reaches or exceeds the critical level, resulting in a violation of economic activity.

Monitoring of flooded lands is carried out not only to identify the ranges and locations of these sites, but to establish the causes, nature and extent of flooding. The monitoring results are used to assess the adverse effects of flooding and to develop specific recommendations to remedy the situation.

In the Stavropol Territory, the problem of land flooding is associated with soil conditions, difficult terrain and the presence of a large number of once irrigated lands. The soils of the Stavropol Territory are heavy and medium loamy, and in some areas also urinated (Kochubeevsky, Shpakovsky, Andropovsky, etc.).

The anthropogenic factor also plays a significant role in the flooding of agricultural land. Operating and non-operating irrigation systems, construction of reservoirs and underground gas storage facilities, changing the structure of landscapes and the ratios of their components, etc.

The combination of natural and anthropogenic (economic) factors led to the fact that in the territory of the Stavropol Territory there is a large number of flooded lands, the area of which over the sixteen year period has decreased by 112,253 hectares. The results of monitoring the areas of flooded land are presented in Table 1.

MATERIAL AND METHODS

Table 1: Dynamics of the area of flooded lands of the Stavropol Territory, ha

Year	Eroded land	Agricultural land	Arable land	Deposit	Perennial plantations	Hayfield	Pastures
2000	Total	361126	119251	6323	4491	27787	203274
	Floodplains	135194	36495	1135	3302	4460	89802
	Out of flood	225932	82756	5188	1189	23327	113482
2006	Total	252412	85535	2726	4699	25447	134005
	Floodplains	99928	17003	17	4248	15316	63344
	Out of flood	148146	66120	2496	451	10131	68975
2012	Total	240199	82698	4880	4229	25004	123388
	Floodplains	103264	16780	1053	3112	10916	71402
	Out of flood	136935	65917	3827	1117	14088	51986
2016	Total	249873	85496	6787	4293	22488	130849
	Floodplains	110825	19438	941	2922	8768	78756
	Out of flood	139048	66018	5846	1371	13720	52093

As can be seen from the table, over the period of research, the total area of flooded agricultural land has decreased by more than 30%. The main reduction was due to non-flood lands, on which the flooding area decreased 86,884 ha. The number of flooded floodplain lands also has a tendency to decrease, since over the analyzed period their area also decreased by 25 thousand hectares.

Natural fodder lands, especially pastures, are more susceptible to flooding in the Stavropol Territory. The area of flooded forage lands for 2016 is more than 153 thousand hectares, of which 85% is pasture. Over sixteen years, the area of over-wetted pastures has decreased by more than 72 thousand hectares, and haymaking by more than 5 thousand hectares.

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Substantial areas of flooded lands fall on arable land (85,496 hectares), of which 77% are floodplains. Flooding in arable land is seasonal and depends directly on the amount of precipitation in a certain period of time. In this case, the period of flooding can be from several days to several months.

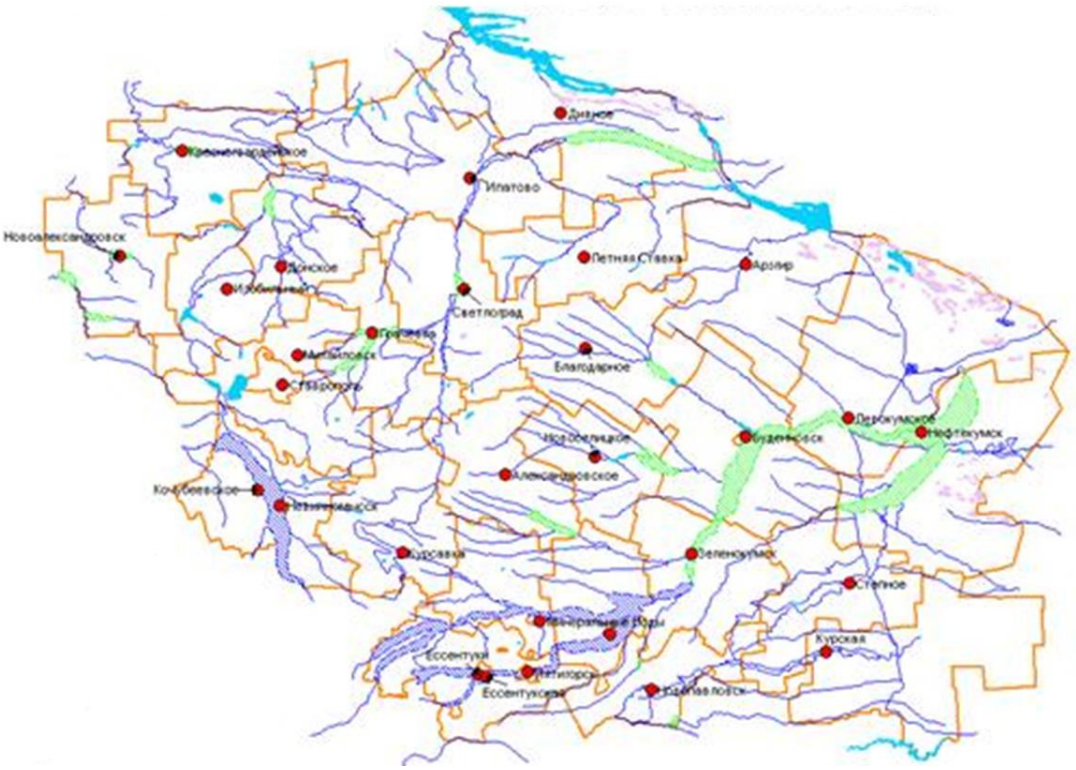

Figure 1: Map of flooded areas of the territory of the Stavropol Territory

Also significant areas of agricultural land are flooded in the floodplains of rivers, lakes and reservoirs. Their total area is 110,825 hectares, including 78,756 hectares of pastureland, 19,438 hectares of arable land, 8,768 hectares of hayfields, 2,922 hectares of perennial plantations and 941 hectares of deposits. For greater clarity, we have compiled a graph of the dynamics of floodplain and outland areas of flooded areas (Fig. 2).

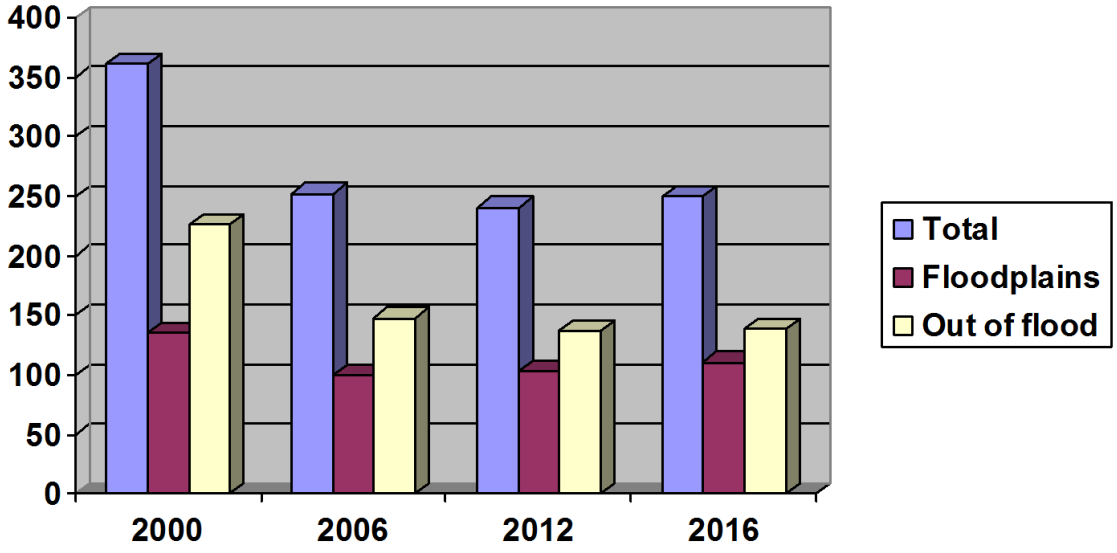

Figure 2: Agricultural land prone to flooding, thousand hectares

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It can be seen from the graph that the maximum area of both floodplain and non-invasive flooded lands was revealed in the 2000th year, after which a stable reduction of these areas is observed. But monitoring of the flooded areas shows that since 2012 there has been a tendency to increase the area of flooding in all types of agricultural land throughout the region.

RESULTS AND DISCUSSION

Monitoring of the flooded agricultural lands of the Stavropol Territory was carried out in the context of all 26 administrative districts in order to identify individual areas in which the areas of flooding have the greatest dynamics. The monitoring results presented in Table 2 show a rather ambiguous and variegated picture in the distribution of flooded agricultural land in the districts of the region. The maximum flooded area was found within the boundaries of the Predgorny District - 39,609 ha, of which more than 63% are arable land and more than 31% are pasture.

Figure 3: Overmoistened plots of arable land in the territory of Izobilnensky district (Tashlyansky landscape, 2016)

Large areas of wetlands were found in the following areas: Levokumsky (39,579 ha), Kochubeyevsky (16,290 ha), Ipatovsky (15,018 ha), Mineralovodsky (14,925 ha), Apanasenkovsky (13,017 ha) and Neftekumsky (11,105 ha). At the same time, we consider it necessary to note that the Levokumsky, Neftekumsky, Apanasenkovsky and Ipatovsky districts belong to very arid and arid areas, that is, overmoistening is associated with the granulometric composition of the soils.

On the territory of 12 administrative districts, the area of over-wetted lands exceeds 5 thousand hectares. These areas are located in all four agro-climatic zones of the region; therefore, it can be concluded that the main factor of waterlogging is the soil and raising the level of groundwater. For clarity, the amount of land prone to flooding, we calculated their area as a percentage (Table 3).

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Table 2: Monitoring of agricultural land prone to flooding (overwetting), ha

№	Area	The area of wetlands on land, hectares											
		Agricultural land		Arable land		Deposit		Perennial plantations		Hayfield		Pastures	
		2006	2016	2006	2016	2006	2016	2006	2016	2006	2016	2006	2016
1.	Aleksandrovsky	13398	12823	6907	6397	-	-	-	-	315	501	6176	5925
2.	Andropovsky	7209	7063	3726	3785	-	-	-	-	627	608	2856	2670
3.	Apanasenkovsky	13874	13017	90	546	-	-	-	-	2484	1940	11300	10531
4.	Arzgirsky	7269	7012	1005	294	-	-	-	-	-	-	6264	6718
5.	Blagodarnensky	7563	7540	1388	2074	-	-	38	-	-	-	6137	5466
6.	Budennovsky	5360	5063	4992	4261	-	-	-	-	-	-	368	802
7.	Georgiyevsky	6188	6750	2533	3042	-	-	982	895	-	-	2673	2813
8.	Grachevsky	5672	5839	246	541	2233	2313	13	-	101	101	3079	2884
9.	Izobilnensky	9144	8985	2366	1962	17	422	17	-	-	-	6744	6601
10.	Ipatovsky	15150	15018	1730	22	-	1952	-	-	-	-	13420	13044
11.	Kirovsky	1080	898	94	126	-	-	25	-	-	-	961	772
12.	Kochubeyevsky	16687	16290	8234	7041	240	1296	-	-	500	433	7713	7520
13.	Krasnogvardeysky	6856	6754	4108	4047	-	-	-	-	-	-	2748	2707
14.	Kursky	5391	5116	1269	1253	-	-	-	-	67	-	4055	3863
15.	Levokumsky	39194	39579	3401	5552	-	-	2750	2514	13197	11898	19846	19615
16.	Mineralovodsky	14603	14925	6312	6361	-	-	175	232	1802	1521	6314	6811
17.	Neftekumsky	11440	11105	3585	3826	36	175	-	-	2907	2298	4912	4806
18.	Novoaleksandrovsky	703	679	649	679	-	-	-	-	-	-	54	-
19.	Novoselitsky	4089	4423	630	1205	-	-	18	-	-	-	3441	3218
20.	Petrovsky	457	527	140	300	-	-	62	-	33	227	222	-
21.	Predgorny	39821	39609	23965	25219	-	-	290	383	1803	1603	13763	12404
22.	Sovetsky	8681	8503	4773	4573	-	-	271	269	56	139	3581	3522
23.	Stepnovsky	1262	1022	124	78	-	193	-	-	-	-	1138	751
24.	Trunovsky	5880	5511	2612	1404	200	200	58	-	-	-	3010	3907
25.	Turkmensky	3693	3742	463	243	-	-	-	-	-	-	3230	3499
26.	Shpakovsky	1748	2080	193	665	-	236	-	-	1555	1179	-	-
Total		252412	249873	85535	85496	2726	6787	4699	4293	25447	22488	134005	130849

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Table 3: Dynamics of over-wetted areas of agricultural land, ha

№	Area	Area of agricultural land, 2006	Over-wetted area, 2006		Area of agricultural land, 2016	Over-wetted area, 2016	
			ra	%		ra	%
1.	Aleksandrovsky	175561	13398	7,63	175561	12823	7,3
2.	Andropovsky	199286	7209	3,62	199285	7063	3,54
3.	Apanasenkovsky	315889	13874	4,39	315889	13017	4,12
4.	Arzgirsky	297766	7269	2,44	297754	7012	2,35
5.	Blagodarnensky	225355	7563	3,36	225269	7540	3,35
6.	Budennovsky	269828	5360	1,98	269807	5063	1,88
7.	Georgiyevsky	161867	6188	3,82	161863	6750	4,17
8.	Grachevsky	160242	5672	3,54	160182	5839	3,64
9.	Izobilnensky	160402	9144	5,7	160276	8985	5,6
10.	Ipatovsky	362557	15150	4,18	362551	15018	4,14
11.	Kirovsky	119719	1080	0,9	119305	898	0,75
12.	Kochubeyevsky	185819	16687	8,98	184715	16290	8,82
13.	Krasnogvardeysky	195753	6856	3,5	195675	6754	3,45
14.	Kursky	314029	5391	1,72	314029	5116	1,63
15.	Levokumsky	416486	39194	9,41	416482	39579	9,5
16.	Mineralovodsky	120223	14603	12,15	119597	14925	12,48
17.	Neftekumsky	326903	11440	3,5	326893	11105	3,4
18.	Novoaleksandrovsky	174006	703	0,4	173796	679	0,39
19.	Novoselitsky	158262	4089	2,58	158210	4423	2,79
20.	Petrovsky	239633	457	0,19	239575	527	0,22
21.	Predgorny	157386	39821	25,3	157159	39609	25,2
22.	Sovetsky	181493	8681	4,78	181361	8503	4,69
23.	Stepnovsky	169995	1262	0,74	169995	1022	0,6
24.	Trunovsky	150037	5880	3,92	150367	5511	3,66
25.	Turkmensky	239240	3693	1,54	239240	3742	1,56
26.	Shpakovsky	181843	1748	0,96	182298	2080	1,14
Total		5659580	252412	4,46	5657352	249873	4,42

In eighteen districts, the area of over-wetted agricultural land over a ten-year period has been reduced. Accordingly, within the boundaries of eight districts, the flooded lands increase their territories.

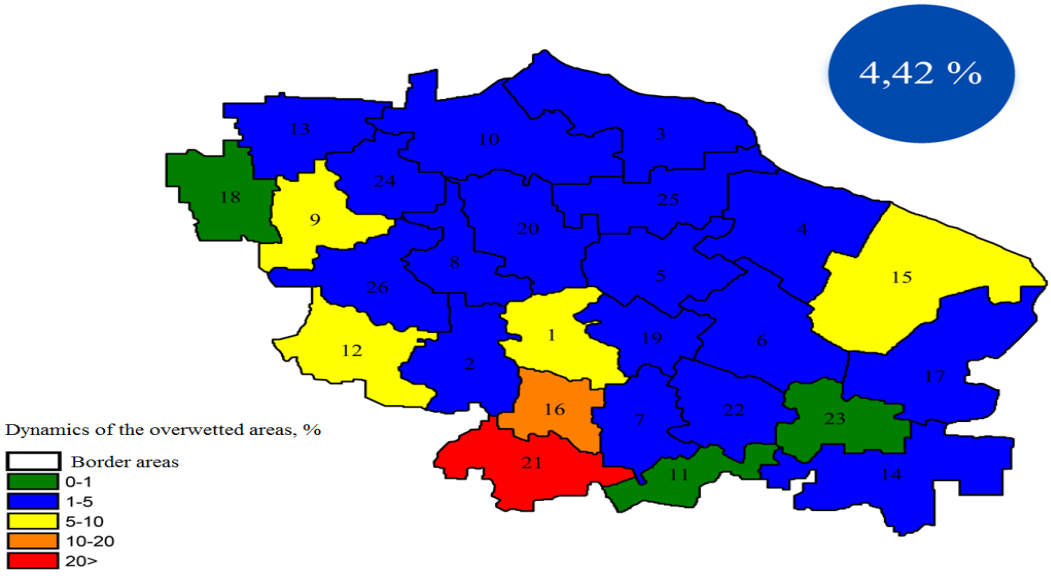

Figure 4: The developed map of the regions of the Stavropol Territory on soil degradation by flooding

If we analyze the area of wetlands as a percentage of the area of agricultural land, in this case the worst situation is in the Piedmont, Mineralovodsky, Levokumsky and Kochubeevsky districts, where 25.2%, 12.48%, 9.5% and 8.82% are flooded, respectively (Fig. 4).

A stable situation on the flooding of land is observed on the territory of Petrovsky (0.22%), Novoaleksandrovsky (0.39%), Stepnovsky (0.6%) and Kirovsky (0.75%) areas, since less than 1% is affected by this type of degradation. areas of agricultural land. Monitoring of wetlands is necessary, because long-term flooding can affect the nature and species composition of vegetation, the development of anaerobic microorganisms, and the spread of wetted landings.

CONCLUSION

Our studies show that in the region the area of agricultural land prone to flooding is constantly increasing, which is associated with the natural features of the soil and intensive anthropogenic activities. Currently, the majority of wetlands, despite the deterioration of their quality, continue to be used for the production of agricultural products, without introducing a set of measures for their conservation and improvement. Agricultural lands susceptible to flooding need to carry out land reclamation work, in addition, it is necessary to introduce crop rotations saturated with perennial grasses on a moistened arable land. With a high degree of flooding, land should be removed from agricultural use with the introduction of a set of measures.

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