



THE INFLUENCE OF TILLAGE METHODS ON THE CHANGES IN THE AGGREGATE CONDITION OF THE SOIL

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ABSTRACT

This article discusses the impact of tillage methods on the overall condition of the soil. By tillage, the soil can be improved agronomically. Choosing the perfect method of cultivation creates favorable conditions for the crops grown. This leads to an increase in their productivity. After winter wheat, it was found that the aggregate composition of the soil improved from its original state, regardless of the tillage methods. The method of tillage without turning the soil to a depth of 20-25 cm creates the most favorable soil composition of granular, porous, and ensures the rapid growth and development of repeated crops in this agro-fund.

KEYWORDS: *plowing, chisel, processing, cotton, yield, crop, cotton, row, agrochemical, water-physical.*

INTRODUCTION

In the global cotton industry (USA, China, India), special attention is paid to the efficient use of resources and energy, the use of technologies and equipment that will save them, improving the agronomic properties of the soil, increasing its fertility, water-physical, agrochemical properties, as well as growing high-quality cotton by developing effective methods and timing of soil cultivation. Preparing the soil for sowing, processing cotton between rows are the most energy-intensive agrotechnical measures, which consume 40-50% of all energy expended from sowing to harvesting cotton. In this regard, the application of new resource-saving minimum and zero technologies that protect the soil in the main and additional tillage is a topical issue.

Therefore, it is important to restore, maintain and regularly improve soil fertility and efficiently use available resources by determining the optimal methods and timing of irrigated land cultivation and the correct choice of repeated types of crops. With this in mind, we conducted research.

At the beginning (without tillage) of the study, the water-physical properties of the field soil, in particular the mechanical composition, aggregate composition, bulk density, porosity, and water permeability, were determined as preliminary data.

Therefore, S.N. Ryzhov [1; p.246.] stressed the importance of starting research work in the field of irrigated agriculture with the study of the water and physical properties of the soil.

S.N.Ryjev, L.N.Slesarova [3; pp.3-19.] proved that in the mechanical composition of gray soils large dust particles are 40-60% less fractions of 0.1 mm, colloidal particles are even less.

According to F.M.Khasanova, A.Bakhromov, A. Khaidarov [4; pp.149-152], after harvesting wheat on typical gray soils of the Tashkent region, the plant grew well in summer, after plowing to a depth of 28-30 cm with a double plow and planting soybeans. In addition, the agrophysical condition of the soil, ie the bulk density decreased by 1.152 g/cm³ compared to other options, improved by 1.2-5.6% depending on the porosity.

Also, the number of agronomically useful particles in the plowing layer was 70.7-71.7%. These figures decreased by 8.1-10.2% in the chisel-planted variants and by 3.8-9.8% in the plowed layers. A significant decrease in soil moisture was also observed in these options.

In the variants of corn planted on 20-22 and 28-30 cm tillage after winter wheat, it was found that the number of agronomically useful particles was 72.6-80.1% and the density was reduced by 1.0-1.7%.



In the studies of F.M. Khasanova, I.K. Karabaev, D. Mavlyanov [5; pp.248-251] of typical irrigated gray soils of Tashkent region were left in the soil 25, 50 and 100% of plant residues, leaving 100% of plant residues in the soil with continuous plowing and plowing at intervals of a year, grain yield improved after planting cotton, winter wheat and moss, when plowing at intervals of a year.

Since our research is carried out annually in different fields, the proportion of particles with a mechanical content of 1.0-0.25 mm is 3.5-5.2; 3.0-5.7 and 3.5-5.4%, while the particles of 0.1-0.05 mm were greater than 8.0-25.4; 6.8-27.4 and 9.3-23.2%.

It is also noteworthy that in the layer of 0-30 and 0-75 cm the total sand is 36.7-18.6%; 37.2-20.4 and 32.0-22.0%, while physical clay (<0.001 mm) was 33.9-45.6; 38.5-47.1 and 37.2-45.4%, respectively. (Table 1).

Therefore, despite the tendency of the experimental field soil to heavy sand, complete

subsidence of the lower layers was not observed. The high level of agricultural culture, soil culture, agrochemical properties, the full introduction of alfalfa-wheat-cotton rotation, as well as the optimal reclamation condition, the location of groundwater at a depth of 4-5 m also had a positive impact on the mechanical composition of the soil.

Thus, according to the results of the analysis, the light gray soil of the experimental field can be considered as medium sandy in texture.

The aggregate composition in the 0-100 cm soil layer of the experimental field was also studied, as changes in these parameters are observed under the influence of the tillage methods and timing we used.

It is known that aggregates or structures are formed during the transition of mineral particles to a granular state under the influence of humus and other compounds.

Table 1.
The initial mechanical composition of the experimental field soil, %

Soil layer, cm	Fractions, mm							Total sandy layer, 1.0-0.05 mm	Total physical mud, <0.001 mm
	1.0-0.25	0.25-01	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001		
Field 1									
0-30	3.9	6.5	26.3	24.5	9.6	10.3	14.0	36.7	33.9
30-45	4.1	7.1	25.4	29.0	8.5	11.1	12.2	35.6	31.8
45-60	5.2	12.7	8.0	31.6	8.0	14.0	17.4	25.9	39.4
60-75	3.6	4.6	1.6	30.8	11.8	15.3	18.5	18.6	45.6
75-100	3.5	3.1	14.7	31.4	9.3	17.9	17.3	21.3	44.5
100-120	3.5	3.0	19.5	40.7	9.9	8.3	11.1	26.0	29.3
Field 2									
0-30	4.3	5.9	27.0	25.2	10.7	12.0	15.8	37.2	38.5
30-45	3.9	8.2	25.9	27.5	7.9	12.3	14.0	38.0	34.2
45-60	5.7	12.5	6.8	23.0	8.0	13.7	19.1	25.0	40.8
60-75	4.5	4.9	11.0	31.0	11.4	15.8	19.9	20.4	47.1
75-100	3.0	3.8	16.2	29.0	10.1	17.7	17.0	23.0	44.8
100-120	4.3	3.6	19.9	40.9	8.3	9.8	12.2	27.8	30.3
Field 3									
0-30	3.5	5.3	23.2	24.9	11.0	11.2	15.0	32.0	37.2
30-45	4.7	7.3	21.0	29.4	9.3	12.3	13.8	33.0	35.4
45-60	5.4	11.7	10.1	32.5	8.8	14.1	18.4	27.2	41.3
60-75	4.6	5.0	9.3	31.7	14.4	15.0	19.0	18.9	45.4
75-100	4.0	3.2	14.8	29.5	10.5	18.0	18.4	22.0	46.9
100-120	3.8	3.3	18.4	41.8	8.9	9.5	12.3	25.5	31.7

In his many years of research, S.N.Rylov [2; pp.135-137] emphasized the importance of micro-aggregates, which make up 70-80% of the soil of the Republic, noting that these aggregates contain the largest amount of carbon, nitrogen and phosphorus, so these aggregates are important in irrigated agriculture.

Analysis shows that the aggregate soil content of the experimental field is 73% of agronomically significant aggregates.

The data in Table 2 show that aggregates in soil with a diameter of more than 10 mm begin from a layer of 70-80 cm and have increased over the years of research by 16-36, 14-30 and 15-31%, respectively.



Aggregates with a diameter of 5-10 mm were 17.6, 15.7 and 18.5% in the 0-70 cm layer, and in the 70-80 cm soil layer, these values were 25.1; 22.8 and 23.1%, respectively.

In general, the agrophysically acceptable composition of the soil of the experimental fields is on average 63-71% of the soil weight in the composition of aggregates of 10-0.25 mm, which indicates that there are optimal conditions for the growth and development of plants.

It should be noted that we determined the effect of changes in soil aggregate composition first on the initial state, then after cultivation, and finally at the end of the application period of repeated crops.

To achieve these goals, after harvesting winter wheat, the soil was cultivated annually on experimental fields using the usual methods of summer tillage, plowing 32-35 cm, plowing 20-25 cm without tipping over and chiselling 15-18 cm. In the last two different backgrounds where the soil was cultivated, secondary corn, mash and soybeans were planted, leaving control options. It is known that any method of tillage, first of all, to some extent affects the composition of agronomically useful aggregates of the soil, leading to changes in the agrophysical and agrochemical environment of the soil and crop yields. (Table 2).

Table 2.
The initial aggregate composition of the soil, %

Soil layer, cm	Aggregates, mm							
	10	10-5	5-3	3-2	2-1	1-0.5	0.5-0.25	0.25
Field 1								
0-10	10.89	17.49	13.47	9.81	8.71	7.35	4.67	2.83
10-20	11.77	17.56	12.19	8.77	6.66	5.23	3.19	4.92
20-30	10.69	20.67	17.33	8.38	10.01	8.88	3.04	3.51
30-40	9.55	18.71	12.82	11.73	9.32	8.11	4.15	5.06
40-50	11.20	17.88	13.53	9.61	10.75	6.36	4.43	6.64
50-60	10.91	21.80	12.16	11.62	12.05	6.15	5.10	6.12
60-70	7.43	17.63	14.19	10.22	9.82	7.30	3.87	4.53
70-80	16.12	25.11	16.33	12.44	7.29	5.92	3.17	2.9
80-90	25.41	27.81	17.09	9.50	6.51	4.41	2.39	1.55
90-100	36.30	37.92	14.17	9.32	5.28	30.5	2.0	1.25
Field 2								
0-10	10.14	15.11	10.16	9.92	15.11	10.72	4.07	5.41
10-20	10.25	15.20	9.26	6.61	9.55	7.56	3.81	6.47
20-30	9.70	18.48	14.81	10.38	14.22	10.76	2.51	2.50
30-40	8.61	16.35	9.73	7.07	14.43	15.01	3.13	7.36
40-50	9.68	15.57	10.09	7.88	13.07	7.29	4.10	8.78
50-60	10.73	19.45	9.94	9.03	14.09	7.91	5.20	6.21
60-70	7.49	15.73	11.41	9.56	24.44	9.05	5.15	3.67
70-80	14.97	22.80	13.95	9.66	14.34	6.51	2.03	1.22
80-90	23.18	24.51	14.1	9.68	9.03	3.18	1.39	1.77
90-100	30.44	30.30	11.76	7.75	5.14	1.11	1.96	1.09
Field 3								
0-10	11.79	16.87	9.30	8.81	13.58	7.07	6.52	4.38
10-20	11.67	16.77	8.28	5.52	7.66	4.09	5.21	7.57
20-30	10.72	19.71	13.41	9.23	12.19	7.50	4.35	3.21
30-40	9.55	17.32	8.63	6.50	12.30	12.01	5.44	3007
40-50	10.08	18.43	9.10	6.54	14.38	4.16	6.48	2.92
50-60	11.68	20.80	8.06	8.24	13.60	4.47	7.11	3.87
60-70	8.72	18.54	10.07	8.38	13.33	6.89	7.70	4.03
70-80	15.19	23.14	12.51	8.48	13.53	3.09	4.27	2.17
80-90	21.31	26.57	13.25	7.81	8.50	1.36	3.41	1.98
90-100	31.66	32.73	10.53	6.03	4.55	1.32	1.60	1.53

Therefore, in the experiment, first of all, the effect of tillage methods on the composition of the field soil aggregate was studied.

According to the results of the experiment, close indicators were obtained in all 3 field conditions. After the autumn wheat, in the summer



the soil is plowed to a depth of 32-35 cm in the usual way, in the background layer of soil 0-30 cm 10 mm aggregates 6.44%, the number of particles were 10-5 and 5-3 mm 12.39 and 14.91%. At the same time, the number of agronomically useful aggregates of 2-1 and 1-0.5 mm was the highest, reaching 22.51 and 18.73%.

It should be noted that after the above method of plowing, the number of aggregates of 10 mm and 10-5 mm significantly decreased from the initial state, and, importantly, the number of aggregates of 2-1 and 1-0.5 mm increased by 15.41 and 10.33%, respectively.

So, as a result of the method of plowing the soil to a depth of 30-32 cm after wheat, the agrophysical environment of the soil is improved, creating a favorable soil environment. This background was postponed until the spring of next year.

After winter wheat, the number of aggregates of 2-1 and 1-0.5 mm in the non-tillage

method of tillage at a depth of 20-25 cm was 19.60 and 15.77%, respectively, compared to the usual method of plowing the soil to 30-32 cm, 91 and 3.40% decrease in agronomically useful aggregates was observed. In this way, a granular and porous soil composition was formed.

There was also an increase in the amount of large aggregates of 10 and 10-5 mm (9.58-16.63%) in the method of chisel tillage of 15-18 cm of soil after winter wheat, while the number of agronomically useful aggregates of 2-1 and 1-0.5 mm was significantly lower, 10.43 and 8.27%, respectively, which was 3.14 and 2.40% higher than the main plowing method. That is, a fine-grained, porous good soil environment was not formed. However, the amount of agronomically useful aggregates of 2-1 and 1-0.5 mm in the soil of these two methods increased by 13.38-1.42% in the plowing layer of the soil (0-30 cm) in proportion to the initial state (Table 3) and 4, increased by 21-7.06%.

Table 3.

Influence of tillage methods on soil aggregate composition,% (0-30 cm soil layer) (after tillage)

Option	Tillage methods	Fractions, mm							
		10	10-5	5-3	3-2	2-1	1-0.5	0.5-0.25	0.25
Field 1									
1-4	Main plowing	5.53	15.82	12.42	11.75	21.31	17.63	10.28	14.42
5-8	Plowing without tipping	6.81	13.63	11.13	10.36	17.53	12.24	7.19	12.15
9-12	Chiseling	8.27	10.24	8.42	7.03	13.33	8.55	5.78	6.26
Field 2									
1-4	Main plowing	7.20	14.73	13.63	11.92	18.33	13.53	21.31	13.50
5-8	Plowing without tipping	8.11	12.52	11.78	9.41	16.21	11.94	6.76	12.17
9-12	Chiseling	10.32	13.71	9.92	5.53	12.30	9.25	5.48	8.77
Filed 3									
1-4	Main plowing	6.44	12.39	14.91	12.22	22.51	18.73	15.55	18.51
5-8	Plowing without tipping	7.88	10.78	13.12	11.44	19.60	15.33	11.47	13.81
9-12	Chiseling	9.58	15.63	11.36	6.67	10.43	8.27	4.88	7.79

So, according to the results of experiments in 2017-2019, after the winter wheat, different tillage methods have created unique favorable soil environments and created opportunities to grow appropriate yields from repeated crops.

CONCLUSION

In summary, it was found that the aggregate composition of the soil improved from its original state, regardless of the methods of plowing the land after the winter wheat. It was observed that the method of tillage without turning the soil to a depth of 20-25 cm creates the most favorable soil composition of granular, porous, and in this agrophone the rapid growth of secondary crops.

After winter wheat, an increase in the number of large aggregates and an increase in the number of agronomically useful aggregates in the chisel method of tillage to a depth of 15-18 cm was observed, but a significant decrease in soil tillage compared to other methods and in doing so, relatively low soil conditions were created for the growth and development of secondary crops.

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