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IMPACT OF RESOURCE - EFFICIENT AGROTECHNOLOGIES ON GROWTH, DEVELOPMENT, GRAIN YIELD AND QUALITY OF WINTER WHEAT

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Abstract:

In the article, the growth, development, grain yield and quality of winter wheat in the conditions of the typical gray soils subjected to irrigation erosion of Samarkand region (Uzbekistan) are evaluated using resource-efficient agro technologies (softening along the length of the experimental field and contour method of soil tillage at a depth of 25-28, 32.35 cm) and mineral fertilizer standards. ($N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/ha) effects were studied in 2017-2019. Under these conditions, when growing winter wheat, applying mineral fertilizers $N_{200}P_{140}K_{100}$ in unwashed areas, $N_{240}P_{168}K_{120}$ when the soil is heavily washed, in moderate stratification and plowing in the contour method at a depth of 32-35 cm, allows for the recovery of winter wheat seeds at a high level (90.5; 89.7%), as well as the general plant and having a positive effect on the number of productive stems, 490.3, 536.3 and 415.7 and 483.2 units/m^2 in areas with unwashed soil, and 466.4-519.5 and 403.2-466.3 units/m^2 when strongly washed m^2 and a positive correlation (r=0.83) between the productive cluster and the number of clusters, the length of the spike is 9.7-10.0 cm, the grains in the spike are 49.0-49.9 grains, and the mass of one spike and 1000 grains is 1.45-1.51 and 42.0-43.3 g to be the highest, respectively, 61.6-60.5 t/ha of grain production and a positive correlation between the grain yield between the main soil tillage methods and depths (r = 0 ,94) ensuring the dependence, in all parts of the field (unwashed soil and strongly washed) grain quality is high (protein 14.3-15.6; gluten 29.7-33.1; vitreous 49.9-51.5%; the grain type is 765-784 g/l and the total baking value of the flour is 3.7-4.1 points) information on the cultivation of grain crops is given.

Key words: resource efficient technology irrigation erosion, typical gray soil, unwashed, strongly washed, leachate accumulated soils, winter wheat, mineral fertilizer, grain yield, quality.

1. INTRODUCTION

Today, degraded lands in the world are 1,964 million hectares, 55.7% of which are caused by water erosion, 12.2% due to soil nutrient depletion, salinization, pollution, and 4.2% due to densification and erosion, 6-7 million hectares of land are out of agricultural use. Currently, more than 235.9 million hectares of wheat are planted in more than 132 countries of the world, and 755.2 million tons of grain are grown. Worldwide, 1,094 million hectares of agricultural land are affected by irrigation erosion, and the majority of these areas are in Asia, Africa, and South America, causing annual losses of up to 400 billion dollars.

In a number of large wheat-growing countries in the world, due to the use of resource-saving agro-technologies, prevention of erosion processes, preservation and increase of soil fertility, as well as the correct selection of the main methods and depth of soil cultivation, increase of crop yield and quality due to the saving of mineral fertilizers, and the use of irrigation water in the soil, in its preventing leaching of nutrients. Among

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them, it is an urgent issue to scientifically substantiate the efficiency of resource-saving agro-technologies in ensuring food safety, protecting the soil from washing away in winter wheat cultivation, preventing erosion processes, the method and depth of the main processing, and stratified application of mineral fertilizers.

In Uzbekistan, the arable land affected by water and irrigation erosion is 1772.3 thousand/ha or 40% of the total arable land, this figure is equal to 121.9 thousand/ha in the Samarkand region, on average, 25-30, in some areas 30-40% less than in uncultivated lands, and the quality of the cultivated products is very low.

That is why, in the areas of irrigated farming, protection of cultivated fields from water and irrigation erosion requires the correct selection of the main methods of soil treatment, the exact consideration of the nutrient requirements of each plot and crop species, and the effective use of resource-saving agro-technologies.

2. MATERIALS AND METHODS

In our experiments conducted in 2017-2019 to determine the effect of the main methods of soil treatment and the stratified application of mineral fertilizers on the cultivation of winter wheat in the conditions of typical gray soils affected by irrigation erosion, the main methods of soil treatment in the conditions of the typical gray soils affected by irrigation erosion of Samarkand region, the depth and norms of mineral fertilizers, winter wheat variety ‘Zimnitsa’ is the object of research.

Field experiments were conducted in the conditions of typical gray soils subjected to irrigation erosion of Bulungur district, Samarkand region. The slope of the experimental field is 0.004-0.005 m, the mechanical composition is medium and light sand, and groundwater is located at a depth of 12-14 m. In the experimental field, the total area of each plot is 784 m^2 (furrow length 140 m, of which 52 m is unwashed soil, 58 m is strongly washed and 30 m is washed and collected soil; width 8 rows x 0.7 = 784 m^2), of which 392 m^2 is taken into account. The number of options is 18, the experiment is in 4 repetitions, the options are systematically placed on one level, and our scientific research works are conducted according to methodological guidelines and recommendations generally accepted in our republic.

Agrochemical, agrophysical and microbiological analyzes of soils were carried out in the following ways:

Humus by the method of I.V. Tyurin, Interstate standard (IS)-26213; nitrate nitrogen by the ion selective method, IS-13496-10; total nitrogen, phosphorus and potassium in one sample by the method of I.M. Mal'tseva, L.P. Gritsenko, mobile phosphorus in 1% ammonium carbonate solution by the method of B.P. Machigin; by the method of P.V. Protasov in an alternating potassium flame photometer; carbonates were determined by the Knop method, using a potentiometer in pH aqueous absorption;

The washing of soil and the release of nutrients together with it into the sewage was determined in the area of (2.8x0.5) = 1.4 m^2, where special sewage is collected at the edge of the ponds. The level of soil leaching was measured by the method of Kh.M.

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Maksudov, and the amount of soil washed was calculated; the amount of humus, total nitrogen, phosphorus, potassium, ammonium and nitrate nitrogen in the waste water and solid residue was determined.

In the experimental field, the seeds of the winter wheat variety ‘Grom’ planned for the main areas in the region were sown in the first and second ten days of October, at a depth of 4-5 cm in the S3 seeder, at the rate of 5 million germinated seeds per hectare. Mineral fertilizers were applied as follows: 80% of the annual rate of phosphorus fertilizers was applied under the plow, the remaining 20% was given at the same time as planting the seeds, all the annual rate of potassium was applied under the plow, and the annual rate of nitrogen fertilizers was divided into two equal parts and given during the period of the plant's operation (branching and tuberization).

Agrochemical and agrophysical analyzes of experimental field soils, all phenological observations and biometric measurements of winter wheat were conducted on the basis of methodological manuals "Methods of conducting field experiments", and productivity indicators were analyzed according to B.A. Dospekhov for repetitions and variants.

3. RESULTS AND DISCUSSION

One of the factors affecting the yield of winter wheat is their overwintering. Up to 50% of winter wheat lawns have been killed in winter. The average air temperature in December, January and February of 2017-2019 in the conditions of typical gray soils affected by irrigation erosion was +2.8-4.8; +3.6-4.3 and +2.4-6.50C, soil temperature +5.2-5.8 in the 0-20 cm layer; was 3.3-5.4 and 3.6-4.10C, and this temperature did not have a significant negative effect on the wintering of winter wheat and the wintering of plants in the experimental field in 2017-2018 in the unwashed part of the field, different methods of soil treatment, depth and 85.5-94.4 depending on the standards of fertilizers; 84.1-92.2% when strongly washed and 14.5-5.6% when diluted, respectively; was 15.9-7.8%, in 2018-2019 these indicators are 83.3-92.7 in accordance with the above; 80.8-90.5 and dilution 7.3-16.7; 9.5-19.2%, and 86.2-95.2% in 2018-2019; 81.2-87.5 and dilution 4.8-13.8; It was taken into account that it was 12.5-18.8%.

In our experiments, plowing was carried out along the slope at a depth of 25-28 and 32-35 cm, on the background of mineral fertilizers ($N_{200}P_{140}K_{100}$ kg/ha). and after wintering, 376.0-385.6 units or the number of wintered plants is on average 89.0-90.1% compared to the ones that have germinated, and the number of plants lost in autumn-winter months is 11.0-9.9%, the field in the heavily washed part, these indicators were 408.6-415.0, 348.6-358.5, or 85.3-86.4%, 14.7-13.6%, respectively, per $1m^2$.

In the experimental field, the number of plants in the unwashed part of the options where the plowing was carried out by the contour method at a depth of 25-28 and 32-35 cm, and mineral fertilizers $N_{200}P_{140}K_{100}$, $N_{240}P_{168}K_{120}$ kg/ha were used, compared to the control option, where the plowing was carried out at the indicated depths along the slope, was 14.0-14 per 1 m^2, 4; 19.2-23.0 grains, 18.5-24.4 grains or 1.4-1.1% higher and thinning 1.4-1.1; 3.8-4.0% was less, these indicators were 21.4-23.0, respectively, in areas with strongly washed soil; 29.9-31.3 pieces or 1.4-1.9; It is higher by 4.0-4.3%

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and in the winter months it decreases to 1.4-1.9; It was taken into account that it decreased by 4.0-4.3%.

In the heavily washed part of the experimental field, the thinning of winter wheat lawns was observed in the variants treated with a cultivator at a depth of 10-12 and 15-18 cm, and mineral fertilizers $N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/kg were used. 19.4 and 17.7%, 15.6 in the control option without fertilizer, according to the fertilizer norms; 17.0; 17.9 and 14.6; 15.8; was 16.9%, during the winter period, a small amount of thinning of winter wheat lawns was observed in the plants of the options that were plowed in the contour method at a depth of 25-28 and 32-35 cm, and mineral fertilizers were used in the indicated norms, and their amount was 16.2 and 15, respectively, in the control without fertilizers .0%, 11.7 in the rest; 13.3; 14.8 and 9.3; 10.7; It was around 12.5%.

In our research, depending on the main methods of soil cultivation, depth and fertilizer rates, the number of bushes at the end of the winter wheat season was averaged in 3 years, plowing was carried out along the slope (control) at a depth of 25-28 and 32-35 cm, mineral fertilizers were applied at the rate of $N_{200}P_{140}K_{100}$ kg/ha it was taken into account that the soil was 338.6 and 347.3 units or 82.0-83.2%, respectively, in well-washed soil. At the end of the period of operation of winter wheat in the experimental field, the number of small bushes was 337.5-326.4 units/m^2 or 81.2-79.3% and 345.0-332.3 units/m^2 or 82.5-80.2% , processed with a chisel at a depth of 10-12 and 15-18 cm, and observed in the plants of the variants $N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/ha were observed, these indicators were plowed in the contour method at a depth of 25-28 and 32-35 cm and specified mineral fertilizers it was taken into account that in the used options it was proportionally higher at 36.5-23.6 units/m^2 or 3.8-3.0% and 43.3-31.7 units/m^2 or 4.0-3.6%. The same positive indicators were observed in the unwashed part of the experimental field and all 2016-2017 researches; It was also recorded in 2017-2018 and 2018-2019.

In all variants and repetitions of our field experiments on typical gray soils affected by irrigation erosion, due to the fact that there was sufficient moisture and temperature in the soil and the seeds were sown at the recommended optimal dates (October 8-16), the seeds of the winter wheat variety ‘Zimnitsa’ in the unwashed and heavily washed part of the field , depending on the methods and depth of the main soil treatment, 7-8 and 8-9 days in the areas where sewage was accumulated, fully germinated evenly. In the experiment, the germination period of winter wheat was on average 24-26 days in three years in the fields where the soil was not washed, 23-24 days when the soil was washed strongly, and 27-29 days when the soil was collected.

Under these conditions, the period of tillering and sprouting of winter wheat was 160-162 and 161-163 days in the control (without fertilizer) plots, where the soil was not washed and 161-163, and 158-160 days in the heavily washed areas, while plowing was 25-28 and 32-35 along the slope. 162-163 and 160-161, respectively, when fertilizers $N_{200}P_{140}K_{100}$ kg/ha are applied at a depth of cm, plowing at the specified depths is carried out by the contour method, fertilizers $N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/ha are applied in this period, respectively, options 15-4, 15-6; It was equal

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to 165-166 and 163-165 days. In this case, it was noted that the moisture and nutrients in the soils of the experimental area where the sewage was collected increased the duration of the tuber period by 2-3 days compared to the plants in the areas where the soil was washed.

In our experiments, plowing was carried out in the contour method at a depth of 25-28 and 32-35 cm, mineral fertilizers ($N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/ha) were used in the unwashed part of the soil, the period of the plant's earing-full maturity was 36-37, and the soil was washed, respectively. and taking into account that it was 35-36 and 37-38 days in the parts, the soil tillage at the indicated fertilizer rates, the soil of the plows carried out with a chisel at a depth of 10-12 cm, in the strongly washed part of the soil, due to the lack of moisture, nutrients and other vital factors of winter wheat period corresponded to 230-232 days. According to the data of our experiments conducted in the conditions of typical gray soils affected by irrigation erosion, the height of winter wheat during the period of tillering is not washed, strongly washed, and leachate accumulated in the parts of the field with contour method at a depth of 25-28 and 32-35 cm, mineral fertilizers ($N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$ kg /ha) in the options used in the norms are the highest (26.7-28.4; 25.3-27.3; 27.4-29.5 cm), the basic tillage of the soil in the indicated fertilizer norms is 10-12; When it was carried out with a chisel at a depth of 15-18 cm, it was noted that it was low (21.2-23.2; 20.5-23.4; 21.6-24.2 cm).

During the tuber period of winter wheat in the experimental field, the height of the plants in the variants applied at the expense of mineral fertilizers ($N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$ $N_{100}P_{70}K_{50}$ kg/ha) at the depth of 25-28 and 32-35 cm by the contour method of the main treatment, i.e. 64.2-71.4 and 69.4-79.5 respectively; 63.3-70.8 and 68.5-79.2; 65.2-71.3 and 70.3-80.4 cm, when plowing along the slope at a depth of 25-28 and 32-35 cm, and especially with a chisel at a depth of 10-12 and 15-18 cm the height of the plants in the treated variants is 6.1-7.7 and 7.9-11.3, compared to the above; 7.0-9.4 and 8.3-11.7; It was observed that it was lower by 4.8-6.8 and 7.7-11.8 cm.

According to the analysis of the results of our research, in the experimental field, the plow was moved along the slope at a depth of 25-28 and 32-35 cm, and mineral fertilizer ($N_{200}P_{140}K_{100}$ kg/ha) was used in the control options, the total number of productive stems of winter wheat in the unwashed part of the soil was 480.5 per $1m^2$, respectively, were 488.6 and 385.3-396.0 units, while these indicators were significantly less in the strongly washed part of the soil of these variants and equaled 439.2-455.4 and 341.6-360.3 units, it was found that the number of total and productive stems was slightly higher in the part of the experimental field with accumulated sewage, 52.3-46.9 and 58.7-54.3 pieces/m^2, respectively, than the indicators in the heavily washed soil. In 2016, these indicators were 475.4-487.5 and 374.4-389.9, respectively, in the unwashed, strongly washed and sewage-accumulated parts; 436.5-452.2 and 340.6-368.4 and 486.3-498.7 and 403.4-412.5; and in 2017, 454.3-468.7 and 365.6-378.4; and was 405.3-433.6 and 329.4-356.2 and 475.2-491.5 and 381.7-394.3 units/m^2.

In our research, the total number of productive stalks of winter wheat in 10-12 cm deep plowed soil with N240P168K120, $N_{200}P_{140}K_{100}$ and $N_{100}P_{70}K_{50}$ kg per hectare of land not

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affected by irrigation erosion is 476.2; 464.7; 453.5 and 378.3; 373.0; in units/m^2, these indicators are 440.4, respectively, in the strongly washed part of the soil of this plot; 422.7; 406.3 and 350.6; 339.5; 326.2 and 492.3 in the part where the sewage is collected; 485.7; 458.5 and 396.5; 385.4; It was equal to 366.3 units/m^2, the main treatment with the specified mineral fertilizers at a depth of 15-18 cm was 8.1-16.3 and 16.3-21.9 units in the unwashed part of the areas with a chisel, when strongly washed 12.8-26.0 and 19.9-30.5, and it was found that it was more in the part where the sewage was collected - 3.5-16.8 and 18.8-22.1 units/m2. Similar results were obtained in the experiments of 2016 and 2017.

In our experiments in the conditions of typical gray soils subject to irrigation erosion, plowing was carried out by the contour method at a depth of 32-35 cm, and when mineral fertilizers ($N_{240}P_{168}K_{120}$ kg/ha) were applied, the number of total and productive stems in winter wheat was 536.3 and 468.4 pieces/m^2, respectively. in the fields with strongly washed soil against the background of fertilizers, these indicators were 519.5 and 466.3, respectively, and in the fields with accumulated sewage, they were equal to 544.6 and 479.4 units/m^2. Similar positive indicators were also shown in the number of total and productive stalks of winter wheat in the options where the plow was carried out by the contour method at a depth of 32-35 cm and mineral fertilizers ($N_{200}P_{140}K_{100}$ and $N_{100}P_{70}K_{50}$ kg/ha) were used.

In the conditions of typical gray soils subjected to irrigation erosion, carrying out the main tillage of the soil at a depth of 32-35 cm in the contour method, stratifying and applying mineral fertilizers in resource-efficient standards, having an effective effect on the number of total and productive stems in the plant, 490.3-536.3 and 415 in the areas where the soil was not washed ,7-483.2 units/m^2, 466.4-519.5 and 403.2-466.3 when strongly washed, and 496.3-544.6 and 428.3-492.5 units/ in m^2 and a positive correlation (r=0.83) between the number of productive plants and the number of plants, made it possible to grow high-quality grain crops from winter wheat in these areas.

According to the analysis of the results of our research, the length of the ears of winter wheat in the unwashed part of the option where the main tillage was carried out along the slope at a depth of 25-28 cm and mineral fertilizers $N_{200}P_{140}K_{100}$ kg/ha (control) was 8.9 cm in average in 3 years and the number of ears in it was 17.5 , the grains in the ear were 35.4 grains, the mass was 1.32, and the mass of 1000 grains was 36.3 g. ,28 and 35.3 g, and when the effluent was collected, it was taken into account that 9.2 cm, 18.1, 36.3 pieces were equal to 1.34 and 37.4 g. At the rate of these fertilizers, the length of the wheat spikes in the option where the plowing is carried out along the slope at a depth of 32-35 cm is 0.13 cm in the unwashed area, the spikes in the spike are 0.4 and the grains in it are 0.8 grains, the mass of one spike and 1000 grains is 0.02 and per 0.9 g, in the parts with strongly washed soil and sewage, these indicators are 0.3-0.4 cm, 0.7-0.6 and 0.9-0.7 grains, respectively, 0.03-0.02 and was higher by 1.2-0.9 g.

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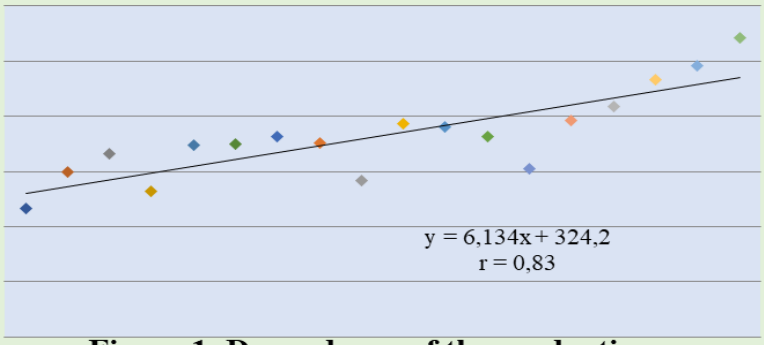

Figure 1. Dependence of the productive accumulation on the thickness of the stem.

Plowing was carried out by the contour method at a depth of 25-28 cm, and the length of the ears of winter wheat in the unwashed part of the variants, which were used in the norms of mineral fertilizers ($N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/ha), according to the norms of fertilizers, were 8.9-9.7 cm, and 17. 7-19.3, grains in a spike 46.6-48.5 grains and grain in one spike 1.34-1.45 g, mass of 1000 grains 36.6-40.1 g., when the soil is strongly washed, respectively 8.7 -9.5 cm and 17.4-19.1; 46.1-48.1 pieces and 1.30-1.44 g., 35.9-39.9 g, and 9.1-9.8 cm and 18.4-19.7 when the waste is collected; 47.4-49.8 units and 1.35-1.46; was 37.4-40.5 g, these indicators are the length of wheat spikes in variants where plowing is carried out at a depth of 32-35 cm in the rates of these fertilizers, 9.3-10.0 cm in the unwashed field, and 18.9-20, 4, the grains in the ear are 48.1-49.9, and the mass of the grains in them is 1.39-1.51 g, and the mass of 1000 grains is 40.2-43.3 g, when the soil is strongly washed, it is 9.1-9.8 cm and 18 ,6-20.3, 47.6-49.7 pieces and 1.37-1.49 g and 39.5-43.2 g, and in the accumulated part of the waste 9.5-10.2 cm and 19, It was equal to 3-20.8, 48.7-50.1 pcs and 1.39-1.51 g and 40.8-42.8 g. This showed that the level of formation of winter wheat grains in the options where the main processing was carried out by the contour method at a depth of 32-35 cm was slightly higher than the indicators of the elements of the winter wheat crop grown in the specified method, but in the fields plowed at a depth of 25-28 cm.

In our research, it was observed that there is a difference in the elements of the winter wheat crop structure in the options where the main tillage was carried out with a chisel at 10-12 and 15-18 cm depths and mineral fertilizers were used in the rates of $N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/ha. For example, the length of the spike of winter wheat in the options treated with a chisel at a depth of 10-12 cm at the rate of the indicated fertilizers, 7.6-8.3, respectively, in the areas where the soil is not washed, strongly washed and runoff accumulated; 7.3-8.1 and 8.1-8.7 cm, the number of grains in the ear is 32.2-33.7; 31.6-33.2 and 32.4-34.0 grains, grain in a spike and mass of 1000 grains 1.24-1.30; 1.20-1.26 and 1.26-1.31 and 30.2-32.5; were 29.0-31.4 and 31.5-33.4 g, these indicators were proportionally 0.9 in the unwashed, strongly washed and leached parts of the variants treated with a chisel at a depth of 15-18 cm at these fertilizer standards -1.1; 0.9-1.0 and 0.8-0.9 cm, 1.6-1.8; 1.6-1.9 and 1.7-2.2 pieces,

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0.02-0.03; 0.03-0.05 and 0.02-0.03 and 3.8-3.3; It was noted that it is higher by 3.7-3.8 and 3.6-3.4 g.

The results of our research show that the grain yield of winter wheat grown in the unwashed, heavily washed and drained parts of the experimental area, the methods of soil cultivation used in its cultivation, the depth and stratified application of mineral fertilizers are inextricably linked to the resource-saving norms. For example, the control (without fertilizer), the main tillage of the soil in the contour method at 25-28 and 32-35 cm, and with a chisel at the depths of 10-12 and 15-18 cm. ,8 and 13.4-15.3; 14.7-16.5 and 12.5-13.2; 16.8-19.5 and 15.8-16.7, or 18.7-20.5 and 16.3-17.6 ts/ha in three years, respectively, these indicators are 15, 3-14.2 or on average 17.4-19.4 and 14.2-16.1 ts/ha and 20.3-21.4 and 18.8-20.2 in the part of the sewage collection; 18.4-20.8 and 17.9-18.3; It was found to be 21.0-22.6 and 19.7-20.0, or on average 19.9-21.6 and 18.8-19.5 ts/ha.

In our experiments, it was observed that the main tillage of the winter wheat grain crop by the contour method, especially when combined with the resource-saving technologies of stratified use of mineral fertilizers. For example, the grain yield of winter wheat in the non-washed part of the options, where plowing was carried out by the contour method at a depth of 25-28 cm and mineral fertilizers ($N_{240}P_{168}K_{120}$, $N_{200}P_{140}K_{100}$, $N_{100}P_{70}K_{50}$ kg/ha) were used, were 55.4-56.5 years, respectively; 52.6-53.4 and 44.5-45.6 ts/ha or 55.2-44.3 ts/ha on average in three years, 55.3-56.1 in areas with strongly washed soil; 52.4-53.2 and 43.4-44.5 ts/ha or 54.6-43.2 ts/ha, and 56.4-57.5, respectively, in the part where the sewage is collected; If it was 54.2-55.1 and 45.2-47.4 ts/ha or 55.7-45.4 ts/ha, these indicators are the options where the plow was carried out at a depth of 32-35 cm in the indicated norms of mineral fertilizers. 6.3-6.7 respectively in the unwashed part of the soil; 6.7-6.9 and 2.1-1.9 ts/ha or 6.2-1.5 ts/ha, 5.6-6.6 when the soil is strongly washed; 6.1-6.2 and 2.2-1.9 ts/ha or 5.9-1.4 ts/ha and 6.6-6.1 in the waste collected part; It was noted that 5.3-4.3 and 1.2-0.6 ts/ha or 6.6-0.8 ts/ha were provided.

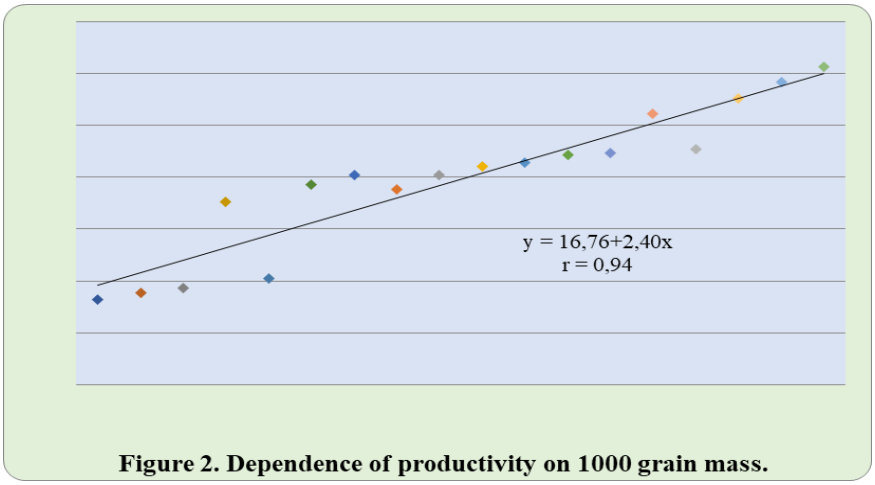

Figure 2. Dependence of productivity on 1000 grain mass.

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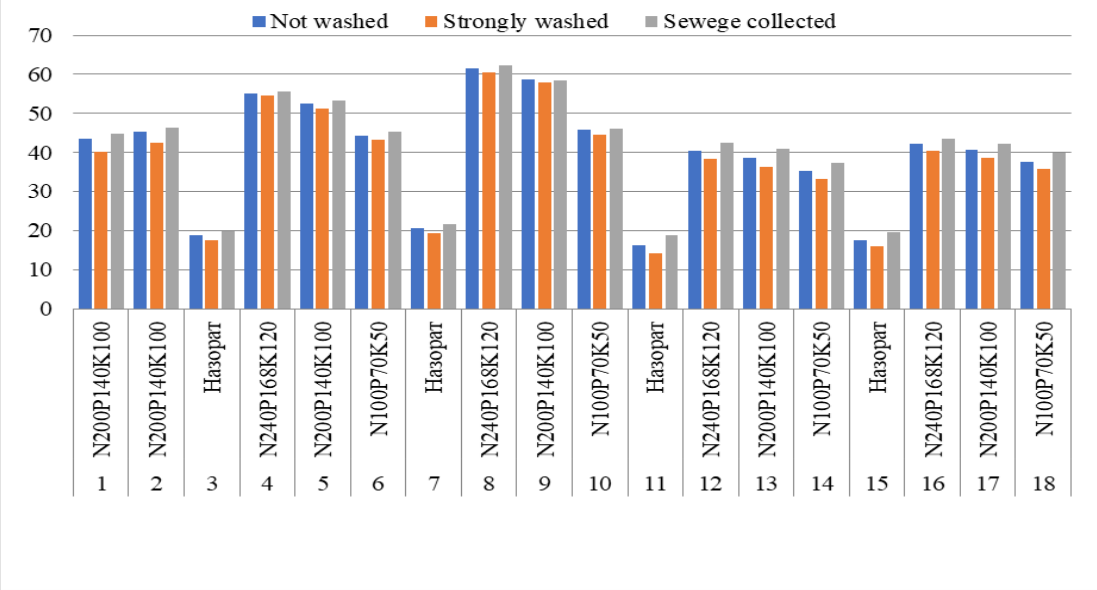
When growing winter wheat in the conditions of typical gray soils subjected to irrigation erosion, in order to reduce the negative consequences of erosion processes, carrying out the main soil cultivation at a depth of 32-35 cm in the contour method, using mineral fertilizer standards in resource-saving technology in areas where the soil has not been washed, N200P140K100, when strongly washed N240P168K120, and in the part of the sewage collected N100P70K kg/ha application, creating the most favorable conditions for the development of winter wheat and the formation of crop elements, respectively 61.6; 60.5 and 62.3 t/ha grain production and a positive correlation (r=0.77) between grain yield per 1000 grain mass (r=0.94) and main soil tillage methods, depth, and erosion under its influence ensures a decrease in the difference between the yield of winter wheat grown in heavily washed and non-washed fields.



Increasing the yield and quality of winter wheat grain in different soil-climatic regions of our republic depends on the external environmental conditions of its cultivation. During plant growth and development, environmental factors accelerate physiological-biochemical processes. As a result, protein, fat, gluten, starch, sugar, vitamins, etc., which characterize the quality indicators of the grain, vary widely. For example, the protein content of winter wheat grain can be from 8 to 22%. Among the indicated factors, the one that has the fastest effect on grain quality is fertilization. Effective use of fertilizers not only increases productivity, but also ensures high grain quality.

The amount of protein in the grain grown in the years of the research, on average, in three years, in the parts of the field where the soil was not washed, strongly washed, and accumulated runoff, ploughing was carried out by contour method at a depth of 32-35 cm, and mineral fertilizers were applied at the rate of N240P168K120 kg/ha or ploughing at the rate of indicated fertilizers was 25- It was observed that the soil of the options carried out at a depth of 28 cm was 15.2-15.6% in the unwashed part, 15.2-15.8 in the strongly washed part, and 15.4-15.5% in the case of sewage accumulation.

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Different soil tillage methods, depth and stratified application of mineral fertilizers in resource-efficient standards had an effective effect on the technological quality indicators of the cultivated autumn soft wheat grain, and ploughing was carried out in the contour method at a depth of 32-35 cm. as a result of application of N240P168K120 when washed and $N_{100}P_{70}K_{50}$ kg/ha in the wasteland of the field, grain quality is high in all parts of the field (protein 14.3-15.6; gluten 29.7-33.1; glassiness 49.9-51.5%, grain nature 765-784 g/l and the overall breadness value of flour was 3.7-4.1 points), while it was noted that grain quality was significantly lower in the main treated areas with a chisel at 15-18 cm, especially 10-12 cm depth.

4. CONCLUSIONS

1. In the conditions of typical Gray soils subject to irrigation erosion, ploughing is carried out along the slope at a depth of 25-28, 32-35 cm and chiselling at a depth of 10-12 cm. in the fields $N_{200}P_{140}K_{100}$, when the soil is strongly washed $N_{240}P_{168}K_{120}$ kg/ha, stratified application, soil particles (4.67 and 3.7 t/ha), humus (13.1-16.1 kg/ha), phosphorus (5.1-4 .5 kg/ha), providing low leaching of potassium (6.6-4.7 kg/ha), creating favourable conditions for nutrition of winter wheat and good development of its root system, has a positive effect on plant growth, development and productivity.

2. The main treatment of the typical gray soils affected by irrigation erosion is carried out by the contour method at a depth of 32-35 cm, and the difference in the height of winter wheat is correspondingly reduced (101.3-102.4; 100.7-102.6) and 101.8-102.3 cm) and prevents plants from becoming dormant, while the number of total and productive stems per plant is 490.3-536.3 and 415.7-483.2 pieces/m2 in unwashed areas, strong 466.4-519.5 and 403.2-466.3 when washed, and 496.3-544.6 and 428.3-492.5 units/m2 on the land with sewage accumulation, and there is a positive correlation between the number of plants and the productive population (r=0.83) correlation, it is possible to grow a high quality grain crop from winter wheat.

3. The main cultivation of the soil was carried out with a chisel at a depth of 15-18 cm and contour method at a depth of 32-35 cm, when mineral fertilizers were used in resource-efficient agrotechnology, the length of the spike was 9.7-10.0 cm, and the number of spikes in it was 19.5-20.4 pcs. , the grains in the ear are 49.0-49.9 grains, and their and 1000 grain masses are 1.45-1.51 and 42.0-43.3 g and respectively 61.6; 60.5 and 62.3 t/ha of good quality (protein 14.3-15.6; gluten 29.7-33.1; vitreousness 49.9-51.5%, grain nature 765-784 g/l and its general nonprobability score 3.7-4.1 points) ensuring grain production and a positive correlation (r=0.77) between grain yield and soil tillage methods, depth and mass of 1000 grains (r=0.94), under the influence of erosion, the difference between the yield of winter wheat grown in heavily washed and unwashed areas is reduced.

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Effect of main tillage methods, depth and mineral fertilizer rates on the quality of winter wheat grain (2017-2019 year)

Var	Cereal contains:														
	Protein, %			Gluten, %			Glassiness of grain, %			The nature of the grain, g/l			General bakery price of grain, level		
	Level of soil leaching:														
	unwashed	strongly washed	sewage collected	unwashed	strongly washed	sewage collected	unwashed	strongly washed	sewage collected	unwashed	strongly washed	sewage collected	unwashed	strongly washed	sewage collected
1	12,6	11,8	13,1	26,9	26,2	27,7	44,0	43,1	45,2	736	728	748	3,5	3,3	3,5
2	12,9	12,4	13,5	27,6	27,0	28,6	45,2	44,5	46,3	746	740	753	3,6	3,4	3,6
3	12,0	11,7	12,2	24,4	23,8	24,9	38,5	37,6	39,2	723	715	727	3,0	2,8	3,1
4	15,2	15,2	15,4	30,7	30,6	31,1	49,1	49,2	48,8	778	770	777	3,8	3,9	3,7
5	14,7	14,8	15,1	29,1	28,6	29,4	48,0	47,8	48,4	768	762	766	3,6	3,5	3,5
6	13,5	13,4	13,6	26,8	26,3	27,8	46,8	46,2	47,1	757	750	757	3,4	3,3	3,3
7	12,2	12,1	12,2	25,2	24,8	25,6	40,4	39,6	40,8	728	723	733	3,1	3,0	3,1
8	15,6	15,6	15,5	33,0	33,1	32,7	51,2	51,5	51,4	789	784	788	4,1	4,1	3,9
9	15,2	15,2	15,3	32,2	32,0	32,6	49,9	50,2	50,2	783	776	779	3,9	4,0	3,9
10	14,3	14,2	14,4	29,7	28,9	30,0	48,6	48,1	49,0	774	765	772	3,7	3,6	3,8
11	11,5	11,1	11,9	22,7	21,8	23,5	36,6	35,4	37,4	708	701	715	2,5	2,4	2,7
12	12,7	12,3	13,2	27,0	26,2	27,6	42,8	41,7	43,7	748	739	762	3,4	3,2	3,5
13	12,3	11,9	12,7	25,9	25,2	26,6	41,7	40,8	42,6	738	728	746	3,3	3,1	3,4
14	12,1	11,6	12,3	25,4	24,7	26,1	40,9	40,0	41,8	732	723	740	3,2	2,9	3,3
15	11,8	11,4	12,2	23,8	23,2	24,3	37,5	36,6	38,5	716	710	721	2,8	2,6	3,0
16	13,3	12,9	13,7	27,6	27,3	27,8	44,2	43,5	44,7	756	749	767	3,6	3,5	3,7
17	12,7	12,2	13,0	26,8	26,1	27,4	43,1	42,2	43,9	746	739	753	3,4	3,3	3,5
18	12,3	11,8	12,7	26,0	25,3	26,6	41,8	40,6	42,8	736	728	745	3,3	3,1	3,4