

**MAPPING THE MAIN PROPERTIES OF TYPICAL IRRIGATED SEROZEM SOILS
BASED ON GAT TECHNOLOGIES****Normatov Yodgor Mamanazarovich**

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Abstract. This article presents information on mapping the main properties of typical irrigated serozem soils distributed in the Zamin district of Jizzakh region, including humus, phosphorus, potassium, and soil mechanical composition, using GIS technologies. The results obtained are of great importance in irrigated farming areas.

Key words: Soil, irrigated typical serozem, humus, nitrogen, phosphorus, potassium, thematic maps, soil layer, mechanical composition, GIS technology.

Introduction. At present, geographic information systems (GIS) are widely used in agriculture to conserve biodiversity, manage and improve water resources in agriculture, improve air quality, monitor crops in agriculture, and increase soil fertility. In addition, they are important in landscape management and assessment in urban planning [1].

Geographic information systems play a very important role in monitoring agricultural land. Nowadays, GIS technologies are very helpful in accurately mapping agricultural land. In addition, they play an important role in obtaining information such as crop management, assessing crop yield, and monitoring weather data [2].

Geographic information systems and technologies are widely used in agriculture. They provide information such as monitoring plant growth, determining soil moisture content, assessing crop areas, predicting yields, predicting expected yields, and predicting droughts and floods [3].

Research object and methods.

Typical irrigated serozem soils of the "Laylak Uya" massif in the Zamin district of the Jizzakh region were selected as the research object. The procedure for conducting soil surveys and compiling soil maps for maintaining the state land cadastre was carried out based on the instructions [4] and generally accepted methods. General chemical and physicochemical soil analyses were performed according to generally accepted methods based on the manuals of Ye.V. Arinushkina [5]. Analysis based on geographic information systems was performed using the ArcGIS program and its Geostatistical Analyst modules.

Research results and their analysis.

Due to the lack of organic matter in the soil, the decline in soil quality has a significant impact on the deterioration of soil properties and soil fertility indicators [10].

Data on the mechanical composition of typical irrigated serozem soils are presented in the following 2 tables. It was determined that these soils consist mainly of light loam and medium loam soils according to their mechanical composition.

Table-1

Mechanical composition of soils

Sample No	Depth, cm	Number of particles in %, size in mm								Mechanical composition
		Sand			Dust			Il	Physical clay (<0,01mm)	
		>0,25	0,25-0,1	0,1-0,05	0,05-0,01	0,01-0,005	0,005-0,001	<0,001	<0,01	
6	0-30	2,1	1,1	18,3	41,8	15,2	11,7	9,8	37,0	Medium loam
	30-59	3,8	1,8	19,2	38,9	16,3	12,4	7,6	36,3	Medium loam
	59-90	4,2	0,9	16,5	40,6	17,9	11,1	8,8	37,8	Medium loam
	90-122	5,8	2,9	23,8	42,4	7,1	10,4	7,6	25,1	Light sand
	122-155	3,2	0,2	33,2	39,3	6,1	11,2	6,8	24,1	Light sand
9	0-31	1,0	8,3	18,2	29,8	14,5	15,3	12,9	39,7	Medium loam
	31-59	1,1	5,8	13,2	36,8	16,6	14,8	11,7	43,1	Medium loam
	59-89	6,3	10,5	18,9	25,7	12,4	15,4	10,8	38,6	Medium loam
	89-122	0,8	9,7	27,6	39,3	6,7	7,8	8,1	22,6	Light sand
	122-155	3,1	4,4	29,1	42,5	10,5	7,3	3,1	20,9	Light sand
17	0-30	1,1	7,0	22,8	32,9	12,5	14,0	9,7	36,2	Medium loam
	30-59	0,8	1,3	27,1	39,3	11,8	11,4	8,3	31,5	Medium loam
	59-90	0,5	3,6	34,5	38,1	10,3	7,3	5,7	23,3	Light sand
	90-123	1,2	11,8	25,7	29,3	13,1	11,4	7,5	32,0	Medium loam
	123-153	0,8	4,2	30,1	43,7	8,4	7,3	5,5	21,2	Light sand
21	0-29	1,1	4,8	22,8	37,9	14,2	11,6	7,6	33,4	Medium loam
	29-58	0,8	0,6	24,2	40,1	12,3	13,4	8,6	34,3	Medium loam
	58-88	4,3	5,1	21,4	42,7	12,3	6,9	7,3	26,5	Light sand
	88-117	2,3	1,1	30,4	41,1	10,7	8,9	5,5	25,1	Light sand
	117-150	1,2	0,4	30,8	45,5	8,3	9,1	4,7	22,1	Light sand

It was found that typical serozem soils contain large sand (>0.25 mm) particles ranging from 0.5-6.3%, medium sand (0.25-0.1 mm) from 0.2-11.8%, fine sand (0.1-0.05 mm) from 34.5-13.2%, large dust particles (0.05-0.01 mm) from 45.5%-29.3%, medium dust (0.01-0.005 mm) from 17.9%-6.1%, fine dust (0.005-0.001 mm) from 6.9%-15.4%, and small particles (<0.001 mm) from 12.9%-3.1%.



Picture-4. Mechanical composition map of typical serozem soils irrigated in “Laylak uya” massif of Zamin district

According to the results of the study, these soils are light sand and medium loamy soils and are characterized by a high content of fine sand (0.1-0.05mm) and coarse dust (0.05-0.01mm) particles.

Due to soil compaction under the influence of mechanical force, the root systems of trees and other plants do not develop well[11].

A decrease in the amount of humus in the soil has a significant impact on soil water properties, soil aeration, and soil fertility indicators [6]. In the above table, it was observed that the humus content in the upper layer of the soil section was 1.100% and decreased significantly towards the lower layer. Nutrients (in % of total NPK) were found to be in the range of nitrogen 0.018-0.078%, phosphorus 0.110-0.187%, potassium 0.682-1.320 mg/kg. Mobile nutrients were calculated in mg/kg, and accordingly, phosphorus 9-29 mg/kg, potassium 80-282 mg/kg.

It was found that these soils belong to the very low (0-15 mg/kg) and low (15-30 mg/kg) groups in terms of phosphorus content, and to the very low (0-100 mg/kg), low (100-200 mg/kg) and medium (200-300 mg/kg) groups in terms of mobile potassium content (Table-1).

In agriculture, chemical and biological fertilization can be used to achieve high crop yields. However, excessive use of chemical fertilizers has significant economic and soil ecological impacts [7].

This can provide plants with the necessary nutrients through chemical and biological fertilization. Although chemical fertilization is a quick method, it is not economically and environmentally advisable, especially if used excessively.

Table-2
The level of humus and nutrient supply of typical irrigated serozem soils

Section №	Layer depth, cm	Humus, %	Nutrients					
			Total, %				Mobile, mg/kg	
			N	C:N	P	K	P ₂ O ₅	K ₂ O
2	0-29	0,988	0,076	7,5	0,147	1,100	29	282
	29-56	0,890	0,070	7,4	0,141	0,975	26	260
	56-86	0,785	0,063	7,2	0,135	0,850	23	185
	86-117	0,487	0,038	7,4	0,120	0,758	19	160

	117-149	0,330	0,025	7,7	0,095	0,670	16	130
4	0-29	0,910	0,071	7,4	0,187	1,320	22	230
	29-56	0,803	0,063	7,4	0,179	1,030	19	205
	56-85	0,601	0,050	7,0	0,165	0,952	15	150
	85-114	0,385	0,030	7,4	0,147	0,785	13	95
	114-146	0,155	0,013	6,9	0,127	0,682	10	80
6	0-30	1,100	0,060	9,6	0,175	1,220	21	250
	30-59	0,875	0,053	9,6	0,168	1,080	18	230
	59-90	0,724	0,047	8,9	0,155	0,987	14	198
	90-122	0,445	0,036	7,2	0,140	0,901	11	170
	122-155	0,221	0,019	6,7	0,110	0,860	9	110
18	0-30	0,907	0,078	6,7	0,145	1,154	25	170
	30-58	0,889	0,064	8,1	0,140	0,994	23	158
	58-89	0,795	0,057	8,1	0,131	0,981	19	145
	89-120	0,478	0,045	6,2	0,123	0,950	17	130
	120-153	0,244	0,018	7,9	0,110	0,887	14	95

Based on this data, a 1:10,000 scale map of soil humus was created using interpolation methods using GIS software.

Picture -1



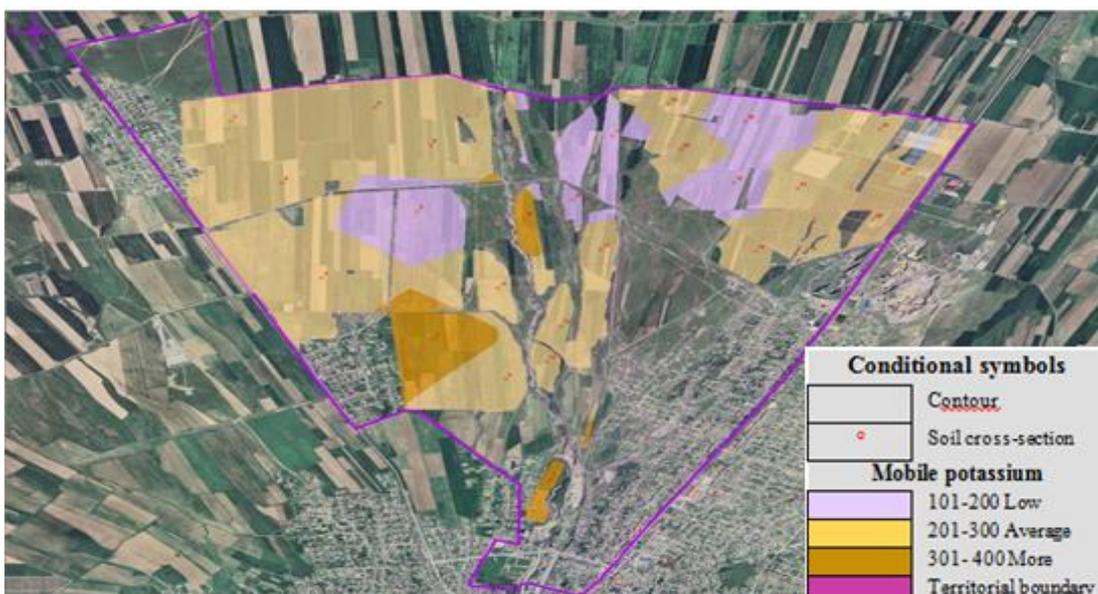
Picture -1. Map of the level of humus supply of typical serozem soils irrigated in the "Laylak Uya" massif of Zamin district.

Remote sensing data using GIS technologies plays an important role in the development of the agricultural sector. As a result, it allows for monitoring agricultural crops and ensuring sustainability [8].

Picture-2



Picture-2. Map of mobile phosphorus content of typical serozem soils irrigated in "Laylak Uya" massif of Zamin district.



Picture-3. Map of mobile potassium content of typical serozem soils irrigated in the "Laylak Uya" massif of Zamin district.

Soil nutrients are essential components for plant growth and development. When nutrients are lacking in the soil, plant growth slows down. Each soil nutrient is essential for plant growth and soil fertility[9].

In conclusion, the study shows that the typical irrigated serozem soils are poorly, low, and moderately supplied with humus, while the soil is very poorly, poorly, and moderately supplied with nutrients. Using maps created using geoinformation technologies, it is possible to determine the distribution of humus and nutrients in the soil and the stratified application of mineral substances in the agricultural sector, which will greatly contribute to increasing soil fertility and obtaining higher yields from agricultural lands.

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