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# IRRIGATED MEADOW-ALLUVIAL SOILS OF THE ARAL SEA REGION AND THEIR MECHANICAL COMPOSITION (IN THE EXAMPLE OF NUKUS DISTRICT)

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**Abstract**
In the article, the mechanical composition of irrigated meadow-alluvial soils in the Nukus massif of Nukus district is studied. In this case, the contour points of the Nukus massif were determined, sections were excavated up to the seepage waters, and the laws of changes in the mechanical composition of their layers were studied. Thus, according to the results of the research, the irrigated meadow-alluvial soils of the studied area are characterized by a unique geomorphological, climatic and vegetation cover, one of the unique features of the studied desert soils is their multi-layeredness and a sharp change in mechanical composition. In some places, sandy layers change to sandy loam, and sandy layers change to clay layers.

**Keywords**: Irrigated meadow-alluvial soils, mechanical structure, seepage waters, loam, sand, sticky sand, physical clay.

## Introduction

Soil fertility plays an important role in obtaining high yields from agricultural crops. It is a difficult issue to raise crop productivity to optimal indicators even at the expense of high agro technologies in low soil fertility lands. Therefore, it is an urgent issue to alter soil properties, regimes and indicators and to implement this before planting crops. The agrophysical properties of the soil also play a role in this [2; 3; 5].

Many scientists have emphasized that the mechanical structure of the soil is of great importance for its productivity. Mechanical composition is an important agrophysical indicator and it does not create the same physical properties and regime in sandy, loamy, loamy soils. Because these soils differ from each other in their mechanical structure, they have their own physical and mechanical properties [1; 4; 6; 7].

In the conditions of arid zone, the mechanical composition is of great importance in the formation of soil and its use in targeted agriculture. All the properties of soils, porosity, water properties, thermal properties, aeration, aggregate, chemical composition, biological activity and fertility are related to its mechanical composition, because the soil moisture level and the amount of nutrients absorbed by plants move through the mechanical composition.

The mechanical composition of the soil has a significant effect on the water-physical, physical-mechanical, air, thermal properties, the conditions of the oxidation-reduction processes in the soil, absorption properties, the accumulation of humus in the soil, as well as the accumulation of ash elements and nitrogen.

When we analyzed the mechanical composition of the irrigated meadow-alluvial soils of the Nukus massif, we found the following results.

We can see that the soil cross-sections of the area differ sharply in terms of mechanical composition from each other and from layer to layer. In sections 1 and 3 of irrigated meadow-alluvial soils of Nukus district, Nukus massif, light loam, light clay, medium clay, sandy layers are distinguished. The amount of large dust fractions (0.05–0.01 mm) in the mechanical composition is 36.6–46.9% in the surface layer and 65.2–31.8% in the lower layer. It can be seen that the cross-sections have light clay (saz) and medium clay (saz) layers with the sedimentation of clay particles as a result of irrigation (Table 1).

As a result of the performed analysis, the mechanical structure of the studied irrigated meadow-alluvial soils is noted to change in some places, which is typical for soils with alluvial genesis. Sections 10 and 11 of irrigated meadow-alluvial soils are moderately sandy, with coarse sand (>0.25 mm) in the upper layer from 0.2 to 0.3%; medium sand (0.25-0.01) 0.4-2.3%, fine sand (0.1-0.05) from 4.0 to 11.6%; coarse dust (0.05–0.01) from 46.9 to 58.8%; average dust (0.01–0.005) from 11.1 to 11.9%; fine dust (0.005–0.001) was found to be found from 13.5 to 15.1%. This type of diversity is characteristic for il particles (<0.001) and its amount ranges from 11.1 to 12.7%. The amount of physical clay (<0.01 mm) varies between 36.6 and 39.0% in the composition of the described soils.

**Table 1. Mechanical composition of irrigated meadow-alluvial soils (2020)**

| Layer depth, cm | Fractions %, size of fractions, mm | | | | | | | Physical clay content (<0.01mm) | Mechanical content |
|---|---|---|---|---|---|---|---|---|---|
| | >0,25 | 0,25-0,1 | 0,1-0,05 | 0,05-0,01 | 0,01-0,005 | 0,005-0,001 | <0,001 | | |
| cross-section-1. Irrigated meadow-alluvial soil | | | | | | | | | |
| 0-26 | 0,7 | 9,8 | 27,6 | 36,6 | 8,0 | 9,5 | 8,0 | 25,5 | Light sand |
| 26-50 | 0,4 | 2,3 | 27,3 | 43,7 | 8,7 | 9,9 | 7,6 | 26,2 | Light sand |
| 50-65 | 0,2 | 0,3 | 5,0 | 25,4 | 18,3 | 26,2 | 24,6 | 69,1 | Light clay (saz) |
| 65-80 | 0,5 | 3,6 | 18,0 | 62,0 | 6,4 | 5,6 | 4,0 | 15,0 | Sandy |
| 80-150 | 0,6 | 4,8 | 16,7 | 65,2 | 4,8 | 4,8 | 3,2 | 12,8 | Sandy |
| 150-180 | 0,7 | 1,8 | 17,2 | 68,4 | 4,0 | 4,8 | 3,2 | 12,0 | Sandy |
| cross-section-3. Irrigated meadow-alluvial soil | | | | | | | | | |
| 0-30 | 0,5 | 12,7 | 14,5 | 46,9 | 9,5 | 8,7 | 7,2 | 25,4 | Light sand |
| 30-42 | 0,4 | 11,0 | 14,8 | 50,9 | 8,7 | 8,0 | 6,4 | 23,1 | Light sand |
| 42-68 | 0,2 | 1,9 | 4,1 | 31,8 | 16,7 | 23,5 | 21,9 | 62,1 | Light clay (saz) |
| 68-112 | 0,2 | 0,9 | 2,0 | 18,3 | 16,7 | 31,8 | 30,2 | 78,7 | Medium clay (saz) |
| cross-section-5. Irrigated meadow-alluvial soil | | | | | | | | | |
| 0-28 | 1,1 | 0,4 | 3,2 | 47,7 | 14,3 | 20,7 | 19,1 | 54,1 | Heavy sand |
| 28-42 | 0,2 | 2,9 | 0,8 | 66,0 | 8,0 | 12,7 | 11,1 | 31,8 | Medium sand |
| 42-70 | 0,1 | 0,3 | 1,3 | 66,0 | 10,3 | 13,1 | 11,5 | 34,9 | Medium sand |
| 70-123 | 0,2 | 3,2 | 12,4 | 73,1 | 2,4 | 4,8 | 4,0 | 11,2 | Sandy |
| cross-section-10. Irrigated meadow-alluvial soil | | | | | | | | | |
| 0-28 | 0,3 | 2,3 | 11,6 | 46,9 | 11,1 | 15,1 | 12,7 | 38,9 | Medium sand |
| 28-52 | 0,3 | 11,9 | 4,4 | 47,7 | 10,3 | 13,5 | 11,9 | 35,7 | Medium sand |
| 52-63 | 0,2 | 0,4 | 0,1 | 40,5 | 15,9 | 22,3 | 20,7 | 58,9 | Heavy sand |
| 63-82 | 0,1 | 0,4 | 0,9 | 16,7 | 15,9 | 34,2 | 31,8 | 81,9 | Medium clay (saz) |
| cross-section-11. Irrigated meadow-alluvial soil | | | | | | | | | |
| 0-19 | 0,2 | 0,4 | 4,0 | 58,8 | 11,9 | 13,5 | 11,1 | 36,5 | Medium sand |
| 19-36 | 0,3 | 0,9 | 1,1 | 58,0 | 12,7 | 14,3 | 12,7 | 39,7 | Medium sand |
| 36-65 | 0,2 | 4,0 | 6,8 | 77,1 | 6,4 | 3,2 | 2,4 | 12,0 | Sandy |
| 65-118 | 0,2 | 3,1 | 14,9 | 73,9 | 4,0 | 2,4 | 1,6 | 8,0 | Sticky sand |

In sections 4, 5, 7, 8 and 9, the mechanical composition of the irrigated meadow-alluvial soils is heavy sand, with coarse sand (>0.25 mm) in the upper layer from 0.2 to 1.1%; medium sand (0.25-0.01) 0.4-7%, fine sand (0.1-0.05) 0.4-7.3%; coarse dust (0.05–0.01) from 35.8 to 47.7%; medium dust (0.01–0.005) from 9.5 to 16.7%; fine dust (0.005–0.001) was found to be from 16.7 to 23.1%. The amount of Il particles (<0.001) ranges from 19.1 to 21.5%. The amount of physical clay (<0.01 mm) fluctuates between 52.5 and 55.7%.

Mechanical composition of irrigated meadow-alluvial soils 2 – light clay (loam) in cross-section, coarse sand (>0.25 mm) 0.5% in the upper layer; medium sand (0.25-0.01) up to 0.5%, fine sand (0.1-0.05) up to 1.3%; coarse dust (0.05–0.01) up to 35.0%, medium dust (0.01–0.005) up to 16.7%; fine dust (0.005–0.001) was found to be up to 23.9%.

It was found that the amount of il particles (<0.001) is 23.9%, and the amount of physical clay (<0.01 mm) is up to 62.8%.

We found out that the irrigated meadow-alluvial soils of the region differ sharply from each other in terms of mechanical composition. According to sections, the mechanical composition of light sand, medium sand, heavy sand and light clay was distinguished.

In general, one of the characteristic features of the studied desert soils is their stratification and the sharp variability of their mechanical composition. In some places, the transition of sandy layers to sandy loam, and sandy layers to clayey layers is observed. It is also noted that the composition of the studied desert soils is dominated by the amount of sand and large dust fractions.

The obtained data show that in the middle part of the soil profile (section 10) the amount of physical clay was 35.7%, and as it deepened, the amount of physical clay increased to 81.9%. In another soil cross-section (cross-section 1), we can see that the physical clay content decreases from 69.1% to 12.0% in the deep part of the profile. Such a sharp fluctuation in the amount of mechanical fractions is associated with a sharp and contrast-changing lithology of alluvial deposits.

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