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FERTILITY OF ERODATED SOILS AND YIELD OF GRAIN CROPS

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ABSTRACT

Erosion control is of great importance for the conditions of irrigated agriculture, especially considering that it is here that irrigation erosion occurs, leading to a sharp drop in soil fertility and crop yields.

Key words: corn, eroded soil, non-eroded soil, erosion, yield, rainfed lands, phosphate fertilizers.

INTRODUCTION

The world pays special attention to the development of agricultural technology for the cultivation of agricultural crops, taking into account their biological characteristics, soil and climatic conditions while meeting the needs of the population with food, industry - raw materials and animal husbandry - feed. Maize (Zea mays L.) ranks third in terms of area in the world after wheat and rice, in the group of fodder crops it ranks first. In the world, when growing corn as a main and secondary crop, by improving the phosphorus nutrition system, the balance of nutrients in the soil is optimized, a high grain yield and green mass is obtained, the population is provided with food, industry with raw materials and animal husbandry with complete (nutrient) feed. In this direction, scientific research is relevant to study the effect of the use of new fertilizers developed on the basis of phosphorites together with nitrogen and potassium mineral fertilizers on the growth, development and yield of corn, as well as the development of an optimal technology for their application.

In the Republic of Uzbekistan for 2018, when placing crops for corn, as a valuable grain and fodder crop, 138.5 thousand hectares of land will be allocated and for the first time it is planned to obtain 1210.9 thousand tons of corn grain. At present, in the Republic, the average yield of corn for grain is 35-45 q/ha.

Under the conditions of the Zarafshan valley in typical gray soils with various degrees of erosion, a complex of scientific studies to study the effectiveness of the use of solid and new liquid phosphorus fertilizers on corn of the main and stubble crops is relevant.

LITERATURE AND METHODOLOGY

Irrigated land in the Republic of Uzbekistan, occupying only 11% of the entire territory, provides more than 90% of agricultural production. From one hectare of irrigated arable land in the republic, on average, 8-10 times more production is received than from a hectare of rainfed land. However, the potential of an irrigated hectare is far from being fully utilized, and the use of unreasonable doses of mineral fertilizers in recent years, the virtual disregard for crop rotations, has led to a decrease in soil fertility, and, naturally, a decrease in the effectiveness of fertilizers used. The problem of increasing the fertility of eroded soils is inextricably linked with their replenishment with organic matter, the scientifically based use of mineral fertilizers, the introduction of intensive, energy and water saving, environmentally friendly technologies for cultivating agricultural crops [97; s-182].

The problem of directed regulation of the fertility of eroded soils is especially urgent. When solving it, it is necessary, firstly, to justify the values of the parameters of agrochemical properties that provide increasing levels of productivity of the most important agricultural crops, and secondly, to determine the specific costs of fertilizers to achieve the optimal level of soil fertility and maintain it.

An increase in the productivity of eroded lands is possible on the basis of a detailed study of all components of a complex natural complex and, first of all, such as soil and vegetation. Soils and plants are closely related to each other, and this connection takes place in constant interaction and change of each other.

At present, the rational system of fertilizer application remains the main strategy for the development of agricultural production throughout the world. Among a wide range of issues related to the use of mineral fertilizers, the most important are the economic and environmental aspects of their use, because. increasing yields through the use of fertilizers is justified only if they do not reduce the profitability of production, product quality [7; s-42].

One of the ways to increase the fertility of eroded soils and reduce energy and water consumption in agriculture in Uzbekistan is to improve the range of mineral fertilizers [10; s-159-206, 8; s-78-79, 9; s-1-2].

One of the most important nutrients for plant nutrition, which in most regions limits yields, is phosphorus. Its gross reserves in the gray soil zone are relatively high - 0.1-0.3%. However, on eroded serozems, most of the soil phosphates are in the form of hardly soluble compounds that are poorly available to plants [62; s-270].

One of the well-known ways to increase the efficiency of phosphorus fertilizers is to use them taking into account the level of available forms in the soil. Another way is a thorough, science-based approach to the selection of a range of phosphorus-containing fertilizers, that is, the search for forms from which fodder crops use

phosphorus more on eroded gray soils. The results of the study of the above authors show that such fertilizers include liquid and solid complex fertilizers based on poly- and orthophosphoric acids.

However, as evidenced by world practice, the use of polyphosphate-based HCS is considered beneficial in market conditions, especially in countries that have their own sources of phosphate raw materials [10; pp-159-206].

On sierozem, HCS, acting equally or slightly superior to orthophosphates, as a rule, have an advantage over granular orthophosphates. The high efficiency of liquid polyphosphates on calcareous gray earth soils is explained by the fact that when they are introduced into the soil for a long time, a much larger amount of easily digestible orthoform is retained.

When choosing crops, it is necessary to take into account the characteristics of their fertilizer system. At the first stage of the introduction of HCS, it is advisable to use a basic solution 10:34:0 for direct application. The advantage of this brand is a high concentration and a wide range of terms of application: in autumn, spring and, if necessary, in top dressing. In this regard, in our opinion, liquid complex fertilizers are of interest, the production, storage, transportation and use of which, in comparison with the production of other fertilizers, is the most environmentally friendly and cost-effective.

In the context of agricultural production in the Zarafshan Valley, one of the most important problems is to increase the efficiency of phosphate fertilizers in the cultivation of fodder crops, especially corn.

Corn is one of the most common and valuable grain forage crops in the world. It is grown on almost all continents on an area of more than 110 million hectares annually. The grain production of this crop is concentrated in 13 major countries. The leading country in the production of corn is the United States, where more than 20 million hectares are occupied under it, and the average grain yield is 85.0 c/ha [14; s-27-31].

According to researchers, corn grain contains (in%): proteins - about 10.5, BEV - 66, fat - 6.5, ash - 1.5, fiber - 2.5, water - 14-15, as well as vitamins [4; p-344].

It’s a multi-use culture. In many countries, it is grown mainly as a food crop, and in others as a raw material for industry and a valuable feed component in animal husbandry. Of the global production of corn grain, 65% is usually used for livestock feed, more than 20% for food purposes, and the rest for industrial processing [13; pp-53-62].

In field experiments, we studied the influence of the rate of mineral fertilizers on the germination of sugar beet seeds. It was noted that in the absence of mineral fertilizers, the germination of sugar beet seeds was high, despite the low seed yield.

While nitrogen mineral fertilizers reduce seed germination, phosphorus and potash fertilizers increase seed germination.

The high energy nutritional value of grain, as well as the presence of a large amount of mineral salts and vitamins, determines its high nutritional value and widespread use as a valuable component of mixed feed for animals and birds. 1 kg of dry corn contains 1.34 feed units and 78 g of digestible protein [124; s-4-8]. 1 kg of silage when ensiling corn of milky-wax ripeness contains 0.25-0.32 units. and 14-18 g of digestible protein. Corn grain is widely used in the processing industry. Flour, cereals, sugar, canned food, butter, starch, etc. are obtained from it. Linoleum, cellulose, paints, glue, medicines, etc. are made from plant stems, wrappers of cobs. Corn is a plant that produces practically no waste, everything in it can be used.

Uzbekistan has all the necessary conditions for the production of corn in quantities that meet the needs of the country's population. Under corn in the country 33.9 thousand hectares are occupied. The average yield in recent years has been 50 c/ha. [1; s-400].

The studies were carried out in 2008-2012. in order to develop optimal norms and forms of phosphorus fertilizers that ensure high yields of corn green mass during re-sowing. The experiments were carried out with the zoned corn variety Uzbekistan 400. The total area of the plots is 144, the accounting area is 72 sq.m. Records and observations on the formation of the fruiting organ - corn cob by the method of biological control of plant development [8; p-78].

The determination of the assimilation surface of the leaves was carried out by a linear method by multiplying the maximum width of the leaf by its length and by a factor of 0.75.

The following biometric counts were carried out: cob height, cob diameter, number of grains per row, number of rows of grains per cob, number of grains per cob, number of cobs per plant, weight of one cob, weight of 1000 grains, grain yield after threshing cobs [9; s-170]. The degree of soil erosion was specified according to the results of chemical analyses. The change in the humus stock in a half-meter layer, as well as in the thickness of the humus horizon A + B1, were taken into account. [10; p-87].

The following indicators were determined in soil samples: humus content according to the method of I.V. Tyurin, fractional composition of humus according to V.V. Ponamareva, T.A. Plotnikova; nitrogen according to I.V. Tyurin, and easily hydrolysable according to I.V. Tyurin and M.I. Kononova, alkaline hydrolysable nitrogen according to Kornfield, described by A.P. Golubeva, ammonia nitrogen in 1% KCl according to E.A. Arinushkina (modification of TsINAO), nitrate nitrogen (ion-selective method), phosphorus, potassium and nitrogen in one sample according to I.M.

Maltseva and L.N. Gritsenko. Mobile P2O5 by the Chang-Jackson method, the Askinazi-Ginzburg, Machigin and Scofield variant, exchangeable potassium according to P.V. Protasov, carbonates from acetic extract, water-soluble salts and dense residues according to the generally accepted method (chlorine with silver nitrate), sulfates - barium chloride (dense residue by weight), pH in the aqueous extract with a potentiometer, the composition of absorbed cations with Pfeffer's reagent. [12; pp-240-245].

The content of starch, crude ash, fat, fiber, nitrates in grain and green mass was determined by the method described in the books [8; s-76-80].

РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЙ

Table 1.1

Corn grain production in the Republic of Uzbekistan and Samarkand region (data from the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan)

Years	By republic			In Samarkand region		
	sowing area, thousand ha	productivity, centner/ha	gross harvest, thousand tons	sowing area, thousand ha	Productivity, c/ha	gross harvest, thousand tons
2019	13,7	31,1	42,4	1,5	24,1	3,6
2020	14,9	47,5	70,8	1,3	47,4	6,2
2021	11,7	57,3	67,0	0,5	81,6	4,1
2022	26,5	96,9	256,8	1,8	58,0	10,4

To obtain high yields and improve the quality of the grain of this crop, a balanced mineral diet is necessary. Nitrogen, phosphorus and potassium are among the most deficient essential nutrients. Numerous studies testify to their positive impact on corn productivity.

Of particular importance is the issue of rational and economically justified use of mineral fertilizers in the presence of their large range and high price for them, especially for such a crop as corn, which has a great potential for increasing productivity. Therefore, the study of methods for the effective use of mineral fertilizers, especially phosphate fertilizers, in relation to eroded soils determines the relevance of the topic being developed.

In Uzbekistan, along with other types of erosion, irrigation erosion is also common (Table 1.2). In all regions, the area of land subject to irrigation erosion reaches 876.4 thousand hectares.

It should be noted that there are no scientifically substantiated criteria for acceptable erosion for different genetic types of soils that would provide compensation

for washout by increasing soil fertility in the process of intensive agricultural land use. To solve this problem, long-term stationary studies will be required. So far, it has been proposed to consider that the allowable soil runoff should not exceed 0.2-0.5 t/ha; 0.2 - on less fertile soils and up to 0.5 - on the most fertile ones.

Table 1.2

Areas of eroded agricultural lands of the Republic of Uzbekistan, ha /% (data from the State Committee on Land Resources of the Republic of Uzbekistan and the author, 2009)

Natural and economic area	General s.-x. land	Total irrigation my lands	Степень смытости				Total medium and strong melting
			unwashed	slabosmy melting	medium washed away	strongly washed away	
Karakalpakstan	4324,5	456,1 100	-	-	264,5 58,0	13,2 2,9	277,7 60,8
Andijan	468,8	295,9 100	170,7 57,6	25,4 6,7	-	48,9 16,5	48,9 16,5
Bukhara	3088,1	263,1 100	85,5 32,5	103,9 39,5	29,9 11,4	16,5 6,3	46,4 17,6
Jizzakh	1257,1	268,6 100	53,7 19,9	167,4 62,3	10,3 3,8	5,8 2,2	16,1 6,0
Kashkadarya	2245,2	430,8 100	54,5 13,3	177,8 43,3	43,2 10,5	29,2 7,1	72,4 17,6
Namangan	542,3	249,7 100	95,8 38,4	46,2 18,5	11,3 4,7	39,0 15,6	50,8 20,3
Samarkand	1346,9	415,4 100	241,9 58,2	36,8 8,8	24,4 5,9	71,4 17,2	95,8 23,1
Surkhandarya	1252,3	269,6 100	101,0 37,5	65,6 24,3	58,2 21,6	12,6 4,8	70,8 36,3
Syrdarya	387,0	271,8 100	71,1 26,2	114,1 42,0	-	54,8 20,2	54,8 20,2
Tashkent	794,4	372,6 100	266,5 71,5	79,9 21,4	4,1 1,1	9,1 2,1	13,2 3,5
Ferghana	519,6	346,5 100	105,6 30,5	72,8 21,0	113,5 32,7	5,9 1,7	119,4 34,4
Khorezm	538,3	236,8 100	12,0 5,1	194,8 82,3	1,5 0,6	8,9 5,8	10,4 4,4
Total:	16764,7	3736,2 100	1258,3 38,6	1085,1 29,0	561,4 15,0	315,3 8,4	876,4 23,5

CONCLUSION

The general research materials of many authors can be noted that erosion control is of great importance for the conditions of irrigated agriculture, especially considering that it is here that irrigation erosion occurs, leading to a sharp drop in soil fertility and crop yields.

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