pISSN:2349-5707 Volume:13,Issue 5, May -2026 eISSN:2349-5715

UDC 631.4

# MECHANICAL COMPOSITION AND AGROCHEMICAL PROPERTIES OF SOILS OF SARIOSIYO DISTRICT, SURKHANDARYA REGION

**Baxodirov Zafar Abduvaliyevich**
Doctor of Biological Sciences (DSc),
Candidate of Agricultural Sciences, Head of Department
zafarbahodirov@gmail.com
**Mamatkulov Asliddin Rustambek o‘g‘li**
Doctor of Philosophy (PhD) in Agricultural Sciences, Acting Senior Researcher
amamatqulov@tersu.uz
**Qarshiboyev Husan Shamsiddin o‘g‘li**
Doctor of Philosophy (PhD) in Biological Sciences, Junior Researcher
qarshiboyevxusan92@gmail.com
**Gulimov Quvondiq Xamzayevich**
Junior Researcher
gulimov611@gmail.com
**Kholniso Doniyorova**
Phd student
xolisxon19930426@gmail.com
Institute of Soil Science and Agrochemical Research, Tashkent, Uzbekistan.
Research Institute of Environmental and Nature
Protection Technologies, 100000, Tashkent, Uzbekistan.

**Annotatsiya.** Mazkur maqolada Surxandaryo viloyati Sariosiyo tumani sug‘oriladigan tipik bo‘z tuproqlarining agrokimyoviy xossalari va mexanik tarkibi to‘g‘risidagi ma’lumotlar bayon qilingan. Tadqiqot hududida tarqalgan sug‘oriladigan tipik bo‘z tuproqlardagi gumus va kaliy bilan kam va o‘rtacha, fosfor bilan juda kam, kam ta’minlanganligi kuzatildi.

**Kalit so‘zlar:** sug‘oriladigan tipik bo‘z tuproqlar, agrokimyoviy xossalar, mexanik tarkib, harakatchan fosfor, almashinuvchi kaliy, gumus, ta’minlanganlik darajasi.

**Аннотация.** В данной статье представлены сведения об агрохимических свойствах и механическом составе орошаемых типичных серозёмов Сариасийского района Сурхандарьинской области. Установлено, что орошаемые типичные серозёмы, распространённые на территории исследования, характеризуются низкой и средней обеспеченностью гумусом и калием, а также очень низкой и низкой обеспеченностью фосфором.

**Ключевые слова:** орошаемые типичные серозёмы, агрохимические свойства, механический состав, подвижный фосфор, обменный калий, гумус, уровень обеспеченности.

**Abstract.** This article presents information on the agrochemical properties and mechanical composition of irrigated typical gray soils in Sariosiyo district of Surkhandarya region. It was observed that the irrigated typical gray soils distributed within the study area were characterized by low and medium levels of humus and potassium, while the phosphorus content was very low to low.

**Keywords:** irrigated typical sierozem soils, agrochemical properties, mechanical composition, available phosphorus, exchangeable potassium, humus, level of nutrient supply.

**Introduction.** The Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020–2030 defines important tasks aimed at the gradual specialization of all districts of the republic in the production of specific agricultural products based on established farming practices, soil-climatic conditions, and water availability, while prioritizing productivity, export potential, and cultivation in large contiguous areas. In this regard, the development of

pISSN:2349-5707 Volume:13,Issue 5, May -2026 eISSN:2349-5715

measures for the efficient use of land resources, preservation and improvement of soil fertility, and enhancement of the ecological and reclamation status of soils is of great importance [1].

Insufficient availability of nutrients in soils negatively affects plant growth and development, as well as the quality and quantity of crop yields. The amount of nutrients in soils depends on the chemical composition of parent materials, and these elements tend to accumulate mainly in the humus horizon due to organic matter content [2,3].

Soils rich in humus become suitable for cultivation more rapidly, require less energy during tillage operations, and possess optimal bulk density. The physicochemical properties of soils, including adsorption capacity and buffering ability, are directly related to the amount of organic matter present. Humus is primarily a source of nitrogen, and plants obtain nearly 50% of their required nitrogen from soil reserves. Organic matter in soils also increases the efficiency of mineral fertilizers [4].

**Research Object and Methods.** The object of the study was irrigated typical sierozem soils of Sariosiyo district, Surkhandarya region.

Field soil investigations and laboratory-analytical studies were carried out according to generally accepted methods developed by the Institute of Soil Science and Agrochemical Research and the Uzbek State Research Institute of Land Resources. The studies were conducted based on the guidelines “Instructions for Conducting Soil Surveys and Compiling Soil Maps for Maintaining the State Land Cadastre” [5, 6, 7] and “Methodological Guidelines for Conducting Soil-Agrochemical Research in Irrigated Lands, Preparing Agrochemical Cartograms, and Determining the Scientific Demand for Mineral Fertilizers” [8].

**Research Results.** The analysis of agrochemical properties of irrigated typical sierozem soils of Sariosiyo district showed that the humus content in the horizons of the main soil profiles ranged from 0,673% to 1,485%, averaging 1,05%. This indicates that the soils of the studied area are generally poorly to moderately supplied with humus.

The content of available phosphorus ranged from 11,06 mg/kg to 23,82 mg/kg, indicating very low to low phosphorus availability. At the same time, relatively high phosphorus values observed in some deeper horizons may be associated with phosphorus leaching into lower layers or specific geochemical characteristics of the soils.

Exchangeable potassium content varied between 105 and 237 mg/kg, indicating that the soils belong to groups with low to moderate potassium supply.

According to their mechanical composition, these soils are represented mainly by medium and heavy loams. The content of physical clay particles (<0.01 mm) in the studied profiles varied within a wide range, accounting for 36,3-44,5% in medium loamy soils and 45,1–56,0% in heavy loamy soils (Table 1).

**Table 1**

**Humus Content and Nutrient Elements in Irrigated Typical Sierozem Soils of Sariosiyo District**

| Profile No. | Depth, cm | Humus, % | Available nutrients, mg/kg | |
|---|---|---|---|---|
| | | | $P_2O_5$ | $K_2O$ |
| 1 | 0-30 | 1,485 | 16,24 | 144 |
| | 30-45 | 1,168 | 15,67 | 132 |
| 2 | 0-30 | 1,228 | 16,81 | 117 |
| | 30-45 | 0,970 | 15,67 | 129 |
| 3 | 0-30 | 1,010 | 19,39 | 163 |
| | 30-45 | 1,267 | 13,61 | 153 |
| 4 | 0-30 | 1,327 | 11,06 | 105 |
| | 30-45 | 1,287 | 15,11 | 196 |
| 6 | 0-30 | 1,366 | 15,67 | 237 |

pISSN:2349-5707 Volume:13,Issue 5, May -2026 eISSN:2349-5715

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|---|---|---|---|---|
| | 30-45 | 1,228 | 15,39 | 136 |
| 7 | 0-30 | 1,069 | 17,66 | 193 |
| | 30-45 | 0,891 | 15,67 | 176 |
| 10 A | 0-27 | 1,366 | 19,93 | 157 |
| | 27-48 | 1,030 | 23,82 | 164 |
| | 48-68 | 0,851 | 19,85 | 198 |
| | 68-95 | 0,792 | 16,24 | 105 |
| | 95-120 | 0,752 | 14,25 | 172 |
| 11A | 0-27 | 1,069 | 17,09 | 155 |
| | 27-48 | 1,208 | 15,11 | 169 |
| | 48-68 | 0,871 | 14,82 | 191 |
| | 68-95 | 0,673 | 13,69 | 167 |
| | 95-120 | 0,970 | 15,67 | 169 |

Large silt particles (0,05-0,01 mm) occupy the dominant position among the mechanical fractions, with their content mainly varying between 21,8% and 48,5%. The second dominant fraction consists of medium silt particles (0,01-0,005 mm), whose content ranges from 12,8% to 19,2%, while fine sand particles (0,1-0,05 mm) account for 11,1-25,4%.

Fine clay particles (<0,001 mm), which largely determine soil fertility, showed considerable variation and were mainly observed within the range of 6,6-19,1%.

**Table 2**
**Mechanical Composition of Irrigated Typical Sierozem Soils of Sariosiyo District**

| Profile No. | Depth, cm | Content of soil particles (%) and particle size (mm) | | | | | | | | Soil texture class according to mechanical composition |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sand | | | Silt | | | Clay | Physical clay (<0,01 mm) | |
| | | >0,25 | 0,25-0,1 | 0,1-0,05 | 0,05-0,01 | 0,01-0,005 | 0,005-0,001 | <0,001 | | |
| 1 | 0-30 | 1,3 | 1,5 | 8,2 | 44,5 | 15,9 | 18,3 | 10,3 | 44,5 | Medium loam |
| | 30-45 | 4,2 | 0,9 | 16,5 | 40,6 | 17,9 | 11,1 | 8,8 | 37,8 | Medium loam |
| 2 | 0-30 | 2,1 | 1,1 | 18,3 | 41,8 | 15,2 | 11,7 | 9,8 | 36,7 | Medium loam |
| | 30-45 | 3,8 | 1,8 | 19,2 | 38,9 | 16,3 | 12,4 | 7,6 | 36,3 | Medium loam |
| 3 | 0-30 | 3,5 | 2,5 | 16 | 22,3 | 15,9 | 21,5 | 18,3 | 55,7 | Heavy loam |
| | 30-45 | 2,2 | 1,2 | 18,3 | 23,4 | 15,1 | 20,7 | 19,1 | 54,9 | Heavy loam |
| 4 | 0-30 | 2,2 | 2,6 | 19,7 | 34,4 | 16,1 | 12,5 | 12,5 | 41,1 | Medium loam |
| | 30-45 | 1,5 | 1,7 | 17,5 | 42,4 | 13,3 | 12,5 | 11,1 | 36,9 | Medium loam |
| 6 | 0-10 | 4,5 | 1,8 | 16,5 | 40,1 | 13,3 | 12,1 | 11,7 | 37,1 | Medium loam |
| | 10-20 | 2,8 | 2,2 | 7,6 | 48,5 | 13,5 | 13,5 | 11,9 | 38,9 | Medium loam |
| 7 | 0-30 | 1,6 | 1,1 | 12,4 | 39,8 | 14,3 | 16,5 | 14,3 | 45,1 | Heavy loam |
| | 30-45 | 2,4 | 3,2 | 16,6 | 35,6 | 18,9 | 16,7 | 6,6 | 42,2 | Medium loam |
| 10 A | 0-27 | 3,5 | 2,5 | 16,7 | 26 | 16 | 18,1 | 17,2 | 51,3 | Heavy loam |
| | 27-48 | 2,3 | 1,7 | 18,4 | 28,2 | 16,2 | 16,1 | 17,1 | 49,4 | Heavy loam |
| | 48-68 | 2,5 | 2,1 | 12,5 | 34,2 | 12,8 | 18,1 | 17,8 | 48,7 | Heavy loam |
| | 68-95 | 3,5 | 1,6 | 14,5 | 33,2 | 18,5 | 13,6 | 15,1 | 47,2 | Heavy loam |
| | 95-120 | 1,7 | 2,8 | 10,2 | 35,6 | 19,2 | 17,2 | 13,3 | 49,7 | Heavy loam |
| 11 A | 0-27 | 2,2 | 1,8 | 19,3 | 39,7 | 14,5 | 11,9 | 10,6 | 37,0 | Medium loam |
| | 27-48 | 0,9 | 0,3 | 21,8 | 39,3 | 16,2 | 12,1 | 9,4 | 37,7 | Medium loam |
| | 48-68 | 2,0 | 0,8 | 17,4 | 28,3 | 13,9 | 23,5 | 14,1 | 51,5 | Heavy loam |
| | 68-95 | 0,3 | 0,9 | 16,8 | 29,8 | 17,5 | 21,9 | 12,8 | 52,2 | Heavy loam |

pISSN:2349-5707 Volume:13,Issue 5, May -2026 eISSN:2349-5715

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|---|---|---|---|---|---|---|---|---|---|---|
| | 95-120 | 2,0 | 0,8 | 19,4 | 21,8 | 13,1 | 25,4 | 17,5 | 56,0 | Heavy loam |

**Conclusion**

1. The soils distributed within the studied area are characterized by low (0.5–1.0%) and moderate (1.0–1.5%) humus content. According to the content of available phosphorus, they belong to very low (<15 mg/kg) and low (15–30 mg/kg) supply groups, while based on exchangeable potassium content, they are classified as low (100–200 mg/kg) and moderate (200–300 mg/kg) supplied soils.
2. According to their mechanical composition, the irrigated typical sierozem soils of Sariosiyo district are mainly represented by medium and heavy loams.
3. Continuous monitoring of soil conditions, implementation of necessary agrotechnical and agromeliorative measures, and the application of organic and mineral fertilizers at optimal rates contribute to improving soil structure, water-physical properties, and reclamation status, thereby ensuring the preservation and enhancement of soil fertility and productivity.

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