

METHODOLOGY OF CREATION OF ARTIFICIAL AND NATURAL SCREENS OF HILLY-BARCHAN SANDS AND ITS INFLUENCE ON COTTON CROP

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ABSTRACT. The article examines the influence of artificial and natural screens on the growth and development of cotton on the planned undulating sandy soils of Central Fergana. The introduction emphasizes the importance of improving the meliorative condition of sandy lands to increase cotton and other crop yields in the region. The article develops technology for water conservation and improvement of the ecological and meliorative condition of sandy lands through the creation of natural and artificial screens. It is determined that as a result of creating natural screens in cotton fields of farms, bolls open 3-4 days earlier.

KEY WORDS: soil, sand, cotton, fertilizer, option, ameliorative condition, erosion, Central Fergana, land, layer.

INTRODUCTION. In our republic in the years of independence large-scale measures on effective utilization of irrigated sands and sandy loam lands and improvement of ecological and reclamation condition of lands were carried out. As a result of these measures on sandy and sandy loam lands, in particular, from each hectare of agricultural lands in Central Fergana, an increase in raw cotton yield by 2-3 centners and wheat yield by 4-6 centners was achieved. At the same time, due attention is not paid to the development of acceptable agro-technologies aimed at determining the genesis, morphogenetic properties of sandy and sandy loam lands with difficult reclamation condition, prevention of erosion processes occurring in them. In the Action Strategy of the Republic of Uzbekistan for 2017-2021 "...further improvement of reclamation state of irrigated lands, development of the network of reclamation and irrigation facilities, wide introduction of intensive methods, first of all modern water and resource-saving agro-technologies into agricultural production" is defined as one of the important strategic objectives. In this respect, scientific research works on improvement of reclamation state of infertile, difficultly reclaimed sandy lands, development and introduction of modern water and resource-saving agrotechnologies are of great importance.

The issues of agrophysical, agrochemical properties, genesis and increase of productive capacity of sands of Central Fergana were studied by A.Baraev[1], K.Mirzazhanov[2], A.Gayel[3], L.Gafurova[4], V.Gussak[5], Sh.Nurmatov[6], C.Zakirova[7], and others. Mechanisms of wind

erosion were studied by M.A.Sokolov, K.Mirzazhanovs, and the role of wind in soil formation is given in the works of V.V.Dokuchaev.

MATERIALS AND METHODS. The research was conducted on the territory of Yazyavan fog farm of "Yorkina Kasimova", "Salizhanabad" and named after Z.Ganiev of Kushtepinskiy fog of Fergana viloyat of the Republic of Uzbekistan. Z.Ganiev of Kushtepinsky fog of Fergana viloyat of the Republic of Uzbekistan. Climatic conditions are typical for Central Fergana. To characterize the sand composition and its occurrence after planning works, section 210-A was laid down.

Section 210-A, S.Zakirova, A.Makhataev, S.Akbarova, Newly developed planned hilly-barchanic sands. The section is laid at a distance of 50 m from the road connecting the state farm with the Central Fergana highway north.

0-30 cm The arable layer is gray, medium-grained loose sand, dry from above, moistened from below, rarely penetrated by plant roots.

30-50 cm The subplough layer is slightly compacted, moist, loose, sand, in some places there are lenses, spots of coarse-grained sand, rarely there are plant roots. The transition is slightly noticeable.

50-100 cm Gray, wetter than the previous one, compacted, homogeneous, medium-grained sand. Transition is noticeable.

100-115 cm Homogeneous in composition and color, gray with pale tint, medium-grained loose sand, many sand grains with whitish tint, wetter than the previous one. Transition is noticeable.

115-155 cm Gray, compacted, not firmly lumpy structure, heterogeneous in mechanical composition - sand with loam and lenses of light sand, very many salt veins. The transition is noticeable.

155-200 cm Dirty-pale with white carbonate patina, very moist, compacted, with lenses of loam and sand of lumpy structure.

To characterize the soil cover of the experimental plot with natural screen laying we have laid down a soil transect.

The thickness of homogeneous sand reaches 50 and more cm. The homogeneity of the profile is broken from 50 cm, where sand is joined by loam with rust spots and plant remains. The water-retaining horizon under the sand is saline, consists of shochic and arzic material, and is dense in composition. The groundwater table varies from 130 to 180 cm.

Thus, there is a water-retaining horizon under the level sands, which prevents water from seeping downwards, and a micro-reservoir is formed under the force of the sand in the section. It was mentioned above that the capillarity of the sands is about 70 cm. From the given materials it is possible to draw a fundamental conclusion that at leveling of sands the thickness of sand horizon should be at the depth of 70-80 cm.

Methodology of laboratory experiment. In order to prevent nutrient elements leaching and improve water regime of sands, the effect of artificial screen from fine-grained soils (discharges of their cleaning of collector-drainage network) was studied in laboratory conditions. The experiment was laid in polyethylene tubes 4.5 cm in diameter, 1 m long. The artificial screen was created at a depth of 40 and 70 cm, 8 cm thick. The tube contained 1.8 kg of sand and 0.200 kg of soil (fine soil).

It was watered in three steps on the first, third and sixth days at 500 ml each, i.e. a total of 1500 ml of water was used for watering. NRC g in the form of ammonium nitrate (34%), superphosphate (20%) and potassium chloride (50%) were applied at filling.

Methodology of the field experiment. The thickness of the planned sands is different. Therefore, in order to determine the optimal depth with artificial screen, field experiments were conducted in artificial and natural screen conditions. Two field experiments were set up. To study the effect of artificial screen on growth, development and yield of cotton. The scheme of experiment 1 is as follows:

1st variant-control. The thickness of leveled sand is more than 2 meters;

2nd variant - introduction of emissions from collector-drainage network cleaning in the amount of 400 tons/ha;

3rd variant - the same 600 t/ha;

4th variant - the same 800 t/ha;

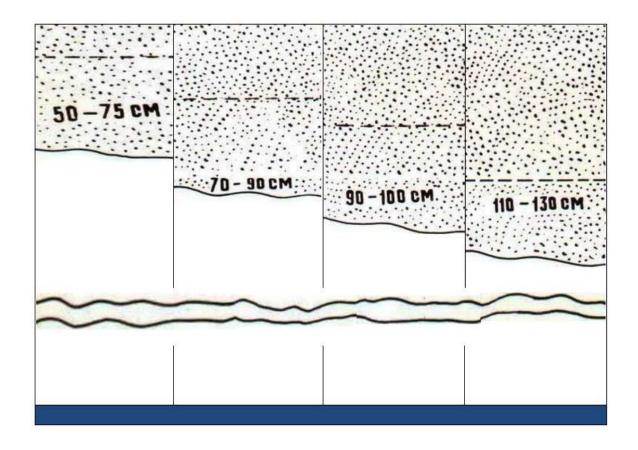
5th variant - the same 1000 t/ha. Plowing was done by tractor C-100 to a depth of 40 cm with a planter plow. Using the same norms of fine-grained soil, the screen was created at a depth of 70 cm.

The area of the plot is 10x3,6 m, accounting 24 m2. Repetition of the experiment 3-fold. Annual rate of fertilizers N350, P250, K170 kg/ha, the method of application is usual, used in the farm.

Experiment I was laid on the plot with natural ground occurrence (ground occurs at the depth of 0-110 (130)¹; 0-90 (110); 0-70 (90); 0-50 (75) cm with sand thickness up to 130 cm in some places, in spring. The plot area was 240 m2.

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¹ At a depth of 110 (130) cm there is heavy soil.



Mechanical composition of soil-soils Fig. 1 Structure of sand-soils of the experimental plot with natural screens.

Table 1
Schematic of the experiment with natural ground occurrence

Sand depth, cm	Variation number	Annual norm, kg/ha				
Sand depth, em	v arration number	N	P_2O_5	K ₂ O		
	I-1	250	150	170		
Contour I	2	250	200	170		
0-110 (130)	3	350	350 200			
	4	350	250	170		
	II-1	250	150	170		
Contour II	2	250	200	170		
0-90 (100)	3	350	200	170		
	4	350	250	170		
Contour III	III-1	250	150	170		
0-70 (90)	2	250	200	170		

	3	350	200	170
	4	350	250	170
	IV-1	250	150	170
Contour IV	2	250	200	170
0-50 (75)	3	350	200	170
	4	350	250	170

On the experimental plots cotton variety C-6524 was sown. Agrotechnics of cotton cultivation on experimental plots. After careful planning we cut furrows for irrigation simultaneously with sowing rye on the ridge in order to protect sands from deflation, for which we used a special seeder. Seed sowing rate was 40-50 kg/ha.

Table 2.

Growth and development of cotton depending on fertiliser rates (production experiment)

Var. Experience Annual rates of mineral fertilisers, kg/ha		Manure and lignin rates,		Height of main stem, cm							
	N	P ₂ O	K ₂ O	tonnes/ha	na 1.VI		1.	I.VII 1		1.VIII	
1	200	140	100	-	11,6	-	30,5	16,6	64,0	61,7	
2	200	140	100	40 tonnes of manure	12,2	-	34,0	20,3	67,0	66,0	
3	200	140	100	60 tonnes of lignin	12,0	-	30,0	17,0	65,0	64,2	

				Qu	ıantity, p	ocs.				
Var. Experience	Real le	aves	Sympodial branches				Boxes			
	1.VI	1.VII	1	.VI	1.	1.VII		'III	1.I	X
1	2.8	7.4	2.0	-	9.8	9.9	2.2	1.7	7.0	6.8
2	3.0	9.4	2.0	-	10.4	11.0	2.5	2.3	7.7	7.3

3	3.0	7.5	2.0	-	9.5	10.0	2.2	2.0	7.3	7.0	Ī
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RESULTS. Based on the conducted vegetation and field experiments, we have established the optimal fertiliser rates that allow to significantly increase the productivity of cotton on the planned hilly-barchanic sands of Central Fergana. These fertiliser rates were tested by us in production conditions in virgin farm 'Salizhanabad' of Kushtepa fog of Fergana region. The results of phenological observations of growth and development of cotton plants in the conditions of production experiment, presented in Table 2, show that the applied fertilisers had a positive effect on growth, plant development and accumulation of fruit elements in cotton plants.

When mineral fertilisers were used at the rates of N-200, P2O5-140, K2O-100 kg/ha, the height of the main stem was 64.0-61.7 cm, respectively. Number of sympodial branches-9.8-9.9 pcs. number of bolls-7.0-6.8 pcs.

Application of 60 t/ha lignin (var.3) on the background of mineral fertilisers resulted in the increase of main stem growth up to 65-64.2 cm, the number of sympodial branches up to 9.5-10.0 pieces, and the number of bolls up to 7.3-7.0 pieces (respectively by years of the study).

The analysis of yield data presented in Table 3 convincingly proves the correctness of the optimal rates of mineral fertilisers that we have established.

Table 3
Raw cotton yield depending on fertiliser rates (production experience)

Var. Experienc e		Annual rates of mineral fertilisers, kg/ha		Manure and lignin rates, tonnes/ha	Average yield by years, c/ha		Average yield for 2 years, c/ha	Increase (c/ha) from manure and lignin on average for 2 years
	N	P ₂ O	K ₂ O					
1	200	140	100	-	23,1	22,8	22,9	-
2	200	140	100	40 tonnes of manure	29,0	25,0	27,0	4,1
3	200	140	100	60 tonnes of lignin	26,2	23,6	24,9	2,0

DISCUSSION. On average for two years, the yield of raw cotton at application of N-200, P2O5-140, K2O-100 kg/ha in our production experiment was equal to 22.9 centners/ha, while on similar sands on economic crops of state farm 'Salizhanabad' it did not exceed 10 centners/ha.

Application of 60 t/ha of lignin (var.3) against the background of the above norms of mineral fertilisers increased the yield of raw cotton in the year of action up to 26.2 c/ha, and in the year of after-effect up to 23.6 c/ha.

Application of 40 t/ha of manure on the background of these norms of mineral fertilisers led to further increase in cotton yield. Compared to var.1, where only mineral fertilisers were applied, the gain from manure application was 5.9 c/ha in the year of action and 2.2 c/ha in the year of follow-up.

CONCLUSIONS: On planned and old-developed sand hills, barchans, rows of Central Fergana irrigated areas with natural screen and with sands, sandy loam, and in some places with light loam on the surface are found. Sandy areas studied during the research, by genesis on the surface consist of sands, and in the lower horizons of heavier mechanical composition. The thickness of surface horizons of these planned soils reaches from 30 cm to 140 cm, in some places up to 2-3 metres. Developed sands of Fergana valley are dry and defenseless, and are exposed to wind erosion at wind speed of 4.3-4.5 m/sec. In these territories, in order to prevent wind erosion processes by means of silt settling and treatment, the creation of artificial screens is achieved.

Creation of artificial screen by means of treatment with silt wastes of drainage (fine earth), from the first years had positive influence on volume mass of arable and subsoil (0-30 and 30-40 cm) layers of investigated sandy soils. In the experiments, at application of 1000 tonnes per hectare of fine soil at 0-30 cm layer of soils in relation to the control, the volume mass was 1.43 g/cm3, and in 30-40 cm layer this index averaged 1.42 g/cm3. When creating an artificial screen, the moisture content of sands noticeably increases, the field moisture content increases down the profile. On the control variant moisture content in 0-30 cm layer was 4.3%, in 30-40 cm layer 5.8%, at application of fine sands 1000 tonnes per hectare field moisture capacity increases to 8.4-22.5, respectively.

RECOMMENDATIONS. For farming on planned sands with natural screen, in these conditions the surface of sands can be protected from wind erosion by 12-14 cm layer of rye residues (roots, stubble), at that the plantation density is 170-200 pcs./m2. To obtain high and quality cotton yields from sandy areas with a thickness of 50-75 cm with a natural screen, it is recommended to apply nitrogen fertilisers in the amount of 250 kg, phosphorus 200 kg and potassium 170 per hectare. In the phase of 2-3 leaves of sympodia, dividing the furrow bed using a cultivator, and creating a new furrow gives a positive result. Creation of artificial screens in cultivation of winter wheat on planned developed sands does not bring economic benefit, therefore these agro-ameliorative measures are not recommended.

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