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DYNAMICS OF SOIL COVER CHANGE UNDER THE IMPACT OF IRRIGATION AND MELIORATION

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Abstract. A study has been conducted to determine how modern agriculture impacted the structure and reclomative state of light serazem soils 77 years after land development. In the first place, when analyzing soil survey materials, a change in the structure of the soil cover of light serazems is revealed. Long-term irrigation of light serazem soils causes grassing, which causes groundwater levels to rise. Due to these changes, serazem soils under the conditions of the new soil moisture regime acquired new features and properties that allow them to be assigned to another genetic group which is called the group of semi-hydromorphic serazem-meadow soils. As a result of irrigation, leaching, there are significant changes in the chemical, physico-chemical and agrotechnical properties of soils. This provision can be supplemented with materials that testify to the processes of salinization and desalinization of soils. Long-term irrigation and unregulated water intake in weakly soddy conditions leads to an increase in the level of groundwater, which causes a high intensity of the solonchak process and causes secondary soil salinization.

Key words: light serazems, semi-hydromorphic soils, soil reclamation, solonchak soils, saline soils, humus content, grassing, drainage, irrigation, desalinization, solonchak, drained.

INTRODUCTION

The agriculture of the Kashkadarya region is developing in accordance with the tasks and direction of the agriculture of the republic. The total area is 2856.799 thousand hectares, which is 7 % of the total area of Uzbekistan. Agricultural development depends primarily on the structure and quality of land and their rational use. Lack of water is a constraining factor in the development of Kashkadarya's productive forces. A majority of the total area of agricultural land is pastureland, which occupies 79 % of the total area of land. Approximately 65 % of them are located in desert areas where sheep are grazed primarily [1].

Irrigation Basics**.** Along with the resolution of the water problem, the Kashkadarya region also has large reserves for the development of new lands.

Research object is the serazem-meadow soils of the Kashkadarya region.

Research subject is agrophysical, agrochemical and water-physical properties and nutrient content.

Scientific novelty of the research lies in certain changes in the agrophysical, agrochemical water-physical properties of soils.

Aim of the research is to determine the agrophysical, agrochemical water-physical properties of solonchak soils and to offer characteristics about the state of soil fertility and their effective use in the future.

MATERIALS AND METHODS

The object of research is serazem-meadow soils of the Kashkadarya region. The studies were carried out according to the standard methods generally accepted in soil science in field, laboratory and cameral conditions. Chemical analyzes were carried out in the laboratory with ISO international certification in the field of soil science, in particular, soil sampling, storage and laboratory experiments were carried out on the basis of the GOST: 17.4.3.01-83 Interstate Standard. The study of the properties of soils with a degraded topsoil based on the GOST: 17.4.2.02-83 Interstate Standard. The con-

tent of calcium and magnesium in soils analyzed based on the GOST 26428-85 Interstate standard. Water extract determination was carried out according to GOST 26423-85 Interstate standard. The humus content analysis performed according to GOST 26213-91 Interstate standard. The mechanical and granulometric composition of the soil is determined on the basis of the O`zDSt 817-97 [2-5].

RESULTS AND DISCUSSION

The study is to examine how land development has changed soil structure and the reclamation state of soils over the past 77 years and how modern agriculture has contributed to these changes. The soils of the Kashkadarya region are presented according to the genetic groups of soils of the serazem belt. As a result of analyzing soil survey materials, it is possible to determine, first, the changes in the structure of the soil cover over the past 77 years. Observations of weeding over time have shown a rise in groundwater levels in the presence of irrigation. Accordingly, the Chirakchi region's groundwater level rose from 8-10 metres to 2-3 metres, and even up to 1 metre in some places, over the course of 77 years. The cause of this occurrence is incompatibility between the existing collector-drainage network and the necessary drainage of drainage water under difficult groundwater drainage conditions. Therefore, serozem soils under the new soil moisture regime acquired new features and properties that enable them to be assigned to another genetic group, the semi-hydromorphic serozem–meadow soil group. Hence, irrigation began at the stage of semi-hydromorphic regime of moistening, resulting in intensification of grassing and transition of soils to meadows. The opposite phenomenon is also observed in areas of intensive reclamation, a reduction in the areas of bog-meadow soils.

During irrigation and leaching, soil properties are affected significantly in terms of chemistry, physics, and agrophysics. The following data can be supplemented with materials indicating the processes of salinization and desalinization of soils (table 1).

Table 1 - Salinization dynamics for 1936-2013 summer period for the soil area

1936 year				
By salinity				
total area	non saline and weakly saline thousand/ha	moderately and heavily saline thousand/ha	soloncaks, thousand/ha	solonetzic, thousand/ha
463,3	372,6	80,5	8,2	0,5
1966 year				
By salinity				
total area	non saline and weakly saline thousand/ha	moderately and heavily saline thousand/ha	soloncaks, thousand/ha	solonetzic, thousand/ha
463,3	357,9	38,5	4,7	36,0
2013 year				
By salinity				
total area	non saline and weakly saline thousand/ha	moderately and heavily saline thousand/ha	soloncaks, thousand/ha	solonetzic, thousand/ha
460.12	378.9	81.13	-	-

Based on the final salinity figures for 1936-2013, it is evident that the area of slightly saline soils has increased by 6.3 thousand hectares, and the area of moderately and strongly saline soils has increased by 0.6 thousand hectares. A signif-

icant amount of solonchaks has also been developed - about 3.5 thousand hectares. These lands have now been classified as weakly and moderately saline meadow soils.

During the period 1936-1966 and 1966 to 2013, solonchaks and solonetzic soils of 8.7 thousand hectares of land moved into the category of medium and strongly saline soils. It can be seen from these data that desalinization has occurred on an area of 70.3 thousand hectares, and salinization of soils have occurred on an area of 49.4 thousand hectares (1966) (table 1). In general, the state of reclamation of the lands has improved, although in some areas the opposite has occurred. Accordingly, in Shakhrisabz, Yakkabag and Chirakchi districts, on an area of 14.2 thousand ha, as well as in Karshi district, on an area of 15.3 thousand ha, the area of saline lands has increased. (1966) The solonchak process is intensified by long-term irrigation and unregulated water intake in poorly drained conditions, causing groundwater levels to rise, resulting in secondary salinization. Changes in soil and reclamation conditions in the context of the administrative districts of the region (shown in table 2).

Table 2 Changes in soil and reclamation conditions in the context of the administrative districts of the region.

1936 year				
Number of cuttings	Depth, in cm	Alkalinity		Moderately
		HCO^{-}_{3} %	HCO^{-}_{3} mg/eq	
1	0-30	0,054	0,060	0,057
	30-50	0,053	0,041	0,047
	50-70	0,059	0,037	0,048
	70-100	0,054	0,032	0,043
2	0-30	0,032	0,042	0,038
	30-50	0,034	0,035	0,037
	50-70	0,28	0,024	0,035
	70-100	0,038	0,040	0,039
1966 year				
Number of cuttings	Depth, in cm	Alkalinity		Moderately
		HCO^{-}_{3} %	HCO^{-}_{3} mg/eq	
3	0-30	0,041	0,053	0,046
	30-50	0,037	0,059	0,048
	50-70	0,032	0,054	0,043
	70-100	0,034	0,045	0,038
4	0-30	0,049	0,051	0,050
	30-50	0,047	0,050	0,048
	50-70	0,043	0,047	0,045
	70-100	0,031	0,045	0,038
2013 year				
Number of cuttings	Depth, in cm	Alkalinity		Moderately
		HCO^{-}_{3} %	HCO^{-}_{3} mg/eq	
5	0-30	0,038	0,62	0,33
	30-50	0,037	0,60	0,32
	50-70	0,039	0,64	0,34
	70-100	0,031	0,50	0,27
6	0-30	0,034	0,56	0,30
	30-50	0,041	0,68	0,36
	50-70	0,032	0,52	0,29
	70-100	0,026	0,42	0,22

CONCLUSION

Consequently, the data showed that long-term irrigation causes grassing and groundwater rise.

As a result, serozem soils under the conditions of the new soil moisture regime acquired new features and properties that allow them to be assigned to another genetic group, the group of semi-hydromorphic serozem–meadow soils.

Under the influence of irrigation and leaching significant changes occur in the chemical, physico-chemical and agrophysical properties of soils.

Long-term irrigation and unregulated water intake in poorly drained conditions leads to an increase in the level of groundwater, which causes a high intensity of the solonchak process and causes secondary salinization of lands.

The correct tillage system with the introduction of crop rotation is of great importance in increasing the yield of agricultural crops. The irrigation regime must be built depending on the depth of groundwater. Land reclamation measures on soils are determined by the need to improve the operation of the collector and drainage network. Drains must be cleaned and deepened to the extent that groundwater can be kept during the growing season at a depth of 2.5-3.0 m from the soil surface.

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ТҮЙІН

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СУАРУ МЕН МЕЛИОРАЦИЯНЫҢ ӘСЕРІНЕН ЖЕР ЖАМЫЛҒЫСЫНЫҢ ӨЗГЕРУ ДИНАМИКАСЫ

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Мақалада қазіргі заманғы егіншіліктің жер жамылғысының құрылымының өзгеруіне және жерді игеруден кейінгі 77 жыл ішінде жеңіл сұр топырақтың мелиорациялық жағдайына қандай әсер ететіндігі анықталады. Топырақты зерттеу материалдарын талдау кезінде, ең алдымен, жеңіл сұр топырақтың жер жамылғысының құрылымындағы өзгерістер анықталады. Ашық сұр топырақты ұзақ уақыт суару нәтижесінде шөгу байқалады, яғни жер асты суларының деңгейі көтеріледі. Нәтижесінде, топырақтың ылғалдануының жаңа режимі жағдайында сұр топырақтар оларды басқа генетикалық топқа – жартылай гидроморфты сұр–шалғынды топырақтарға жатқызуға мүмкіндік беретін жаңа белгілер мен қасиеттерге ие болды. Суарудың, шаюдың әсерінен

топырақтың химиялық, физика–химиялық және агротехникалық қасиеттерінде айтарлықтай өзгерістер болады. Бұл позицияны топырақтың тұзденуы мен тұздану процестерін көрсететін материалдармен толықтыруға болады. Ұзақ уақыт суару және нашар құрғатылған жағдайда реттелмеген су алу жер асты суларының деңгейінің жоғарылауына әкеледі, бұл тұздану үрдісінің жоғары қарқында жүруін тудырады және топырақтың қайталама тұзденуына акеледі.

Түйінді сөздер: жеңіл сұр топырақтар, жартылай гидроморфты топырақтар, топырақты мелиорациялау, тұзды топырақтар, гумустың құрамы, шөгу, дренаж, суару, тұздану, сортаң, құрғатылған.

РЕЗЮМЕ

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ДИНАМИКА ИЗМЕНЕНИЯ ПОЧВЕННОГО ПОКРОВА ПОД ВЛИЯНИЕМ ОРОШЕНИЯ И МЕЛИОРАЦИИ

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В статье выяснено какое влияние оказывает современное земледелие на изменение структуры почвенного покрова и мелиоративное состояние светло–серозёмных почв за истекшие 77 лет после освоения земель. При анализе материалов почвенной съемки, прежде всего, выявлено изменение структуры почвенного покрова светлых серозёмов. В результате длительного орошения светло–серозёмных почв наблюдается залужение, т.е. подъём уровня грунтовых вод. В результате этого серозёмные почвы в условиях нового режима грунтового увлажнения приобрели новые признаки и свойства, позволяющие отнести их к другой генетической группе – полугидроморфных серозёмно–луговых почв. Под влиянием орошения, промывных поливов, происходят существенные изменения химических, физико–химических и агротехнических свойств почв. Это положение можно дополнить, материалами, свидетельствующими о процессах засоления и рассоления почв. Длительное орошение и неурегулированный водозабор в слабодренированных условиях приводит к повышению уровня грунтовых вод, что обусловливает высокую напряженность солончакового процесса и вызывает вторичное засоление почв.

Ключевые слова: светлые серозёмы, полугидроморфные почвы, мелиорация почв, солончаковые почвы, засоленные почвы, содержание гумуса, залужение, дренаж, орошение, рассоление, солончак, дренированный.

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