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IMPROVING THE PRODUCTIVITY OF IRRIGATED SOILS

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Abstract. The article shows the role of compaction in time and space in increasing the productivity of irrigated crop rotations and saturating agricultural crops with two- and three-component mixed components. Particular attention is paid to increasing the efficiency of irrigation water use by forage crops. Particular attention is paid to increasing the efficiency of using forage crops through irrigation, taking into account agrotechnical requirements.

Key words: agricultural technology, crop rotation, agricultural crops, groundwater, salinization, soil moisture, photosynthetic potential.

Introduction: Situated in an oasis in the delta of the Zeravshan River in central Uzbekistan, Bukhara sits at the crossroads of ancient trade routes that stretched across Central Asia and was an important stopping point for traders on the edge of the Kyzylkum (Red Sand) and Karakum (Black Sand) deserts.

Despite the slowness of the sand massifs, drought and sharply continental climate, the flora and fauna are quite diverse, especially with the onset of spring, when the amount of precipitation increases.

Increasing the productivity of irrigated lands in the Bukhara oasis, which has a sharply continental climate, is the main problem of modern agriculture. The use of green manure crops allows for additional yields from irrigated areas, thereby ensuring the full use of land resources, as well as increasing the volume of additional products [1-3].

In addition, the Bukhara oasis is located in the semi-desert and dry steppe zones of Uzbekistan, where steppe plant species with low forage productivity due to acute moisture shortage predominate. Here, a sustainable forage base can be created by growing annual and perennial plants that can intensively use only solar energy, especially with irrigation.

Forage production on irrigated lands largely depends on the selection of crops that respond to intensive technologies. Compacted crops acquire an important place in irrigated crop rotations, both in space (winter, early spring, post-harvest, post-harvest, etc.) and in time (mixed and joint).

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Being the most important reserve for the intensification of irrigated agriculture, the compaction of crop rotations will increase the use of agroclimatic resources of the growing season of a given region, increase the yield of agricultural products per 1 ha, reduce crop contamination, and preserve and improve the fertility of irrigated lands [4-7].

The expansion of irrigated areas under repeated cropping contributes to a significant increase in agricultural production, and the intensive use of irrigated wedge ensures more complete use of labor, equipment, water resources and irrigation systems.

We know that compaction of crops not only increases the productivity of irrigated lands, but also improves their agro-meliorative condition. For more efficient use of irrigated lands, it is necessary to select the most productive forage crops taking into account clean and compacted crops.

One of the tasks of agricultural technology is the development of methods aimed at increasing the surface of photosynthetic organs of plants, which is achieved to a certain extent by some thickening and compaction of crops.

Materials and methods. The most important condition for solving the problem of sustainability of agriculture, obtaining stable harvests that meet the needs of the national economy, is the rational use of bioclimatic resources, preservation and increase of soil fertility.

The scientific basis of agriculture was and remains crop rotation with an optimal ratio of agricultural crops and their rational alternation. The results of numerous studies have shown that the development of crop rotation contributes to a more efficient use of natural soil fertility, energy, material and labor resources. Only in scientifically based crop rotations is it possible to apply a rational system of soil cultivation, fertilization, control of weeds, pests and diseases of cultivated plants, seed production and other measures [7].

The negative trends that have developed in the country's economy in recent years have had a negative impact on forage production. The total volume of succulent and coarse forage procurement has decreased by 2.3-2.5 times compared to 1990, the area of forage crops on irrigated arable land has been halved, the yield has decreased and the quality of forage has worsened, which has led to an increase in forage costs per unit of livestock production.

The problem of increasing the yield of forage crops has been the subject of research by many authors, but most of the previously conducted field experiments were limited to

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studying the influence of one, rarely two factors, on crop productivity, at best in a crop rotation link, and not in the crop rotation as a whole.

A more in-depth study requires a comprehensive approach to solving the problem of increasing the yield of forage crops, which involves assessing a larger set of factors, taking into account their mutual influence on the efficiency of forage crop cultivation. In current conditions, due to changes in the structure of agricultural lands and the diversity of farming forms, all farming systems, including crop rotation systems, require a different approach.

Along with the transition from multi-field crop rotations to highly specialized short-rotation crop rotations, there is a need to improve crop rotations in the direction of resource conservation and reducing technological loads on the soil.

The preservation and expanded reproduction of soil fertility is constrained by the high cost of energy, mineral fertilizers and other services to agricultural producers, and the disparity in prices for agricultural and industrial production [9].

At present, when only 11.5 kg of mineral fertilizers are applied per hectare of arable land, and 0.6 tons of organic fertilizers, and the formation of crop yields occurs due to the natural fertility of the soil, the priority direction in field forage production is the sowing of perennial grasses and mixtures of legumes with cereals, green manure, which ensures the preservation of soil fertility while obtaining stable yields of green mass and hay.

The use of organic fertilizers is closely related to the solution of many environmental problems, namely: the dependence of the biological activity of the soil on the balance of organic matter in it, the impact of living plants and their remains on the soil, its phytosanitary condition, the presence of biologically active toxic emissions of plants in the soil, its allelopathic properties, etc. [19].

In this regard, there was a need to conduct comprehensive research aimed at resource-saving technologies for cultivating agricultural crops, ensuring, in the conditions of the flat Peshkunsky district, the receipt of planned yields of forage crops and crop rotation productivity of up to 8.10 thousand forage units per hectare.

In such conditions, irrigation is the main guarantor of stable crop production and a significant increase in land productivity. However, the additional supply of a certain volume of irrigation water leads to an increase in the overall water load on the territory and zones of active water exchange, as well as to the intensification of migration processes and the involvement of new components of the natural environment in the cycle.

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The interaction of geomorphological, lithological, hydrogeological and climatic conditions in the Bukhara region has determined various directions of soil-forming processes in the region. In the irrigated lands of the Peshkunsky district, predominantly grassy, meadow, steppe, meadow-marsh, meadow-alluvial soils and partially sod-podzolic soils are widespread. In the Peshkun district of the Bukhara region, the area of irrigated land is 22,756 hectares, in the zone of 60-year drought, the area of pastures is 879 thousand hectares.

Soil salinization determines the fertility and productivity of irrigated lands, as well as their ecological and meliorative state, which depends on the relief, geomorphological and lithological structure (masses), soil-climatic and anthropogenic-economic conditions of the territory. In particular, salinization of groundwater causes great damage to the national economy, leading to a 25–30 percent reduction in the yield of industrial crops on slightly saline soils.

In addition, the content of heavy metals in the soil is a necessary element for plants (iron, manganese, molybdenum, copper, zinc, cobalt), some elements (mercury, lead, arsenic, nickel, chromium) have a toxic effect on microorganisms and plants contained in the soil.

Quantitative determination of nickel and chromium content in irrigation, meadow and sizote waters showed that the amount of metals in them is several times higher than the permissible amount, which leads to a strong negative effect, leading to disruption of the ecological balance serves as a factor. It is the presence of metals in water that can explain the significant increase in the amount of nickel and chromium in the soil section[3-4]. The relatively heavy mechanical composition of the soils of Mintaka, the presence of silt fractions in their composition contribute to increased absorption by the soils of irrigation water and metals moving along the soil section as a result of evaporation. In combination with heavy metals with environmental objects and, first of all, with surface and ground waters.

Requires comprehensive improvement of the melioration state and increase in the fertility of chemically contaminated soils. In such meliorated soils, high-quality work on pumping out soils, adding organic and mineral fertilizers and, if necessary, washing salt will give a positive effect. To maintain the fertility of reclaimed soils, it is necessary to properly burn crop rotation systems, properly use mineral coal forms, and carry out their differentiated processing.

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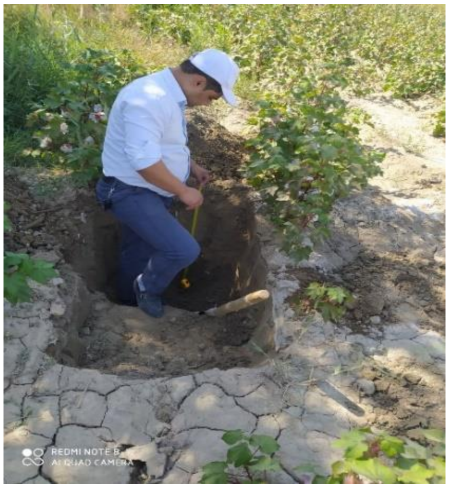

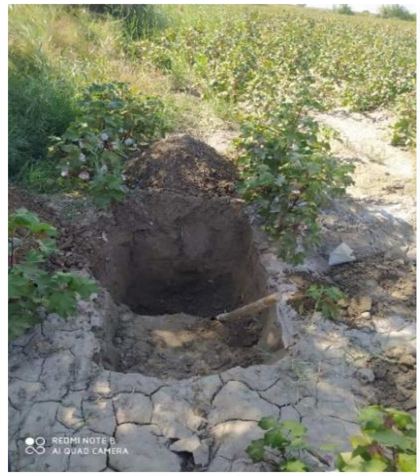

Salinization is the result of irrational use of water resources. When the average annual groundwater level is below 120 cm, the yield of agricultural crops increases, and when the average for the growing season is less than 130 s m, it decreases [7].

In order to study the melioration state, properties and characteristics, and fertility of irrigated soils common in the Beta Oasis, research work is being carried out during 201-2024 based on generally accepted methods in soil science [7,11].

On irrigated typical soils, the salt reserves are expressed in small indicators, the total salt reserve in the upper 0-2-meter layer of the soil profile is 99.4 tons, including the reserve of chlorine ion - 7.92 tons, the reserve of sulfate ion - 30.2 tons, in the upper 0-1-meter layer - 39.98 tons, the reserve of chlorine ion 5.35 and sulfate ion 15.56 tons.

The reserves of toxic salts in this layer are 60.38 tons per hectare, and of chargeless salts - 39.06 tons. Of these, 21.84 and 18.16 tons, respectively, are observed in the upper 0-1 meter soil feather. The quantitative (%) indicators of toxic salts in the soil feather 0-2 meters are 40.82-68.68% of the total amount of salts

Table 1

Agrochemical properties of typical gray soils.

Section	**Depth (m)**	**Volumetric whole g/cm3**	**Amount of salts (%) and reserves (t/ha) by dry residue**										**The proportion (percentage) of toxic salts**
			General		**CL**		**SO_4**		**Toxic**		**Non-toxic**		
			%	**т/га**	**%**	**т/га**	**%**	**т/га**	**%**	**т/га**	**%**	**т/га**	

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													from the sum of salts
1	0-30	1,40 g/cm3	0,271	11,38	0,038	1,60	0,119	5,00	0,119	5,00	0,152	6,38	43,91
	30-48		0,489	12,32	0,116	2,92	0,142	3,58	0326	8,22	0,163	4,11	66,67
	48-70		0,267	8,22	0,014	0,43	0,099	3,05	0,109	3,36	0,158	4,87	40,82
	70-94		0,198	6,65	0,010	0,34	0,095	3,19	0,136	4,57	0,062	2,08	68,68
	94-100		0,168	1,41	0,007	0,06	0,088	0,74	0,082	0,69	0,086	0,72	48,81
	100-143		0,168	10,11	0,007	0,42	0,088	5,30	0,082	4,94	0,086	5,18	48,81
	143-200		0,618	49,32	0,027	2,15	0,117	9,34	0,421	33,60	0,197	15,72	68,12
	0-100		0,286	39,98	0,038	5,35	0,111	15,56	0,156	21,84	0,130	18,16	54,55
	0-200		0,355	99,41	0,028	7,92	0,108	30,20	0,216	60,38	0,139	39,06	60,85

**Note: S-Cl is a chloride-sulfate type of salinity.*

The results of Table No. 1 were obtained after washing the soil of the specified arrays, which indicates that the soil becomes slightly salty and this increases the yield of this soil. It follows from the table that one of the important measures to improve soil melioration is soil leaching. In this regard, leaching of the soil by flooding areas that are limited and well leveled by plowing is of great importance, establishing leaching criteria

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taking into account the degree of soil salinity, the chemical and mechanical composition of salts and water permeability.

In soils with a light mechanical composition, salts are washed out more easily than in soils with a heavy mechanical composition. Therefore, less water is spent on desalination of light soils, despite the same degree of soil salinity.

At present, due to the technical malfunction of the existing collector-ditch networks and steep wells and the extremely low efficiency (productivity) of the work, the optimal reclamation regime is the replacement (transfer) of the hydromorphic water regime that has developed in the main areas to a semi-hydromorphic water regime. In this case, the entire complex of measures aimed at maintaining the level of underground wastewater below the "critical" depth (2.5-3.0 m) should be reflected. The use of a semi-hydromorphic meliorative regime in agricultural production allows maintaining irrigated saline soils in a favorable meliorative state.

The continuous annual supply and subsequent processing of suspended sediments and other anthropogenic-accumulative material (earth, organic and mineral fertilizers, ash, etc.) leads to the formation of a thick layer of irrigation-accumulative soils and the distribution of underlying agro-irrigation deposits with them.

Conclusions. For fertile soils, the most important support for plant life is nutrients. Fertile soils are usually well-provided with nutrition sources. This depends entirely on additives and mineral fertilizers. In the republic, the necessary fertilizers (manure) are produced very little (no more than 4-5 t/ha per year) and not in all regions. It can be said that irrigated lands today have received almost no fertilizers. If, on the one hand, there is a process of deterioration of soil properties, then, on the other hand, organic fertilizers should not be introduced to restore them.

The most effective agricultural technology that quickly restores the fertility of irrigated soils is the stable application of fertilizers, at least at the rate of 15 t/ha annually. To achieve this, the number of cattle in Uzbekistan should be increased to 6 million heads, plus a technology for obtaining non-traditional additives should be developed.

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