Spectrum Journal of Innovation, Reforms and Development
Volume 36, February- 2025 | ISSN (E): 2751-1731
WEBSITE: WWW.SJIRD.JOURNALSPARK.ORG

# THE INFLUENCE OF SOIL CROPS AND MINERAL FERTILIZER RATE ON CHANGES IN SOIL SALINITY INDICATORS

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**Abstract**
This article presents the results of a scientific study on the effect of siderate crops and mineral fertilizers on soil salinity in the conditions of moderately saline pasture-growing gray soils of the Jizzakh region in different proportions and rates. According to it, in these conditions, the use of rapeseed and perco crops as siderates or the application of manure at a rate of 10 and 20 t/ha in addition to mineral fertilizers serves to maintain the amount of agronomically active salinity in the soil.

**Keywords**: pasture-growing gray soils, salinity, rate, siderate crops, manure, mineral fertilizer rates.

## Introduction

Soil fertility is mainly directly related to the amount and type of salinity. Most of the irrigated lands of Jizzakh region consist of low plains, and in these areas the groundwater is located at a level of 1.5-2.0 m, and is saline to varying degrees and is prone to salinization due to the influence of runoff and irrigation processes. This negatively affects the yield of crops grown in these conditions, leading to a lot of labor required for crop care and production. Accordingly, in order to reduce the harmful effects of salts on plants, it is necessary to develop a system of agronomic measures for crop care on soils with varying degrees of salinity, including the use of local and mineral fertilizers and siderates, on a scientific basis.

## RESEARCH METHODS

The experiments were conducted in the field conditions of 2015-2018 for farms in the Mirzachul district of Jizzakh region, where the effect of intercropping of rapeseed and percona as an intermediate crop after cotton and plowing as siderate in the spring against the background of different mineral fertilizer rates and ratios and additional application of manure at a rate of 10 and 20 t/ha on changes in soil salinity indicators was studied. The soil of the experimental field is a

gray loamy soil with an average loamy mechanical composition, seepage waters are located at a depth of 1.5-2.0 meters, and it is moderately saline.

The experiment was conducted in 3 fields (in time and space) and included 13 options. The options were placed in 4 replications and 1 layer. The total area of each option is 720 $m^2$ (length 100 m, 8 rows, row spacing 90 cm = 7.2 m), of which 360 $m^2$ is taken into account. The total area of the experiment is 3.744 hectares. The experimental system is presented in Table 1. The cotton variety "AN-Bayovut-2" was planted in the experiment. The amount of humus in the soil is determined by the I.V. Tyrin method, total NPK in one soil sample by I.M. Maltseva, L.P. Gritsenko, nitrate nitrogen ($NO_3$-N) by the ionoselective method, mobile phosphorus ($P_2O_5$) by B.P. Machygin, exchangeable potassium ($K_2O$) by P.V. Protasov, chlorine ion by the Mor method, dry residue, sulfate anion by weighing on a scale [6; p. 460].

## DISCUSSION OF RESEARCH RESULTS

It should be noted that, despite the fact that the experiments were conducted in a new field every year, the changes in the amount of dry matter in the soil were close to each other in years, with some differences between the options.

Initially, the level of soil salinity was studied in the experimental fields at the beginning of the season. According to the data, the dry matter in the 0-20 cm layer of the soil was 0.326%, in the 20-40 cm layer 0.387%, in the 40-60 cm layer 0.476%, while in the lower layers of the soil it was found to be slightly less, respectively 0.376%; 0.341%, 0-100 cm

**Table-1 The effect of feeding cotton with mineral fertilizers in different rates and proportions, applying organic fertilizers, and using catch crops on changes in the amount of dry matter in the soil, %**

| Var t/r | Mineral fertilizer rates used in cotton, kg/ha | | | Mineral fertilizer ratio, N : P : K | Manure, t/ha | Soil layers, cm | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | $P_2O_5$ | $K_2O$ | | | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 | 0-100 |
| At the beginning of the period of action | | | | | | | | | | | |
| | N | $P_2O_5$ | $K_2O$ | | | 0,326 | 0,387 | 0,476 | 0,376 | 0,341 | 0,381 |
| At the end of the action period | | | | | | | | | | | |
| 1 | Control (without fertilizer) | | | - | - | 0,324 | 0,386 | 0,474 | 0,373 | 0,339 | 0,379 |
| 2 | 240 | 168 | 120 | 1:0,7:0,5 | | 0,329 | 0,391 | 0,481 | 0,379 | 0,344 | 0,385 |
| 3 | 200 | 140 | 100 | 1:0,7:0,5 | | 0,328 | 0,390 | 0,480 | 0,378 | 0,343 | 0,384 |
| 4 | 160 | 112 | 80 | 1:0,7:0,5 | | 0,327 | 0,389 | 0,479 | 0,377 | 0,342 | 0,383 |
| 5 | 160 | 112 | 80 | 1:0,7:0,5 | siderate | 0,315 | 0,376 | 0,465 | 0,365 | 0,330 | 0,370 |
| 6 | 160 | 112 | 80 | 1:0,7:0,5 | 10 | 0,318 | 0,379 | 0,468 | 0,368 | 0,333 | 0,373 |
| 7 | 160 | 112 | 80 | 1:0,7:0,5 | 20 | 0,314 | 0,375 | 0,464 | 0,364 | 0,329 | 0,369 |
| 8 | 240 | 120 | 72 | 1:0,5:0,3 | | 0,356 | 0,417 | 0,48 | 0,406 | 0,381 | 0,408 |
| 9 | 200 | 100 | 60 | 1:0,5:0,3 | | 0,329 | 0,39 | 0,48 | 0,379 | 0,345 | 0,385 |
| 10 | 160 | 80 | 48 | 1:0,5:0,3 | | 0,327 | 0,388 | 0,478 | 0,377 | 0,343 | 0,383 |
| 11 | 160 | 80 | 48 | 1:0,5:0,3 | siderate | 0,313 | 0,374 | 0,463 | 0,363 | 0,328 | 0,368 |
| 12 | 160 | 80 | 48 | 1:0,5:0,3 | 10 | 0,317 | 0,378 | 0,467 | 0,367 | 0,332 | 0,372 |
| 13 | 160 | 80 | 48 | 1:0,5:0,3 | 20 | 0,312 | 0,373 | 0,462 | 0,362 | 0,327 | 0,367 |

The average in the layer was 0.381%. Chlorine ion was 0.046% in 0-100 cm, depending on the soil layers, and sulfate ion was 0.422%. By the end of the season, in the variant where mineral fertilizers were not applied, these indicators proportionally decreased to 0.379% in the 0-100 cm layer, which was 0.002% less than the initial indicator, which was determined by the fact that the amount of dry residue in the soil was relatively lower when no fertilizers were applied.

In option 4, where mineral fertilizers were applied in a ratio of 1:0.7:0.5 at the rates of N-160, $P_2O5$-112, and $K_2O$-80 kg/ha, it was found that the dry residue decreased to 0.383%, chlorine to 0.045%, and sulfate ion to 0.421%, respectively.

As a result of the application of mineral fertilizers in cotton in the ratio of 1:0.7:0.5 N-160, P2O5-112, $K_2O$-80 kg/ha + 10 t/ha manure, in option 6, the average dry residue in the 0-100 cm layer was 0.373%, chlorine ion 0.036%, sulfate ion 0.412%, respectively, compared to the beginning of the application period, the dry residue decreased by 0.008%, chlorine ion 0.010%, sulfate ion 0.010%. The decrease in salinity indicates that the applied fertilizer rate had an acceptable effect on soil salinity. Even better data were recorded when the standard fertilizer was applied as an addition to mineral fertilizers at a rate of 20 t/ha (variant 1), with dry residue content of 0.369%, chlorine ion content of 0.032%, and sulfate ion content of 0.408%.

Against the background of these ratios and norms of mineral fertilizers, the indicators of the parallel option 5 were close to those of the application of 20 t/ha of fertilizer, and it was found that the dry residue was reduced by 0.011%, chlorine ion by 0.009%, and sulfate ion by 0.009% compared to the control. This situation showed that in order to prevent soil salinization, it is acceptable to use rapeseed and perco crops as fertilizer or siderate at 20 t/ha in addition to the norm of mineral fertilizers in cotton. In cotton, when mineral fertilizers were applied in a ratio of 1:0.5:0.3 with a standard of N-160, $P_2O_5$-80, $K_2O$-48 kg/ha and 20 t/ha of manure as an additive, the dry residue increased by 0.014% compared to option 1 (control) and the initial one,

**Table-2 The effect of feeding cotton with mineral fertilizers in different rates and proportions, applying organic fertilizers, and using catch crops on the type and degree of salinity in soil layers, %**

| Var t/r | Mineral fertilizer rates used in cotton, kg/ha | | | Mineral fertilizer ratio, N:P:K | Manure, t/ha | Soil layers (cm), type and degree of salinity (%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0-20 | | 20-40 | | 40-60 | | 60-80 | | 80-100 | | 0-100 | |
| | N | $P_2O_5$ | $K_2O$ | | | *Cl* | *HSO₄* | *Cl* | *HSO₄* | *Cl* | *HSO₄* | *Cl* | *HSO₄* | *Cl* | *HSO₄* | *Cl* | *HSO₄* |
| Beginning of the period of action | | | | | | 0,036 | 0,401 | 0,049 | 0,435 | 0,056 | 0,501 | 0,049 | 0,402 | 0,040 | 0,371 | 0,046 | 0,422 |
| End of the period of validity | | | | | | | | | | | | | | | | | |
| 1 | Control (without fertilizer) | | | - | - | 0,032 | 0,397 | 0,045 | 0,431 | 0,051 | 0,496 | 0,044 | 0,398 | 0,036 | 0,366 | 0,042 | 0,418 |
| 2 | 240 | 168 | 120 | 1:0,7:0,5 | | 0,037 | 0,402 | 0,050 | 0,436 | 0,058 | 0,503 | 0,050 | 0,404 | 0,041 | 0,371 | 0,047 | 0,423 |
| 3 | 200 | 140 | 100 | 1:0,7:0,5 | | 0,036 | 0,401 | 0,049 | 0,435 | 0,057 | 0,502 | 0,049 | 0,403 | 0,040 | 0,370 | 0,046 | 0,422 |
| 4 | 160 | 112 | 80 | 1:0,7:0,5 | | 0,035 | 0,400 | 0,048 | 0,434 | 0,056 | 0,501 | 0,048 | 0,402 | 0,039 | 0,369 | 0,045 | 0,421 |
| 5 | 160 | 112 | 80 | 1:0,7:0,5 | siderate | 0,023 | 0,388 | 0,035 | 0,421 | 0,042 | 0,487 | 0,036 | 0,390 | 0,027 | 0,357 | 0,033 | 0,409 |
| 6 | 160 | 112 | 80 | 1:0,7:0,5 | 10 | 0,026 | 0,391 | 0,038 | 0,424 | 0,045 | 0,490 | 0,039 | 0,393 | 0,030 | 0,360 | 0,036 | 0,412 |
| 7 | 160 | 112 | 80 | 1:0,7:0,5 | 20 | 0,022 | 0,387 | 0,034 | 0,420 | 0,041 | 0,486 | 0,035 | 0,389 | 0,026 | 0,356 | 0,032 | 0,408 |
| 8 | 240 | 120 | 72 | 1:0,5:0,3 | | 0,064 | 0,429 | 0,076 | 0,462 | 0,057 | 0,502 | 0,077 | 0,431 | 0,078 | 0,408 | 0,070 | 0,446 |
| 9 | 200 | 100 | 60 | 1:0,5:0,3 | | 0,037 | 0,402 | 0,049 | 0,435 | 0,057 | 0,502 | 0,050 | 0,404 | 0,042 | 0,372 | 0,047 | 0,423 |
| 10 | 160 | 80 | 48 | 1:0,5:0,3 | | 0,035 | 0,400 | 0,047 | 0,433 | 0,055 | 0,500 | 0,048 | 0,402 | 0,040 | 0,370 | 0,045 | 0,421 |
| 11 | 160 | 80 | 48 | 1:0,5:0,3 | siderate | 0,021 | 0,386 | 0,033 | 0,419 | 0,04 | 0,485 | 0,034 | 0,388 | 0,025 | 0,355 | 0,031 | 0,407 |
| 12 | 160 | 80 | 48 | 1:0,5:0,3 | 10 | 0,025 | 0,390 | 0,037 | 0,423 | 0,044 | 0,489 | 0,038 | 0,392 | 0,029 | 0,359 | 0,035 | 0,411 |
| 13 | 160 | 80 | 48 | 1:0,5:0,3 | 20 | 0,020 | 0,385 | 0,032 | 0,418 | 0,039 | 0,484 | 0,033 | 0,387 | 0,024 | 0,354 | 0,030 | 0,406 |

It was found that the amount of salts decreased by 0.012% of chloride ions and 0.012% of sulfate ions.

Thus, in order to reduce the salinity of the soil in gray soils that are becoming pastures or to maintain it in its original state (to prevent secondary salinization), it was found in the experiments that applying mineral fertilizers in cotton in a ratio of 1:0.7:0.5 N-160, $P_2O_5$-112, $K_2O$-80 kg/ha + 20 t/ha of manure or planting rape and perco as an intermediate crop and using it as siderate gives acceptable results.

**Conclusion**

Increasing the fertility of weak and moderately saline gray-meadow soils of the Jizzakh region, in order to grow high-quality cotton crops in these conditions, the use of some elements of resource-saving agrotechnology, including the application of mineral fertilizers $N_{160}P_{80}K_{48}$ kg/ha in combination with 10 t/ha of manure, the application of mineral fertilizers $N_{160}P_{112}K_{80}$+ kg/ha in combination with 20 t/ha of manure against the background of two-component siderate crops (rapeseed + percolate), provides an average yield of 40-43 t/ha of cotton, reduces the level of groundwater and soil salinity without harming the ecological environment.

**REFERENCES**

1. Methods of conducting field experiments.-Tashkent: UzPITI, 2007. 145 p.
2. National report on the state of land resources of the Republic of Uzbekistan.-Tashkent. 2018.-73 p.
3. Alikhanov B., Ganieva F. Охрана земли: Инновационные подходы (К всемерному дню земли) // Материалы российско-узбекской науч. практ. конф. посвящен. 100 летию НУ Узбекистана. – Масква-Тошкент: НУ Уз, 2019. - с. 3-7.
4. Методика проведения полевых опытов.–Ташкент: ЎзНИИХ, 2007.–145 с.
5. Доспехов Б.А. Методика полевого опыта, -М: Агропромиздат, 1985.-350 с.
6. Методы агрохимических, агрофизических и микробиологических исследований в поливных хлопковых районах. –Ташкент. 1963. -460 с.
7. Jabborov O.A., Mahkamova D.Yu. Salinity level of irrigated land in Vobkent district of Bukhara region // “Почва, климат, удобрений и урожай: актуальные проблемы и перспективы”. Респуб. науч. практ. конф. посвящен. 100 летию НУ Уз. – М., НУ Уз, 2018. – С. 190-194.
8. Mirzaev J., Kulmatov R., Taylokov A. Sustainable use of water and irrigated land resources of Jizzakh region in the context of climate change // Bulletin of ecology. – Tashkent, 2018. -№ 9. – P. 26-30.
9. Rajabov T. Different salinity levels and cotton yield // Journal of Agriculture of Uzbekistan. – Tashkent, 2018. -№ 7. – P. 27.
10. Kulmatov R. Sustainable Development indicators of lower Zarafchon region and their practical evaluation (Uzbekistan). LAPLAMBERT Academic Publishing, Germany. 2018, 110 pp.