Volume 4, Issue 5, May - 2026
ISSN (E): 2938-3781

Licensed under a Creative Commons Attribution 4.0 International License.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

THE EFFECT OF WINTER WHEAT AND REPEAT-SOWN LEGUME CROPS ON THE BULK DENSITY OF THE SOIL

Khalilova Ma‘mura Ravshan qizi
PhD Student, Bukhara State Technical University

Hakimova Nodira Khayrilloyevna
Associate Professor, Bukhara State Technical University

Isoyeva Laylo Bakhtiyorovna
Associate Professor, Bukhara State Technical University

Islomova Umida Rustam qizi
Researcher

Abstract
This article presents data on the effect of winter wheat and repeat-sown common bean and mung bean crops on the bulk density of the soil, under the conditions of the soils of Jondor district, Bukhara region.

Keywords: Winter wheat, repeat crops, common bean, mung bean, furrow irrigation, sprinkler irrigation, soil, bulk density.

Introduction

Wheat is the most important crop for ensuring world food security, and today wheat is grown on 219.2 million hectares worldwide, producing up to 808.4 million tons of wheat grain. However, in recent years, global climate change and the emergence of water scarcity in the world have led to a decline in total yield. This is causing an increase in the price of grain products, which are already in very high demand, and in some cases is leading to shortages. In this regard, the world’s major wheat-producing countries, such as Russia, the USA, Australia, France and others, are paying great attention to the use of water-saving irrigation technologies in wheat cultivation, including sprinkler irrigation technology, and are achieving positive results.

Under the conditions of light-colored grey soils in Kashkadarya region, N. Yodgorov and Kh. Tog‘aeva note in their research that, compared with the moisture-accumulation background, during the development stages of the "Shukrona" and "Turon" winter wheat varieties, the growing season was extended by 3 days at a pre-irrigation soil moisture regime of 70-75-60% of FC, by 6-7 days at a pre-irrigation soil moisture regime of 75-80-70% of FC, and by 1, 3 and 5 days in the plots where the seeds were coated with 30, 40 and 50 kg/t of bentonite clay, compared with the control (untreated seeds) [2, pp. 57-58]. In the research of B. U. Suvonov, it is noted that good results were obtained in Bukhara region when winter wheat was irrigated four times according to

Volume 4, Issue 5, May - 2026
ISSN (E): 2938-3781
Licensed under a Creative Commons Attribution 4.0 International License.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

the growth phases, in a 2-1-1 system, with periodic irrigation norms of 590-675 m³/ha and a seasonal irrigation norm of 2488-2535 m³/ha [1, pp. 194-195]. The research of B. To‘xtashev, Ye. Berdiboev and U. Norqulov shows that, during the stem elongation and grain ripening stages of winter wheat, it is advisable for the soil moisture in the root zone not to fall below 70-75% of field capacity (FC). It was observed that a soil moisture level below 70-75% during the stem elongation, flowering and ear ripening stages of the crop had a negative effect on the yield [3, pp. 21-22]. In A. Sherov’s scientific research, an analysis of the results of field experiments on developing an irrigation regime for wheat shows that the most optimal irrigation regime is the one in which the soil moisture in the root-activity layer is maintained at no less than 70% of FC; it is noted that under this regime, water consumption for irrigation is used economically, and high profitability and low production costs are achieved [4, p. 68].

In the research of H. Yusupov, A. Muratkasimov and N. Yusupov, it is reported that, under the conditions of typical grey soils where a shortage of water resources occurs during the autumn and spring vegetation periods of winter wheat varieties, irrigation at a pre-irrigation soil moisture regime of 60-70-70% or 70-80-70%, depending on the amount of precipitation and air temperature, makes it possible to increase the effectiveness of mineral fertilizers [5, pp. 61-63].

Research methods:

During the research, the agrophysical and agrochemical properties of the soil and phenological observations of the plants in the field experiments were obtained using the manuals "Methods of Conducting Field Experiments" of the Uzbek Cotton Research Institute (UzPITI) and "Methods of Agrophysical, Agrochemical and Microbiological Studies in Irrigated Cotton-Growing Regions", and the variation-statistical analysis of the data obtained was carried out on the basis of B. A. Dospekhov’s method "Methodology of Field Experiment".

Research results

When field experiments on the agrotechnology of growing winter wheat and, as a repeat crop, common bean and mung bean were carried out under the conditions of the soils of Jondor district, Bukhara region, the experimental results on the bulk density of the field soil are presented below. The winter wheat crop was grown in the experiment in four variants: in the first variant, furrow irrigation was carried out at a pre-irrigation soil moisture regime of 70-70-60% of FC, while in the second to fourth experimental variants sprinkler irrigation was carried out. After the winter wheat harvest was gathered, common bean and mung bean were also sown as repeat crops, and irrigation agrotechnical measures were carried out using furrow and drip irrigation at various pre-irrigation soil moisture levels.

At the beginning of the growing season, in the experimental field sown with winter wheat, on the common background, the bulk density in the 0-50 cm estimated layer of the soil was found to be 1.34 g/cm³, and in the 0-70 and 0-100 cm estimated layers it was 1.35 g/cm³. By the end of the growing season, in the winter wheat field where furrow irrigation was carried out at a pre-irrigation soil moisture regime of 70-70-60%, the bulk density in the 0-50, 0-70 and 0-100 cm estimated layers of the soil was found to be 1.41, 1.42 and 1.42 g/cm³ respectively. In the second variant of the experiment, when sprinkler irrigation was carried out according to the irrigation regime mentioned above, the bulk density in the 0-50 cm estimated layer of the soil was found to be 1.40

Volume 4, Issue 5, May - 2026
ISSN (E): 2938-3781
Licensed under a Creative Commons Attribution 4.0 International License.

g/cm³, and in the 0-70 and 0-100 cm estimated layers of the soil it was 1.41 g/cm³. In the third and fourth variants of the experiment sown with winter wheat, when a higher pre-irrigation soil moisture level was applied, the bulk density in the 0-50, 0-70 and 0-100 cm estimated soil layers was found to be 1.40 and 1.41 g/cm³ in both variants.

In the common bean and mung bean crops sown as repeat crops after the winter wheat, at the initial common background, the bulk density in the 0-50 cm layer of the soil was found to be 1.35 g/cm³, in the 0-70 cm estimated layer 1.36 g/cm³, and in the 0-100 cm estimated layer 1.36 g/cm³. In the control variant of the experiment, sown with common bean and furrow-irrigated, the bulk density of the soil in the 0-50, 0-70 and 0-100 cm estimated layers was found to be 1.38, 1.39 and 1.35 g/cm³ respectively. In the sprinkler-irrigated experiment, at a pre-irrigation soil moisture regime of 65-65-60%, the bulk density in the soil layers mentioned above was found to be 1.38, 1.40 and 1.35 g/cm³ respectively, and at an irrigation regime of 75-75-70% it was recorded as 1.38, 1.39 and 1.35 g/cm³. In the control variant of the repeat-sown mung bean field, where furrow irrigation was carried out at a pre-irrigation soil moisture regime of 70-70-60%, and in the variant where sprinkler irrigation was carried out at a regime of 65-65-60%, the bulk density of the soil in the 0-50 cm estimated layer was found to be 1.39 g/cm³, and in the 0-70 cm layer 1.40 g/cm³. In the sprinkler-irrigated variants of the experiment, the bulk density of the soil in the 0-50 cm estimated layer was found to be 1.38 g/cm³, and in the 0-70 and 0-100 cm estimated layers 1.39 g/cm³, as presented in the data of Table 1.

According to the 2025 data of the experimental field sown with winter wheat, on the common background, the bulk density in the 0-50 cm estimated layer of the soil was 1.34 g/cm³, in the 0-70 cm estimated layer 1.35 g/cm³, and in the 0-100 cm estimated layer 1.36 g/cm³. In the control variant of the experiment, the bulk density in the soil layers mentioned above was 1.40 g/cm³ and 1.42 g/cm³ respectively. In the second variant of the experiment, where sprinkler irrigation was carried out, the bulk density in the 0-50 and 0-70 cm estimated layers was found to be 1.40 g/cm³, and in the 0-100 cm estimated layer 1.41 g/cm³. In the third and fourth variants of the experiment, under sprinkler irrigation, the bulk density in the third variant was found to be 1.39 g/cm³ in the 0-50 cm estimated layer of the soil, and 1.40 and 1.35 g/cm³ in the 0-70 and 0-100 cm layers. In the fourth variant, the bulk density in the soil layers mentioned above was found to be 1.38, 1.39 and 1.40 g/cm³ respectively.

For the repeat crops, on the common background, the bulk density in the 0-50, 0-70 and 0-100 cm estimated layers of the soil was 1.34, 1.35 and 1.36 g/cm³ respectively. By the end of the growing season, in the control variant sown with common bean and furrow-irrigated, the bulk density of the soil in the 0-50 cm estimated layer was found to be 1.40 g/cm³, and in the 0-70 and 0-100 cm layers 1.41 g/cm³. In the third and fourth variants of the sprinkler-irrigated experiment, the bulk density in the soil layers mentioned above was found to be 1.40 and 1.38 g/cm³ in the 0-50 cm layer, 1.42 and 1.39 g/cm³ in the 0-70 cm layer, and 1.41 and 1.39 g/cm³ in the 0-100 cm layer of the soil.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 4, Issue 5, May - 2026
ISSN (E): 2938-3781

Licensed under a Creative Commons Attribution 4.0 International License.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Table 1 Bulk density of the experimental field soil at the beginning and end of the growing season, g/cm³ (2024)

Soil layer, cm	At the beginning of the season	At the end of the season				At the beginning of the season	At the end of the season					
		Winter wheat					Common bean				Mung bean	
	1	2	3	4	1	2	3	4	5	6		
0-10	1.31	1.39	1.38	1.37	1.36	1.32	1.36	1.35	1.36	1.35	1.37	1.36
10-20	1.33	1.41	1.39	1.38	1.38	1.33	1.37	1.36	1.37	1.37	1.38	1.37
20-30	1.34	1.42	1.4	1.39	1.4	1.35	1.38	1.39	1.38	1.39	1.39	1.38
30-40	1.35	1.43	1.41	1.41	1.41	1.36	1.39	1.4	1.39	1.4	1.4	1.39
40-50	1.37	1.44	1.42	1.43	1.42	1.37	1.4	1.42	1.4	1.42	1.41	1.4
50-60	1.38	1.45	1.43	1.44	1.43	1.37	1.41	1.43	1.41	1.43	1.43	1.41
60-70	1.39	1.43	1.44	1.45	1.44	1.39	1.43	1.44	1.42	1.44	1.45	1.42
70-80	1.36	1.42	1.42	1.43	1.42	1.36	1.4	1.42	1.4	1.43	1.43	1.41
80-90	1.34	1.4	1.4	1.41	1.4	1.35	1.38	1.41	1.38	1.41	1.41	1.4
90-100	1.35	1.38	1.37	1.38	1.37	1.36	1.36	1.39	1.36	1.39	1.37	1.37
0-50 (average)	**1.34**	**1.41**	**1.4**	**1.4**	**1.39**	**1.35**	**1.38**	**1.38**	**1.38**	**1.39**	**1.39**	**1.38**
0-70 (average)	**1.35**	**1.42**	**1.41**	**1.41**	**1.41**	**1.36**	**1.39**	**1.4**	**1.39**	**1.4**	**1.4**	**1.39**
0-100 (average)	**1.35**	**1.42**	**1.41**	**1.41**	**1.4**	**1.36**	**1.39**	**1.4**	**1.39**	**1.4**	**1.4**	**1.39**

In the experiment, under furrow irrigation of the mung bean crop, the bulk density in the 0-50 cm estimated layer of the soil was found to be 1.38 g/cm³, and in the 0-70 and 0-100 cm estimated layers 1.40 g/cm³. In the fifth and sixth variants of the experiment, where sprinkler irrigation was carried out, the bulk density in the 0-50 cm layer of the soil was 1.38 and 1.37 g/cm³, in the 0-70 cm layer 1.40 and 1.38 g/cm³, and in the 0-100 cm estimated layer 1.39 g/cm³, as confirmed in the field experiments.

Conclusion

Alongside the positive effect of sprinkler irrigation on the bulk density of the soil of the experimental field sown with winter wheat and repeat-sown legume crops, a high yield was achieved for winter wheat at a pre-irrigation soil moisture regime of 75-80-75% of FC, and for the repeat-sown common bean and mung bean crops at a pre-irrigation soil moisture regime of 75-75-70% of FC.

References

1. Suvanov B. U. "Scientific and Practical Basis of Water Consumption under Various Water-Saving Irrigation Methods for Cotton and Winter Wheat". Doctor of Science dissertation abstract. Tashkent, 2019, pp. 194-195.
2. Yodgorov N., Tog‘aeva X. "The Effect of Irrigation Regime and Bentonite Clay Seed-Coating Rate on the Duration of the Winter Wheat Growing Season". Proceedings of the International Scientific-Technical Conference "Prospects for the Effective Use of the Genetic Resources of Agricultural Crops and the Application of Advanced Cultivation Technologies in Ensuring Food Security". Qarshi, 2024, pp. 80-83.
3. To‘xtashev B., Berdibaev Ye., Norkulov U. "Winter Wheat Care". Agro Ilm. Tashkent, 2015, No. 4(36), pp. 21-22.

Licensed under a Creative Commons Attribution 4.0 International License.

Volume 4, Issue 5, May - 2026
ISSN (E): 2938-3781

4. Sherov A. "The Effect of Soil Moisture on Winter Wheat Irrigation". Agro Ilm. Tashkent, 2014, No. 5, p. 68.
5. Yusupov H., Muratkasimov A., Yusupov N. "Optimal Rates and Timing of Mineral Fertilization of Winter Wheat Varieties on Irrigated Land". Agro Ilm. Tashkent, 2020, No. 4, pp. 61-63.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8