

The Results of the Study of the Compactions of the Bottom of the Furrow in Plowing by Plug Corpusies as well as Tractor Wheels

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Abstract: In this article, the physical and mechanical properties of the soil during plowing, that is, hardness, density, In order to study the humidity, the results of the researches are presented.

Keywords: plug, corpus, knife, soil-deepener, soil moisture, soil hardness, soil density, plowed field, tractor, wheels.

Introduction.

Soil moisture, hardness, and density are its main physical and mechanical properties, and soil-deepener in the main tillage to soil they have a great impact on the quality of work, productivity, as well as the energy content of the soil plow. [1; 7-19-p., 2; 6-p., 3; 18-28-p.].

Physical-mechanical and technological properties of soil were studied by G.M.Rudakov, V.P.Kondratyuk, R.I.Boymetov, A.A.Akhmetov, M.M.Muradov, A.Tukhtakuziev, N.S.Bibutov, Kh. R.Gaffarov, F.M.Mamatov, I.T.Ergashev, I.G.Temirov, H.B.Begimov, M.Mirakhmatov, A.A.Nasritdinov, I.S.Qurbanov, O'.N.Abdurahmonov, H.T. Kyrgyzov, R.O. Sodikov, I.Z. Nosirov, Q.B. Imamkulov, B.Sh. Gaybullaev, A.R.

Because the properties of the soil are variable, it is important to study how hard, dense, and moist it is before plowing the soil. It is known that, under agricultural conditions, the soil is compacted mainly under the influence of external forces. For example, when a certain amount of soil is pressed by the machine's tractor wheels, it shrinks in the vertical direction and expands in the horizontal direction. During the compaction process, the porosity of the soil decreases and the air in it is squeezed out [1; 7-19-p., 2; 6-p., 3; 18-28-p.].

Therefore, research was conducted to study the physical and mechanical properties of the soil, ie hardness, density, moisture.

To determine soil moisture, hardness, and density in the experimental field, samples were taken from 0–10, 10–20, 20–30, 30–40, and 40–50 sm layers of soil..

The results of the study are presented in Tables 1, 2 and 3.

Table 1

Moisture of the soil of the areas free of cotton, wheat, and secondary crops, as well as alfalfa, by layers

Soil layer, sm	Soil moisture, %		
	Bottom	High	Average
A field emptied of wheat			
0-10	7,48	14,43	11,25
10-20	10,22	17,18	15,24
20-30	12,81	19,41	17,46
30-40	14,71	20,25	18,41
40-50	17,12	21,09	19,21
The area where the cotton stalks were plucked			

0-10	7,38	16,82	13,44
10-20	9,59	12,83	11,72
20-30	10,51	14,98	13,27
30-40	11,95	16,85	15,13
40-50	13,01	18,61	16,21
Area vacated from secondary crops			
0-10	6,95	12,39	11,13
10-20	8,75	13,46	12,43
20-30	11,01	14,67	13,49
30-40	11,77	16,28	14,99
40-50	12,11	17,87	15,56
The area planted with alfalfa			
0-10	8,19	15,13	11,39
10-20	10,22	17,81	15,35
20-30	14,12	19,29	17,39
30-40	16,21	22,54	18,48
40-50	18,03	23,17	18,91

Table 2

Hardness of the soil of the areas free of cotton, wheat, and secondary crops, as well as alfalfa, by layers

Soil layer, sm	Soil hardness, MPa		
	Bottom	High	Average
A field emptied of wheat			
0-10	0,99	1,39	1,13
10-20	1,53	2,49	1,76
20-30	2,18	3,04	2,75
30-40	2,81	3,78	3,18
40-50	3,35	4,51	3,68
The area where the cotton stalks were plucked			
0-10	0,93	1,47	1,23
10-20	1,41	2,89	2,46
20-30	2,33	3,41	3,03
30-40	3,29	3,78	3,49
40-50	3,99	4,34	4,18
Area vacated from secondary crops			
0-10	1,33	1,89	1,77
10-20	1,76	2,87	2,42
20-30	3,28	3,99	3,68
30-40	4,18	4,66	4,45
40-50	4,89	5,45	5,18
The area planted with alfalfa			
0-10	0,76	1,34	1,08
10-20	1,31	2,37	1,63
20-30	2,14	3,25	2,61
30-40	2,88	3,82	3,35
40-50	3,35	4,21	3,61

Table 3

Density of the soil of the areas free of cotton, wheat, and secondary crops, as well as alfalfa, by layers

Soil layer, sm	Soil density, g/sm ³		
	Bottom	High	Average
A field emptied of wheat			
0-10	1,15	1,39	1,28
10-20	1,23	1,41	1,31
20-30	1,34	1,58	1,46
30-40	1,41	1,69	1,53
40-50	1,45	1,75	1,62
The area where the cotton stalks were plucked			
0-10	1,23	1,37	1,31
10-20	1,30	1,41	1,35
20-30	1,36	1,46	1,41
30-40	1,40	1,51	1,49
40-50	1,45	1,59	1,53
Area vacated from secondary crops			
0-10	1,39	1,43	1,41
10-20	1,41	1,55	1,49
20-30	1,46	1,68	1,61
30-40	1,52	1,79	1,65
40-50	1,55	1,87	1,69
The area planted with alfalfa			
0-10	1,34	1,41	1,38
10-20	1,38	1,51	1,45
20-30	1,42	1,63	1,55
30-40	1,49	1,72	1,60
40-50	1,51	1,79	1,64

Materials And Methods

Research in this GOST 20915-11 On“Testing of agricultural machinery. Methods for determining test conditions” [5; 1-23-p.] The Scientific Research Institute of Agricultural Mechanization researches carried out on the experimental farm, free from cotton, wheat, and secondary crops, as well as in the areas planted with alfalfa.

As can be seen from the data in Tables 1, 2 and 3, in all fields the physical and mechanical properties of the soil varied at different intervals. This difference can be explained by the fact that the harvested crops, and the timing of irrigation, as well as the macro and micro structures of the soil are different.

In short, cotton, wheat and empty from secondary crops as well as During the plowing of alfalfa planted areas, soil moisture in the 0-50 cm layer where the working corpus of the soil-deepener are working: in the range of 6.95-23.17 moisture percent, hardness: in the range of 0.76-5.45 MPa, and density: 1.15-1, in the range of 87 g/sm³.

The results of the study of the compaction of the bottom plug corpus of the furrow formed by plowing, as well as by the tractor wheels

It is known that when plowing the fields, the soil layer, the knife of the plow corpus, and the edges formed by the last corpus after each pass of the plug are compacted to a certain extent by the tractor wheel. When this happens, a layer of dense is formed in the subsoil. This is especially the case when the furrows formed from the last body of the plow are compacted by the tractor wheel, which negatively affects the development of plant roots, and productivity. [1; 37-40-p., 2; 15-16-p.].

We conducted a study on the degree to which the bottom plow corpus is compacted by the knife of the plow corpus and the edges formed during plowing layer by the tractor wheel. In this case, in order to determine to what extent the plow corpus is compacted by the knife of the plug corpus, the in the furrows

formed during plowing as well as In plowing, to assess the degree of compaction of the formed edges by the tractor wheel, moving these units in the transport mode and compacting them, remove the layer from the uncultivated land equal to the plowing depth, the hardness and density of the soil every 5 cm below it. GOST 20915-11 “Testing of agricultural machinery. Methods of determining the condition of the test” [5; Pp. 1-23], we studied the fields vacated from corn planted as a secondary crop on the experimental farm of The Scientific Research Institute of Agricultural Mechanization during the plowing period. Figure 1



Figure 1. The process of studying compaction by tractor wheels in plowing

The results of the study are presented in Tables 4 and 5.

Results And Discussion

As can be seen from the data presented in these tables, the density of the layer in the plowed area was 0-5, and the density of the layer in the plowed area was 5-10 sm, which was greater than the density of the layer in the uncultivated area. That is accordingly

Table 4

Unplowed, plowed as well as the density of the soil in layers at the edges formed from the last corpus of the plug

Soil layer, sm	In an uncultivated area, the density of the soil in the subsoil layer, g/sm ³	In a cultivated area, the density of the soil in the subsoil layer, g/sm ³	The density of the soil in the furrow formed from the last corpus of the plug, g/sm ³
0-5	1,41	1,49	1,62
5-10	1,47	1,53	1,64
10-15	1,55	1,56	1,70
15-20	1,62	1,63	1,65
20-25	1,66	1,67	1,69
25-30	1,71	1,71	1,72

Table 5
Unplowed, plowed as well as the stiffness of the soil in layers at the edges formed from the last corpus of the plug

Soil layer, sm	Soil hardness of the plowing layer in an unplowed field, MPa	Soil hardness of the plowing layer in an plowed field, MPa	The hardness of the soil in the edges formed by the last corpus of the plug, MPa
0-5	2,71	2,93	3,21
5-10	3,52	3,71	3,92
10-15	4,15	4,18	4,33
15-20	4,57	4,59	4,61
20-25	4,84	4,87	4,88
25-30	5,01	5,02	5,04

That is accordingly 1.41-1.49 g / cm³ and 1.47-1.53 g / cm³. In the remaining layers, i.e., 10-15, 15-20, 20-25 and 25-30 cm layers, the density of the soil was almost the same, that is, 1.55–1.56, 1.62–1.63, 1.66–1.67, and 1.71–1.71 g / cm³, respectively. This indicates that in the 0-10 cm layer of soil is compacted by knife. The soil in the 10-30 cm layer is not compacted by knife.

The hardness of the layer in the plowed area was 0-5, and the hardness of the subsoil in the plowed area was also greater than the hardness of the subsoil in the uncultivated area. This was due to the compaction of the soil in this layer by knife. Since the soil in the 10–30 cm layer was not compacted by knife, the hardness of the soil in these layers was almost the same. From the soil in the furrows formed by the last corpus of the plug, as a result of the passage of the tractor wheels, the density of the soil in layers 0-5, 5-10, and 10-15 cm was greater than the density of the plowing layer in the plowed area. That is, 1.49–1.62, 1.53–1.64, and 1.56–1.70 g / cm³, respectively. In the remaining layers, that is, the density of the soil in the 15-20, 20-25, and 25-30 cm layers was almost the same, that is, 1.63–1.65, 1.67–1.69, and 1.71–1.72 g / cm³, respectively. This indicates that in the edges formed by the last corpus of the plow, the soil in a layer of 0-15 cm is compacted as a result of the passage of the tractor wheels.

In the edges formed by the last corpus of the plow, the soil in the 15-30 cm layer is not compacted by the tractor wheels.

From the soil in the furrows formed by the last corpus of the plug, as a result of the passage of the tractor wheels, the hardness of the soil, 0-5, 5-10, and 10-15 cm layer, was also greater than the hardness of the plowing layer in the plowed area. This is also due to the compaction of the passage of the tractor wheels in the 0-15 cm layer on the edges formed by the last corpus of the plug. In the furrows formed by the last corpus of the plow, the soil hardness in these layers was almost the same, as the soil in the 15-30 cm layer was not compacted by the tractor wheels.

These conditions have a negative impact on plant root development, and productivity, and this is a pressing issue that needs to be addressed.

Conclusions

At the time of plowing: soil moisture in the 0-50 cm layer in the areas freed from cotton, wheat and secondary crops and planted with alfalfa is 6.95-23.17%, hardness 0.76-5.45 MPa and density 1.15-1.87 g / cm³ ranges. The 0-10 cm layer of soil under the plow is compacted by the knife, as well as the 0-15 cm layer of soil in the furrow formed by the last corpus of the plow as a result of the passage of tractor wheels. This has a negative impact on the development of plant roots, and productivity, and is a topical issue that needs to be addressed.

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