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Nutrient Elements Depending on Artificial and Natural Screens on The Sand

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ABSTRACT
To obtain relatively high yields, special measures are required. Sands are poor in organic matter, which determines their unfavorable physical and chemical properties. Due to the rapid mineralization of organic matter and the leaching of nutrients from the arable horizon into deeper layers, the positive effect and aftereffect of fertilizers on such soils is limited. To increase the fertility of sandy and sandy loam soils, it is first necessary to improve their water and nutrient regime, increase moisture capacity and absorption capacity.
Keywords: *agriculture, soil, sands, protection, tillage, anti-erosion, fertility, water resources, artificial and natural screens.*

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INTRODUCTION
Uzbekistan has created a sufficient margin of safety and the necessary resource base in order to ensure the stable and uninterrupted operation of our financial and economic, budgetary, banking and credit system, as well as enterprises and sectors of the real economy.
Each of us should be aware that Uzbekistan today is an integral part of the world space and the global financial and economic market. Over the past period, a fairly solid foundation has been formed for the economic and financial management of the financial and banking infrastructure.
In agriculture, the planned increase in the average annual volume of gross output will be achieved mainly due to intensive development factors, the introduction of the latest achievements of science, technology and best practices, and the effective use of the created production potential. The consistent development of scientifically based farming systems, the expansion of the use of soil-protective methods of land cultivation and the implementation of anti-erosion measures will ensure a significant increase in the productivity and sustainability of agriculture, the implementation for these purposes of a set of measures to increase soil fertility, the introduction of intensive technologies for cultivating crops. In order to increase soil fertility, provide the population with food, rationally using land and water resources, research is being conducted in the world on the scientific justification of agricultural technology for cultivating joint sowing of various crops, on the selection of joint crops, on determining their seeding rates and studying the need for mineral fertilizers and water, ensuring high yields.
The scientific justification of the combined sowing of various crops, taking into account the peculiarities of agrotechnology of their cultivation and resistance to pests, weed infestation and their impact on the yield of the main crop remains relevant.
The agriculture of the Republic of Uzbekistan has the following tasks: to increase the efficiency of the use of irrigated lands, to achieve the project yield on these lands; to raise the technical level and quality of water management construction; to develop and implement measures to accelerate the transition to water-saving irrigation technologies, to the lean use of water resources and land; to comprehensively address issues of land reclamation and their agricultural development.

MATERIAL AND METHODS

In the Republic, in order to preserve soil fertility, as well as the rational use of lands with low fertility, the introduction of combined sowing of cotton cultivation with other crops ensures high and high-quality yields. In the Decree of the President of the Republic of Uzbekistan dated October 23, 2019, No. UP-5853 "On approval of the strategy for the development of agriculture of the Republic of Uzbekistan envisaged for 2020-2030, tasks are outlined aimed at implementing the development of agriculture, strengthening food security, expanding the production of environmentally friendly products, introducing new resource-saving technologies"2 and in this regard, the development of agrotechnology cultivation of combined sowing of legumes to ensure increased soil fertility of low-fertile lands is relevant. The dissertation work to a certain extent serves to fulfill the tasks set out in the Decree of the President of the Republic of Uzbekistan dated October 23, 2019 No. PF-5853 "On the strategy for the development of agriculture of the Republic of Uzbekistan for 2020-2030"Development of land and water resources in agriculture", as well as other regulatory documents related to this activity. To assess the effective fertility, the actual ability of the soil to provide high yields of agricultural crops, the content of nutrients in it in forms accessible to plants is very important. Therefore, agrochemical analyses of the soil, allowing to determine the content and dynamics of mobile forms of nitrogen, phosphorus and potassium, are important for the correct, differentiated application of fertilizers and on sands.

Dynamics of nitrate nitrogen in sand. The soils of Central Asia are characterized by high biological activity, as a result of which they undergo rapid mineralization of humic substances and accumulation of nitrogen forms assimilated for plants. Organic and ammonia nitrogen of fertilizers in the conditions of Central Asia is rapidly oxidized into nitrate salts. The mobile forms of nitrogen on these soils are mainly represented by nitrates, which is due to the pronounced nitrification process. It has been established that in the summer months, the ammonia nitrogen of mineral fertilizers usually passes into nitrate compounds within a few days after their introduction into the soil. Nitrates are not absorbed by the soil, they dissolve well in soil moisture and move along the soil profile under the influence of precipitation and irrigation water. In the autumn-winter and early spring periods, the washing of nitrate nitrogen into the underlying horizons can reach up to 1.5-2.0 m or more. In the case of the proximity of groundwater, the possibility of its loss and contamination of the latter is not excluded. In the summer, as a result of strong evaporation of moisture from the soil surface, a rapid rise of indented nitrates occurs in the surface dried soil layer.

The systematic use of mineral fertilizers increases the content of gross and mobile forms of nutrients in the soil and increases their solubility. By reducing the content of organic matter and destroying it, erosion suppresses microbiological processes in the soil, reduces its nitrification ability, as well as the content of nitrates in it and thereby worsens the conditions of nitrogen nutrition of plants.

RESULT AND DISCUSSION

Despite the extensive research devoted to the dynamics of mobile forms of nitrogen depending on the norms of fertilizers in various soil and climatic zones, the study of this issue on the deflated bumpy-barkhanist sands of Central Fergana was conducted for the first time by us. The obtained data on the dynamics of mobile forms of nitrogen on deflated sands are of great importance in establishing optimal norms of nitrogen fertilizers to increase the productivity of agricultural use of these lands and environmental protection. The results of our studies of the dependence of the dynamics of nitrate nitrogen on the norms of fertilizers are shown in Tables 1, 2, Figure 1.

The content of nitrate nitrogen in the sand on the fertilized variants is directly dependent on the applied fertilizer rates. Nitrogen in the norms of 150, 200 and 250 kg / ha against the background of phosphorus and potash fertilizers creates a significant difference in the content of nitrate nitrogen in a meter layer of sand. This difference is observed in all phases of plant development. Thus, at the norms of N – 250, P_2O_5 – 175, K_2O – 125 kg / ha, the content of nitrate nitrogen in a meter layer of sand with 2-4 real leaves was 15.1, at budding – 11.8, at flowering – 15.7, and at the end of the growing season – 8.6 mg/ kg of sand. When using N – 200, P_2O_5 – 140, K_2O – 100 kg /ha + 40 tons of manure, the content of nitrate nitrogen in the sand at the specified time was 15.4; 11.7; 17.2 and 9.0, respectively, against the same background, mineral fertilizers + 60 tons of lignin 14.6; 11.1; 15.2 and 8.5 mg/ kg of sand.

Table 1. Nitrate nitrogen content in sand depending on fertilizer standards (field experience)

Experience options	Annual rates of mineral fertilizers, kg/ha			Norms of manure and lignin, t/ha	Sand horizons, cm	Nitrogen content, mg/kg sand			
	N	P_2O_5	K_2O			2-4 nast. the sheet.	budding	blossom	end of the growing season
1	150	105	75	-	0-30 30-50 0-100	2,9 2,7 12,3	1,5 1,6 7,6	3,0 2,5 13,2	1,3 1,0 6,5
2	200	140	100	-	0-30 30-50 0-100	2,0 1,9 6,9	1,6 1,5 5,4	1,8 1,8 6,8	1,3 1,1 3,8
3	250	175	125	-	0-30 30-50 0-100	4,0 2,9 15,1	3,0 2,5 11,8	4,5 3,1 15,7	1,9 1,6 8,6
4	200	140	100	40 tons of manure	0-30 30-50 0-100	3,2 2,5 15,4	1,8 1,7 11,7	5,0 3,0 17,2	1,7 1,4 9,0
5	200	140	100	60 t lignin	0-30 30-50 0-100	3,5 2,7 14,6	2,9 2,3 11,1	3,4 2,9 15,2	2,0 1,7 8,5

The highest content of nitrate nitrogen in a meter layer of sand was observed when applied against the background of mineral fertilizers (N – 200, P_2O_5 – 140, K_2O – 100 kg/ha) + 40 t/ha of manure.Studies of the seasonal dynamics of nitrate nitrogen in the experimental variants allowed us to establish that, regardless of the norms of mineral fertilizers, the process of nitrate accumulation is activated from spring to summer, reaching a maximum of 2-4 real leaves and in the flowering of cotton. At the end of the growing season, the nitrate content in the soil decreases, which is explained by temperature factors, a decrease in microbiological activity and the general removal of nitrates by plants.

Table 2. The content of nitrate nitrogen in sand, depending on the norms of fertilizers (vegetation experience)

Experience options	Annual rates of mineral fertilizers, g/vessel			Norms of rye, manure and lignin, g/vessel	Nitrate nitrogen content mg/kg of sand			
	N	P_2O_5	K_2O		2-4 nast. the sheet.	budding	blossom	end of the growing season
1	-	-	-	-	1,5	sl.	1,3	sl.
2	6,0	-	-	-	14,1	9,7	13,2	6,0
3	6,0	5,0	-	-	14,5	11,3	13,7	6,8
4	6,0	-	3,0	-	14,0	10,8	13,5	6,5
5	6,0	5,0	3,0	-	14,8	12,2	13,7	6,3
6	6,0	5,0	3,0	-	15,2	12,7	14,8	6,9
7	6,0	5,0	3,0	235-manure	22,6	20,5	21,2	9,7
8	6,0	5,0	3,0	350-lignin	19,7	16,2	19,0	8,0
9	-	5,0	3,0	-	1,7	1,0	1,4	сл.
10	9,0	-	-	-	27,3	23,5	25,4	12,2
11	9,0	5,0	-	-	26,8	22,6	25,9	12,5
12	9,0	-	3,0	-	26,4	23,5	26,4	12,7
13	9,0	5,0	3,0	-	27,3	24,0	26,9	13,0
14	9,0	7,0	3,0	-	27,8	23,5	27,3	12,7
15	9,0	7,0	4,5	-	27,3	23,1	26,4	13,0
16	9,0	7,0	4,5	175-rye	32,4	27,3	31,0	15,0
17	9,0	7,0	4,5	235-manure	36,6	31,0	35,2	16,2
18	9,0	7,0	4,5	350-lignin	34,0	28,3	32,4	15,9
19	12,0	7,0	4,5	-	47,0	41,0	45,2	18,3
20	12,0	10,0	4,5	-	49,0	45,2	48,0	19,0
21	12,0	10,0	6,0	-	49,0	44,4	47,0	19,7
22	12,0	10,0	6,0	235-manure	56,6	53,8	55,6	21,2
23	12,0	10,8	6,0	350-lignin	52,8	48,0	50,8	20,1

A similar pattern of nitrate nitrogen content in sand, depending on the norms of fertilizers, was noted in all the years of research and in the vegetation experiment (Table 2).

Dynamics of mobile forms of phosphorus in sand. Phosphorus fertilizers introduced into the carbonate soils of Central Asia undergo significant transformations, as a result of which their digestibility and solubility change. This occurs as a result of a variety of chemical, physical, physico-climatic and microbiological processes occurring in the soil during fertilization.

Phosphorus fixation in the soil occurs mainly with calcium and magnesium, to a lesser extent with aluminum and iron. In addition, phosphorus is fixed by microorganisms that use it in the process of vital activity. Microorganisms convert mineral phosphorus into organic phosphorus, which is inaccessible to plants. After the death of microorganisms, organic phosphorus again passes into mineral forms available to plants.

The total phosphorus content in the soil cannot serve as a decisive criterion for soil fertility. To assess it, it is not the absolute values of the phosphorus content that matter, but the forms of compounds in which it is located, the degree of their mobility and accessibility for cotton.

For normal growth and development, it is important not only the content of nutrients in general, but also the nature of the seasonal dynamics of these elements in the soil, since the need for nutrients varies in different periods of plant life. The dynamics of soil phosphates may depend on a number of factors, including the concentration of electrolytes in the soil solution.

The amount of phosphates can be determined by the nature of the surface of soil colloids and their electrokinetic properties, which can change not only for a long time, but also for a short period, especially in summer, when the vital activity of microorganisms is most intense in the soil, physico-chemical processes and chemical reactions occur rapidly due to changes in the water and thermal regimes of the soil.

Water-soluble forms of phosphorus fertilizers are strongly absorbed by the soil when they are applied to the soil. The fixation of phosphates depends on the type of soil, the temperature and degree of its moisture and the forms of phosphorus fertilizers. The introduction of phosphorus fertilizers and phosphorus-containing fertilizers significantly increases the content of assimilated phosphorus in the soil, thereby dramatically improving the phosphorus nutrition of plants. The systematic use of mineral fertilizers increases the content of gross and mobile forms of nutrients in the soil and increases their solubility.

Erosion has a strong influence on the phosphorus content in the soil. Phosphorus losses due to erosion are usually proportional to soil losses per unit area. Phosphorus losses are especially significant during erosion of finely dispersed mineral and organo-mineral particles and organic matter, which contain the bulk of compounds of this element. Studies have found that the total phosphorus content varies less along the soil profile than humus and nitrogen. Therefore, unlike organic matter and soil nitrogen, the difference in the content of common and mobile forms of phosphorus due to the degree of erosion of the soil cover in the arable layer in the entire soil column is less pronounced.

The lower content of mobile phosphates in eroded soils explains the well-known fact of the high efficiency of increased doses of phosphorus fertilizers on most washed and blown soil differences of all major types and subtypes of soils and agricultural zones, G.A.Cheremisinov.

Phosphorus is the most scarce nutrient element for plants, and therefore agrochemical control is especially important when using phosphorus fertilizers, and the study of methods of differentiated application of phosphorus fertilizers, taking into account the availability of soil, deserves the most serious attention.

The determination of the dynamics of mobile phosphates in planned bumpy-dune sands, depending on the norms of fertilizers, is of great importance for the correct and most effective use of them. These studies have not been carried out in the conditions of the sands of Central Fergana before. The results of agrochemical studies on the seasonal dynamics of mobile phosphates in sand, shown in Tables 3, 4, show that in the conditions of planned bumpy-barkhanist sands, with an increase in the rate of phosphorus fertilizers used, the content of mobile phosphorus in the 0-30 cm layer of sand increases. In the spring, when cotton had 2-4 real leaves, after applying phosphorus fertilizers at the rates of 105, 140, 175 kg / ha, the content of mobile phosphorus in the sand at a depth of 0-50 cm increased accordingly to the applied norms of phosphorus fertilizers to 1,4; 1,7; 11,0; 13,3; 14,3; 9,9; 10,3; 14,7; 14,0; 9,1; 13.5; 17.5; 16.4; 10.3 and 11.8; 13.5; 12.0; 10.0 mg/kg of sand.

Table .3: The content of mobile phosphorus in sand, depending on the norms of fertilizers (field experience)

Experience options	Annual rates of mineral fertilizers, kg/ha			Norms of manure and lignin, t/ha	Sand horizons, cm	Mobile phosphorus content, mg/kg of sand			
	N	P_2O_5	K_2O			2-4 nast. the sheet.	budding	blossom	end of the growing season
1	150	105	75	-	0-30 30-50	2,0 1,4	2,3 1,7	1,7 sl.	1,7 sl.
2	200	140	100	-	0-30 30-50	12,0 11,1	15,8 13,3	15,2 14,3	12,2 9,9
3	250	175	125	-	0-30 30-50	12,5 10,3	18,2 14,7	15,0 14,0	11,9 9,1
4	200	140	100	40t of manure	0-30 30-50	14,8 13,0	19,1 17,5	18,5 16,4	13,3 10,3
5	200	140	100	60t lignin	0-30 30-50	15,1 11,8	19,2 13,5	15,2 12,0	12,7 10,0

The same pattern in the change in the content of mobile phosphates in the sand was noted by us in the phases of budding, flowering and at the end of the growing season of cotton in all years of research in both field and vegetation experiments (Table 3).

The largest amount of powdered phosphorus in the soil was recorded in variants with the introduction of mineral fertilizer, where 40 t/ha of nitrogen and 60 t/ha of lignin. By the end of the growing season of cotton, its content decreases sharply, which is explained by the removal of phosphorus by plants, the temperature factor and a decrease in the biological activity of microorganisms.

The use of 40 t/ha of manure (var.11) or 60 t/ha of lignin (var. 12) against the background of N – 350, P_2O_5 – 250, K_2O – 170 kg/ha increases the content of mobile phosphorus in sand in comparison with the variant where only mineral fertilizers applied in the same norms were used (var. 10). Thus, the content of mobile phosphorus in sand in variant 10 was 18.0 mg/kg of sand at the beginning of the growing season and 16.3 mg/kg of sand at the end of the growing season. The use of 60 t/ha of lignin and 40 t/ha of manure increased these indicators to 21.4-19.5 mg/kg of sand and to 24.2-20.4 mg/kg of sand, respectively.

Table 4: The content of mobile phosphorus in sand, depending on the norms of fertilizers (vegetation experience,)

Experience options	Annual norms of nutrients, g/vessel				Mobile phosphorus content, mg/kg of sand			
	N	P_2O_5	K_2O	manure, rye, lignin	2-4 nast. sheet	budding	blossom	end of the growing season
1	-	-	-	-	1,7	2,3	1,4	1,1
2	6,0	-	-	-	2,3	2,6	1,7	1,1
3	6,0	5,0	-	-	26,5	29,0	25,0	15,7
4	6,0	-	3,0	-	2,3	2,6	2,0	1,4
5	6,0	5,0	3,0	-	26,0	27,5	24,2	17,1
6	6,0	5,0	3,0	-	27,0	29,0	24,6	16,1
7	6,0	5,0	3,0	235-manure	34,5	36,0	32,5	19,2
8	6,0	5,0	3,0	350-lignin	31,5	33,0	27,0	17,8
9	-	5,0	3,0	-	27,0	30,5	24,2	16,4
10	9,0	-	-	-	2,0	2,6	2,0	1,4
11	9,0	5,0	-	-	26,5	28,5	24,2	16,4
12	9,0	-	3,0	-	2,0	2,3	2,0	1,4
13	9,0	5,0	3,0	-	27,0	28,5	25,0	16,8
14	9,0	7,0	3,0	-	34,5	37,0	32,5	19,6
15	9,0	7,0	4,5	-	35,0	38,0	33,5	20,0
16	9,0	7,0	4,5	175-rye	37,0	39,5	35,0	20,7
17	9,0	7,0	4,5	235-manure	42,0	46,4	39,0	24,2
18	9,0	7,0	4,5	350-lignin	38,5	40,0	36,5	22,5
19	12	7,0	4,5	-	36,5	38,5	34,0	20,4
20	12	10	4,5	-	41,4	46,4	38,0	23,5
21	12	10	6,0	-	42,0	47,0	39,0	24,2
22	12	10	6,0	235-manure	51,0	55,0	49,3	31,0
23	12	10	6,0	350-lignin	47,8	49,2	44,2	29,0

The same dependence of the content of mobile phosphorus in sand on the norms of mineral and organic fertilizers used in the experiment is observed in all the years of research and in the vegetation experiment (Table. 4).

Dynamics of potassium exchange in sand. In connection with the study of the conditions for the effectiveness of the use of potash fertilizers, the determination of the availability of potassium for plants is of great importance. When applying potash fertilizers in the soil, easily mobile forms of potassium are fixed. The amount of fixed potassium depends on a number of factors: the norms of fertilizers, the time of interaction with the soil, the mechanical composition of the soil, the accompanying potassium anion, the fertilizers applied.

The content of mobile potassium in the soil depends on its humidity, temperature, etc. An increase in humidity and temperature contributes to an increase in the amount of exchangeable potassium in the soil. Periodic drying of the soil leads to potassium fixation. The study of the dynamics of potassium exchange on the deflated bumpy-velvety sands of Central Fergana has not been carried out before. The results of studying the seasonal dynamics of potassium exchange in sand are presented in Tables 5, 6.

Table 5: The content of exchangeable potassium in sand, depending on the norms of fertilizers (field experience)

Experience options	Annual rates of mineral fertilizers, kg/ha			Norms of manure and lignin, t/ha	Sand horizons, cm	2-4 nast. sheet.	budding	blossom	end of the growing season
	N	P_2O_5	K_2O						
1	150	105	75	-	0-30 30-50	70 60	65 55	65 50	50 40
2	200	140	100	-	0-30 30-50	70 55	60 50	60 55	55 50
3	250	175	125	-	0-30 30-50	65 60	55 50	50 40	45 35
4	200	140	100	40 tons of manure	0-30 30-50	100 90	95 80	80 75	75 70
5	200	140	100	60 t lignin	0-30 30-50	110 100	100 95	95 85	85 75

C the possession of exchangeable potassium in the sand of variants fertilized with potash fertilizers is proportional to the norms of fertilizers used, so if, when applied from the sand, 75 kg/ha of K_2O against the background of N+150, P_2O-105 kg/ha, the content of exchangeable potassium in the sand (0-30 cm) with 2-4 real leaves was 60, in budding – 55, in flowering – 50 and at the end of the growing season – 40 mg/kg of sand, then when adding K2O – 100 kg/ha against the background of 200 kg/ha of nitrogen and 140 kg/ha of phosphorus, the content of exchangeable potassium in the same time was already equal to 55, 50, 55 and 50 mg/kg of sand, respectively (Table. 6).

Table 6: The content of exchangeable potassium in sand, depending on the applied norms of fertilizers (vegetation experience)

Experience options	Annual rates of mineral fertilizers, g/vessel			Norms of rye, manure and lignin, g/vessel	Content of exchangeable potassium, mg/kg of sand			
	N	P_2O_5	K_2O		2-4 nast. the sheet.	budding	blossom	end of the growing season
1	-	-	-	-	55	50	45	35
2	6,0	-	-	-	60	55	40	35
3	6,0	5,0	-	-	50	45	40	30
4	6,0	-	3,0	-	120	110	95	90
5	6,0	5,0	3,0	-	115	110	100	85
6	6,0	5,0	3,0	-	120	115	100	90
7	6,0	5,0	3,0	235-manure	190	170	160	150
8	6,0	5,0	3,0	350-lignin	170	160	140	130
9	-	5,0	3,0	-	115	110	90	85
10	9,0	-	-	-	60	50	45	40
11	9,0	5,0	-	-	65	55	50	40
12	9,0	-	3,0	-	115	110	95	90
13	9,0	5,0	3,0	-	120	115	100	95
14	9,0	7,0	3,0	-	120	110	100	90
15	9,0	7,0	4,5	-	230	200	180	140
16	9,0	7,0	4,5	175-rye	270	250	220	190
17	9,0	7,0	4,5	235-manure	365	310	260	240
18	9,0	7,0	4,5	350-lignin	320	300	250	210
19	12,0	7,0	4,5	-	240	200	190	170
20	12,0	10,0	4,5	-	240	210	180	170
21	12,0	10,0	6,0	-	380	330	300	270
22	12,0	10,0	6,0	235-manure	490	450	400	350
23	12,0	10,0	6,0	350-lignin	430	400	360	310

It should be noted that with an increase in the applied phosphorus nitrogen norms against the background of an unchanged potassium norm, the content of exchangeable potassium in the sand in the stage 2-4 of these leaves increases slightly. So, when applying N – 250, P_2O_5 – 175, K_2O – 125 kg / ha, the content of exchangeable potassium in the sand with 2-4 real leaves is 60, in budding – 50, in flowering 40 and at the end of the growing season – 35 mg / kg of sand, further decreases, the potassium content in the sand increases when manure is applied and lignini (Table 5).

CONCLUSION

The identical dependence of the content of exchangeable potassium in sand on the applied norms of fertilizers was noted by us in all the years of research and in the conditions of vegetation experience.

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