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LAND RECLAMATION AND SUBSEQUENT HUMUS BALANCE IN SOIL UNDER CROP CULTIVATION

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Article history:		**Abstract:**
Received:	28th March 2026	Based on field experiments conducted on low-fertility soils of the Republic of Karakalpakstan, this paper discusses the reclamation of lands withdrawn from active use and the subsequent dynamics of soil humus content under various agricultural crops.
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Keywords: Uzbekistan, Aral Sea region, Karakalpakstan, land, soil humus, balance, reclamation, agriculture, efficient use, yield, cotton, wheat, millet, sorghum, mung bean, beans, alfalfa.

INTRODUCTION

The total area of lands withdrawn from active economic circulation and degraded due to various factors continues to increase. Identifying these areas, reclaiming them, and reintegrating them into active agricultural use is one of the most pressing issues in the Republic today. Once lands are restored via technical and biological reclamation, they must be systematically cropped to sustain and enhance soil fertility while generating stable economic returns.

Relevance of the Topic

To ensure food security for the population of the Aral Sea region and elevate agriculture to a higher level, it is crucial to utilize available resources correctly. High-quality land reclamation is vital for integrating abandoned lands back into the national economy, boosting crop productivity, increasing soil fertility, and achieving efficient land resource management. In the Aral Sea region, it is highly important to conduct research aimed at detecting land withdrawal, degradation, and desertification processes, mitigating their negative impacts, and developing scientifically sound, effective measures to preserve, increase, and manage soil fertility.

To improve these systems under the leadership of President Shavkat Mirziyoyev, measures are being implemented to align the national food security framework with international standards, aiming to increase the country's agricultural export volume to $10 billion by 2030 and expand its export geography to an additional 100 countries.

This research addresses the vital tasks outlined in the Decree of the President of the Republic of Uzbekistan No. UP-5853 dated October 23, 2019, "On Approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020–2030," Resolution No. PP-4575 dated June 17, 2019, and the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 169 dated April 29, 2023, "On Measures for the Reclamation of Disturbed Lands, Preservation, and Rational Use of the Fertile Soil Layer," alongside other regulatory legal documents aimed at ensuring the well-being of our people.

RESEARCH RESULTS

Two field experiments were conducted on degraded, saline meadow-alluvial soils on the lands of the "Allamurat taxta", "Ataniyaz Sultan", "Pirniyaz ata", "Pirniyaz taxta", and "Gapur" farms in the Takhtakupir district of the Republic of Karakalpakstan. The first experiment evaluated the use of organic and mineral fertilizers, as well as shredded weeds as green manure during reclamation to maintain soil fertility. The second experiment investigated the subsequent impact of cultivating cotton, winter wheat, alfalfa, sorghum, sesame, millet, mung bean, and common bean on soil humus dynamics within these reclaimed areas. These production trials were carried out across 709.5 hectares in the Takhtakupir, Kegeyli, Karaozak, Khodjeyli, Kanlikul, Shumanay, Kungrad, Beruni, Turtkul, and Ellikkala districts of the Republic.

The primary objective of our research is to determine the significance of reclaiming lands withdrawn from use in Karakalpakstan, assess the impacts of subsequent cropping options on crop yield and soil fertility, and implement these findings into production.

MATERIALS AND METHODS

The research methodology is primarily based on field experiments, supplemented by laboratory analytical work, data synthesis, and spatial analysis and modeling using Geographic Information Systems (GIS). The research process utilized methods of comparative analysis, statistical grouping, correlation and regression analysis, monitoring, monographic studies, and economic assessment. Laboratory and desk studies were carried out in accordance with standard guidelines: "Methodology of Field Experiments with Cotton under Irrigated Conditions", "Methods of Agrochemical, Agrophysical, and Microbiological Research in Irrigated Cotton-Growing Regions", and E.V. Arinushkina's "Handbook on Chemical Analysis of Soils" [2.10; pp. 5-450], as well as regional recommendations on "Application of Mineral and Organic Fertilizers in Cotton Cultivation". Yield determination, analysis of variance (ANOVA), mean values, and the relationships between crop yield and soil properties were statistically processed using B.A. Dospekhov's "Methodology of Field Experiment" [2.35; pp. 9-351] and Microsoft Excel.

The research also followed the manual "Methods of Conducting Field Experiments" (Tashkent, 2007), methodological guidelines for land reclamation, stripping, storage, and rational use of the fertile soil layer (Tashkent; ID-1255, 2018), and was executed using 1:10,000 and 1:25,000 scale land maps of the "Takhtakupir" farm according to topographic survey instructions.

To monitor soil humus changes before, during, and after reclamation under the influence of subsequent crops, soil profiles were sampled in the farms of the Takhtakupir district. Profile No. 1 was sampled from "Allamurat taxta", No. 2 from "Ataniyaz Sultan", No. 3 from "Pirniyaz ata", No. 4 from "Gafur taxta", No. 5 from "Atabay-Muxtar", and No. 6 from "Kaxarman Taxta" farms for subsequent laboratory analysis.

Experimental Results

Under the severe climatic conditions, water scarcity, and saline soils of the Republic of Karakalpakstan, land reclamation dynamics revealed distinct trends. In the first control variant, where no fertilizers or shredded weeds were applied during reclamation, the soil humus content decreased during the first year from 0.620% to 0.618% (a net reduction of 0.002%). In the second year of the experiment (2022), the humus content in the control variant was 0.615% at the beginning of the growing season (spring) and 0.611% at the end (autumn) by total soil weight. By the third year, the spring value was 0.607%, dropping to 0.598% by the end of the season.

In the variant where dried weeds were shredded and incorporated into the soil during reclamation, the initial humus content was 0.618%, rising to 0.620% by the end of that year. In the spring of 2022, the humus level was 0.626%, reaching 0.630% at the end of the vegetative period. By the third year, it reached 0.635% in spring and peaked at 0.638% by the end of the study.

In the third variant, where manure was applied at a rate of 30 t/ha during reclamation, the humus content started at 0.622% in the first year and rose to 0.663% by the end of the third growing season. Compared to the baseline initialization, the total soil humus accumulation increased by +0.041%.

In the fourth method of investigation, the initial humus content was 0.621%, which successfully increased to 0.669% by the end of the third year's growing season, showing an overall growth of +0.048%.

In the control variant where no crops were sown after reclamation, the soil humus content in the spring of the first year stood at 0.623% of total soil weight. By the end of the first year, it fell to 0.595%, showing a seasonal decrease of 0.028% from spring to autumn.

In the variant cropped with cotton, by the third year, the humus content fell to 0.526%, showing a continuous decline. By the end of the experiment, the final humus content dropped to 0.483%, resulting in a net negative dynamic of -0.140% from the first year's spring to the final year's autumn. (Note: Another parallel cotton trial variant similarly showed a decline from an initial spring level down to 0.540%, finishing at 0.476% by the end of the trial, yielding a net negative dynamic of -0.163%).

In the winter wheat variant, the soil humus content at the beginning of the first year's growing season (spring) was 0.634%. By the end of the first season, it dropped to 0.608%, a seasonal decrease of 0.026%. However, from the end of the first year to the beginning of the second year's spring, a 0.022% increase in humus was observed. This recovery occurs because the root and stubble residues left behind by winter wheat over the autumn, winter, and early spring decompose into stable organic matter. Wheat produces a substantially larger volume of root/stubble biomass with a higher humification coefficient compared to cotton, allowing soil humus levels to recover close to baseline or increase slightly.

In the second year of the wheat variant, the initial humus level was 0.630%, which decreased to 0.606% by autumn. In the third year, the initial spring level was 0.642%, which experienced a minimal drop to 0.639% by autumn. Overall, the net three-year dynamic for winter wheat from the initial spring to the final autumn was positive at +0.005%.

In the fifth variant cropped with sorghum, the initial humus content in the spring of the first year was 0.640%. By autumn, it decreased to 0.610%, representing a seasonal decline of 0.030% (text notes 0.022% fluctuation). From the end of the first year to the spring of the second year, an increase of 0.030% was observed. In the second year, it started at 0.621% and decreased to 0.607% by autumn under the sorghum canopy (a seasonal loss of 0.014%). Between the end of the second year's autumn and the third year's spring, a decrease of 0.033% was noted. By the third year, the initial sorghum plot value was 0.537%, settling at 0.563% at the final harvest. Over the full three years, the net change from the first spring to the final autumn was -0.077%, proving that sorghum acts as a moderate consumer of soil nutrients and organic reserves.

In the sixth variant sown with sesame, the first-year spring humus level was 0.640%, dropping to 0.620% by autumn (a decrease of 0.020%). Over the winter period into the second year's spring, an increase of 0.060% occurred as residual biomass decomposed. Sesame leaves an average amount of root and stubble residue with a moderate humification coefficient (0.012 - 0.013), allowing the humus level to remain close to or slightly above its previous status. In the second year, the sesame variant started at 0.626% and dropped to 0.616% by autumn, consuming 0.010% for biomass formation. By the third year, it initiated at 0.631% and finalized at 0.627%. Comparing the initial spring of the first year to the final autumn, the net dynamics shifted from 0.640% to 0.627%, a net variance of -0.013%.

In the seventh variant cropped with millet, the baseline spring value was 0.635%, dropping to 0.608% by autumn (a 0.027% decrease). From autumn to the second year's spring, a 0.022% increase occurred due to the decomposition of overwintering residues. Due to its biological traits, millet extracts nutrients but leaves behind sufficient root and stubble biomass with a moderate humification coefficient (0.013 - 0.014), keeping the balance stable. In the second year, it moved from 0.630% down to 0.606% (a 0.024% reduction). In the third year, it began at 0.648% and finished at 0.638%. Over the three-year timeline, the total change from the first spring to the final autumn was positive, moving from 0.635% to 0.638% (+0.003%).

In the alfalfa-sown variant, the first-year spring level was 0.635%, dropping marginally to 0.628% by autumn (a loss of only 0.007%). From autumn to the second year's spring, an increase of 0.019% was logged. Alfalfa accumulates substantial root and shoot biomass and possesses a high humification coefficient (averaging 0.025), triggering a strong upward trend. In the second year, the initial value of 0.647% increased over the season to 0.679%. In the third year, it started at 0.711% and completed the cycle at 0.718%. Over the three-year trial, the net humus dynamic under alfalfa increased from 0.635% to 0.718%, demonstrating a net growth rate of +0.083%.

In the mung bean variant, the first-year spring level started at 0.635% and dropped to 0.628% by autumn (-0.007%). Over the winter-to-spring transitional phase, it recovered by 0.005% due to crop residue humification. Mung bean leaves significant biomass with a good humification coefficient (0.013). In the second year, the initial value of 0.628% adjusted down to 0.625% due to crop uptake and natural mineralization. In the third year, the initial value was 0.648%, ending at 0.639%. Over three years, the overall humus dynamics moved from 0.635% to 0.639%, achieving a positive net growth of +0.004%.

In the tenth variant sown with common beans (lobiya), the initial spring humus level was 0.636%, dropping to 0.620% by autumn (-0.016%). Over the winter period, it gained 0.007% from residue decay. Like mung beans, it leaves substantial root biomass with a humification coefficient around 0.013. In the second year, it moved from an initial 0.628% down to 0.625% by autumn. In the third year, the spring level rose to 0.633% and concluded at 0.631% in autumn. Over the three-year evaluation period, the net change under common beans went from 0.636% to 0.631%, resulting in a slight net decline of -0.005%.

CONCLUSIONS

1.In order to maintain lands in active economic circulation in Uzbekistan, including the Republic of Karakalpakstan, it is highly expedient to proactively prevent the risks of land abandonment and systematically keep agricultural lands under active cultivation.

2.During the reclamation of lands withdrawn from active use, the combined practice of applying organic manure at a rate of 30 t/ha, mineral fertilizer in the form of ammophos at 300 kg/ha (physical weight), and incorporating shredded on-site weeds as green manure proved to be completely effective and exerted a highly positive impact on sustaining and enhancing soil fertility.

3.It is necessary to conduct systematic monitoring to determine the exact boundaries and areas of abandoned lands across the Republic and to reintegrate them into active production based on the specific underlying causes of their withdrawal.

4.Reintegrating abandoned lands into agricultural use is fully cost-effective and economically viable. Furthermore, it ensures environmental cleanliness, returns underutilized territories within the state land fund back into active circulation, and safely maintains regional ecological balance.

REFERENCES

1. Reymov O,N., Narbaev SH.K., Reimov N.B. Foydalanishdan chiqib ketgan yerlarni rekultivatsiyalash va sungi ekilgan ekinlarning hosildorligi bilan tuproq unumdorligiga ta’siri. Xorazm ma’mun akademiyasi axborotnomasi –11/1-2025yil. 312- 316 betlar.
2. Reymov O,N., Reimov N.B. Yerlarni rekul`tivaciyalash va keyingi ekilgan ekinlarning tuproqdagi nitrat miqdoriga tasiri.//GLOBAL RESEARCH AND ACADEMIC INNOVATI-ONS. Ссылка на сайт: https://imrconf.com/index.php/ GRAI/article/view/736. Ссылка на PDF:https://imrconf. com /index.php/GRAI/article/view/736/628. Vol. 2 No. 1 (2026): 2026-01-06. 276-287pp
3. Reymov O.N., Reimov N.B. Yerlarni rekultivatsiyalashning zarurligi va rekultivatsiyadan keyingi ekilgan ekinlarning hosili bilan tuproq unumdorligiga ta’siri.// «O‘zbekiston zamini-Земля Узбекистана- Lahd of Uzbekistan» ilmiy-amaliy-innovasion jurnali. 2026 yil 1 son. 10-13 betlar.
4. Reymov Omirbayning 2021-2024 yillardagi hisobatlari.