The Effectiveness Of Deep Processing Between Rows Of Cotton

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Abstract: The article elaborates on the possibility of increasing cotton yields by improving the agrophysical, agrochemical and microbiological properties of fallow soils by deep tillage at different depths between rows of cotton grown on irrigated fallow soils in the southern regions of the Republic of Uzbekistan. In variants 4 and 5 of the experiment, an increase in cotton yield was observed as a result of improved agrophysical, agrochemical and microbiological properties of the soil when cotton was cultivated at depths of 26-28 cm and 30-32 cm, respectively. In the experiments, when the cotton row spacing was loosened to a depth of 30-32 cm, the mass volume of the soil in the drive and subsoil layers decreased by 0,02-0,03 g/cm^3, porosity by 2,0-2,1%, water permeability by 100-120 m^3/ha increase in; humus content was higher by 0,004%, nitrogen content was higher by 0,007%, and phosphorus content was higher by 0,006%; As a result of the rapid development of the cotton root system, the efficiency of moisture and nutrient utilization has increased, and an additional 4-5 ts/ha of cotton has been proven to be obtained. The best results are obtained by cultivating cotton at a depth of 30-32 cm between rows. additional yield was obtained.

Keywords: Tillage soils, fertility, humus, yield, soil volume weight, porosity, microorganism, deep tillage.

1. INTRODUCTION

Not only in the Republic of Uzbekistan, but all over the world, the attitude to land resources is controlled by the state and they are under state protection. In our country, special attention is paid to irrigated soils. Because most of the crops are grown on irrigated soils. Therefore, the study of the properties of irrigated soils, the development and implementation of agrotechnologies suitable for each soil-climatic zone is a topical and important issue.

In this regard, high and abundant cotton yields using high resource-saving agro-technologies in the country's cotton industry, reducing costs and increasing profitability on cotton farms remain important tasks for scientists and specialists in the field.

Based on the above, in Kashkadarya region, located in the southern part of the country, in the system of short-term crop rotation in the conditions of widely irrigated fallow soils to increase cotton yield by deep processing between rows of cotton at different depths, development of new agrotechnologies suitable for these soils. maintaining soil moisture and creating opportunities for rational use of irrigation water remains a key task.

2. LITERATURE REVIEW

The issue of tillage, especially between the rows of cotton, has always been in the focus of attention of scientists of the republic. In the history of cotton growing in Uzbekistan a number of scientific researches on inter-row processing of cotton have been published by IP Kondratyuk, M. Muhammadjanov, KM Mirzajonov, Sh.N. Nurmatov, AE Avliyokulov, S.Saidumarov, F.M. Hasanova, G.Abdalova, K.Kamilov and other scientists.

According to the researches of MVMuhammadjanov and A.Zokirov [6], "It is possible to loosen the row spacing once or twice deeper until the cotton has 3-4 leaves and blooms in some places. This is because during this period, the cotton is more restrained, and the active roots penetrate deeper into the soil. "

According to Z. Maksumov [5], softening the spacing of cotton rows with special deepeners to a depth of 25-27 cm, even 30-32 cm has a positive effect on cotton and its yield.

According to Sh.Teshaev et al. [9], frequent and deep cultivation in excess saxaul soils near groundwater prevents root rot, gum disease and reduces the effect of salinity on seedlings.

In all areas, regardless of soil type, deep loosening of cotton row spacing at least 2 times gives good results. Carrying out this measure at a depth of 20-25 cm, along with saving 25-30% of water per hectare, ensures the full yield of the bush, increasing the weight of the buds by 1-1.2 grams and early ripening of the crop. Also, increasing the inter-row processing of cotton from 18-20 cm to 30-32 cm layer reduces the incidence of cotton wilt by 2.5% to 3.5% [7].

According to U.S. and German scientists K. Brauman, S. Siebert, and J. Foley [12], in areas with low rainfall, deep cultivation between rows of plants replaces 20% of the annual water supply to the plant.

In the south of the Republic of Kazakhstan, 55-60 cm of cotton between rows has yielded a total of 44.8 t / ha of cotton in two harvests, and an additional 9.7 t / ha compared to control [2].

However, in the conditions of irrigated fallow soils of Kashkadarya region, no scientific research has been conducted to study the optimal depth of intercropping in the cultivation of cotton.

Information about the area:

Each region of Kashkadarya region is divided into existing and newly developed areas, as it has several sharply different soil and climatic conditions. These areas are divided into mountainous, foothill and desert regions, depending on their geographical location. The mountainous and foothill part includes Kitab, Shahrisabz, Yakkabag, Chirakchi, Kamashi, Guzar districts, and the desert region includes Karshi, Nishan, Mirishkor, Kasbi, Mubarek and Kasan districts.

The Karshi desert is located in the south of Uzbekistan at a latitude of 37 ° 58¹-39 ° 32¹ north and 64 ° 23¹-67 ° 42¹ east, with a total land area of 13.6 thousand sq. Km. Of this, 306.3 thousand hectares are arable lands. [8].

The climate of the Karshi desert is sharply changing continental, with hot summers and much colder winters. In winter, cold air currents come from the northern Arctic, lowering the temperature significantly. The average air temperature in January can drop from 0 ° C to + 2 ° C, and in winter sometimes from -15 ° C to -25 ° C. Summers are hot and dry and last a long time. In July, the temperature sometimes rises from + 44 ° C to + 47 ° C during the day. By the second half of the summer, garmsel winds have been recorded for 7-15 days.

The average annual air temperature is always above + 15 ° C. The hottest days of the year are 242 days. The sum of the useful temperatures is 4533-4939 ° C per year.

The sum of useful temperatures for plants is 2330-2991 ° C. It has been observed that in the conditions of the Karshi desert there is an opportunity to grow cotton and plant heat-loving crops, as well as to harvest two or three times a season [1].

The irrigated sedimentary soils of the study area consist of heavy, medium and light sandy, non-saline and low-salinity soils, belong to the category of newly developed soils, and groundwater is located at a depth of 2-4 m.

3. MATERIALS AND METHODS

Researches "Methods of state sortoispytaniya selskokhozyaystvennykh kultur" (1964, M: Kolos), "Methods of conducting experiments with cotton (1983, Tashkent)," Methods of agrochemical analysis of soil and plants "(1977, Tashkent)," Methods of agrophysics " , Tashkent), "Methods of soil microbiology and biochemistry" (1991, Moscow), "Methods of conducting field experiments" (UzPITI, Tashkent, 2007).

The cotton was deeply cultivated between the rows with the help of “KChN-1.8 suspended deep cultivator”. A depth gauge developed in 1955 by VP Kondratyuk was used to study the depth of cultivation between rows of cotton, the depth of the furrow or the depth of fertilizer application. In the experiment, Bukhara-8 variety of cotton was planted and cultivated.

4. RESULTS

In order to achieve high and quality yields of agricultural crops, it is necessary to apply agro-measures that meet the biological characteristics and needs of the type of crop being cultivated. Only then will you have a better chance of achieving the expected results.

An experiment was performed on the system listed in Table 1 to carry out the specified research work.

The mechanical composition of the soil was studied as preliminary information before conducting the field experiment. SN Ryjov stressed that the mechanical composition of the

soil must be taken into account in the optimal nutrition and water supply of agricultural crops, including cotton. This is because the water, air and nutrient regimes of the soil also depend on the mechanical composition of the soil. The analysis revealed that the mechanical composition of the irrigated loamy soils in which the scientific research was conducted consisted of medium sand.

Table 1. EXPERIMENTAL SYSTEM.

In the conditions of irrigated fallow soils of Kashkadarya region (row spacing 90 cm)

Variant	Depth of row spacing (cultivation), cm.					
	1	2	Deep processing	3	4	5
Autumn wheat: cotton						
1- Control	8-10	12-14	-	16-18	14-16	14-16
2	8-10	12-14	18-20	16-18	14-16	14-16
3	8-10	12-14	22-24	16-18	14-16	14-16
4	8-10	12-14	26-28	16-18	14-16	14-16
5	8-10	12-14	30-32	16-18	14-16	14-16
6	8-10	12-14	34-36	16-18	14-16	14-16

It is also important to study the agrophysical and agrochemical properties of the soil. A.F. Ustinovich [10] noted that the growth and development of cotton is good when the soil volume mass is 1,1-1,2 g/cm^3. In this case, the root system of cotton develops optimally, the air exchange in the soil is moderate, the evaporation of moisture is less.

According to the data on the volume mass of the soil, in the conditions of irrigated fallow soils of Kashkadarya region at the beginning of the application period the volume mass in the 0-30 cm layer of soil averaged 1,33 g/cm^3, in the 30-50 cm layer 1,39 g/cm^3.

Prior to deep tillage between cotton rows (during mowing), the volume mass of the soil increased by 0,03-0,04 g/cm^3 according to the initial parameters, the main reason for the increase in volume mass was the preparation for field sowing, plowing, sowing and 1 and 2. - assessed as a result of repeated introduction of machinery in cultivation. After deep tillage between rows of cotton (during mowing) the soil volume mass is 1,31-1,35 g/cm^3 at 0-30 cm and 1,40-1,42 g/cm^3 at 30-50 cm. The volume was improved by 0,02-0,03 g/cm^{3}compared to the previous state without deep processing, the best result was observed in variant 5, where the cotton was processed 30-32 cm deep between rows. According to the data obtained at the end of the application period, as the depth of cultivation between cotton rows increased, the soil volume mass decreased compared to the control option, the best result was observed in option 5 treated at a depth of 30-32 cm between rows of cotton, 0,03 g/cm^3.

According to the data on soil porosity, winter wheat: in the areas where cotton was planted, the initial values of soil porosity were 49,2% at 0-30 cm, and 46,5% at 30-50 cm, before the cotton was deeply cultivated between rows (during mowing) the porosity in the driving layer decreased by 0,7-1,5% compared to the initial values for the options, and after deep tillage (during mowing) was 48,1-49,6%, up to 1,1% of the soil The porosity is improved, the best result is 30-32 cm. observed in the deeply treated variant 5, it was found that the soil porosity (49,6%) improved by 1,5% compared to the control variant (Fig. 1).

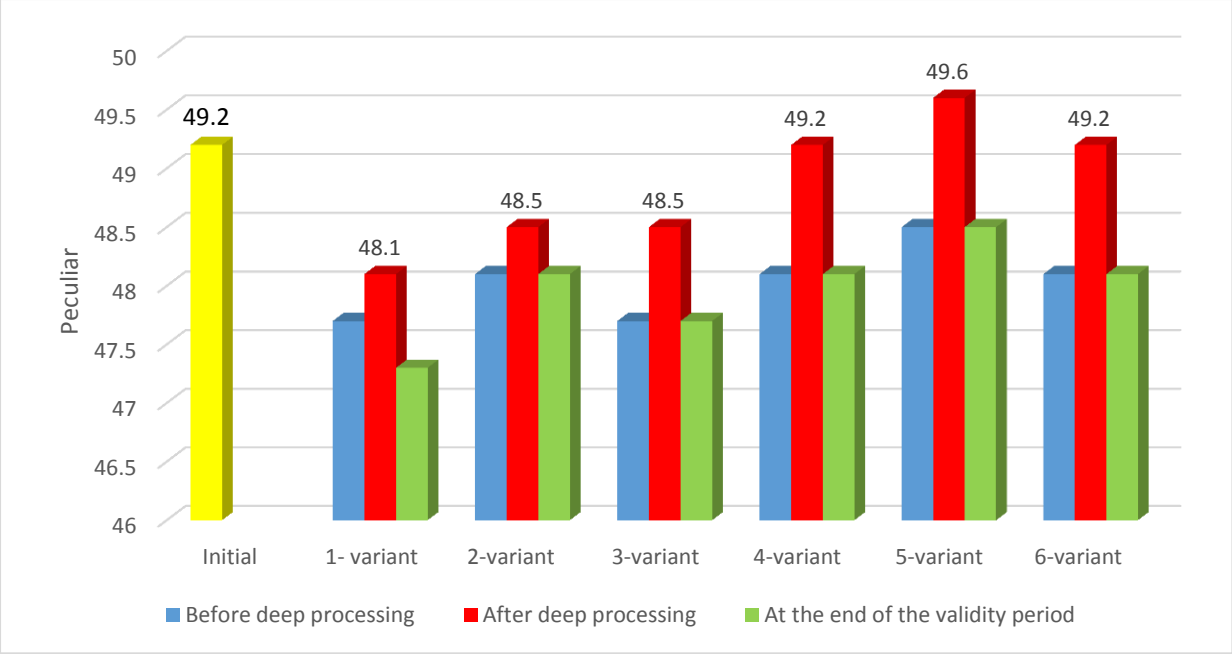

Figure 1. The effect of deep tillage between rows of cotton on soil porosity.

The water permeability of the soil is one of its important water properties, and the rate of wetting of the layers depends on this property. Water permeability varies depending on the mechanical composition of the soil. Coarse and light mechanical soils have high, medium and heavy mechanical soils have low water permeability.

According to preliminary data on soil water permeability in the conditions of irrigated fallow soils of Kashkadarya region, it was found that it was 383,2 m^3/ha in 1 hour and 884,5 m^3/ha in 6 hours. Deterioration of water permeability of the soil before deep tillage, which, according to the options, amounted to 290,2-311,6 m^3/ha in 1 hour, and 762,5-810,4 m^3/ha in 6 hours, compared to the initial values of 50-70 per hour. m^3/ha, low water permeability of 40-90 m^3/ha in 6 hours. After deep tillage, it was found that the water permeability of the soil was 40-60 m^3/ha higher than in the untreated period.

In the control variant of the experimental area, the water permeability was 778,3 m^3/ha in 6 hours. The highest result was observed in the treatment depth 30-32 cm 5 - variant, which was 110 m^3/ha more permeable than the control variant.

According to the results of the study, in experiments on irrigated fallow soils of Kashkadarya region, it was found that there is a correlation between the agrophysical properties of the soil and cotton yield between rows of cotton. found that there was a strong correlation between porosity and water permeability (r = 0,893487, r = 0,946955) and a moderately correct (r = 0,699266) correlation between processing depth and yield (Table 2).

Table 2. Correlation of deep intercropping with soil agrophysical indicators and cotton yield

Processing depth, cm	Soil volume mass, g / cm^3	Soil porosity, %	Soil water permeability, m^3/ha	Productivity, ts/ga
control	1,35	48,1	293,2	36,8
18-20	1,34	48,5	311,2	37,3

22-24	1,34	48,5	332,0	39,1
26-28	1,32	49,2	342,7	39,7
30-32	1,31	49,6	360,4	41,9
34-36	1,32	49,2	352,0	38,7
correl 1-5	r=-0,89709	r =0,893487	r =0,946955	r =0,699266
correl 1-5		r =-0,99948	r =-0,94003	r =-0,86211
correl 2-5			r =0,943149	r =0,871617
correl 3-5				r =0,876999

The content of mobile nitrogen and phosphorus in irrigated fallow soils is very low and low (very low 0-15 mg/kg; less 16-60 mg/kg), and potassium belongs to the low-income group, ie nitrates in the topsoil and subsoil 7,97-. 10,85 mg/kg, mobile phosphorus was found to be 10,8-16,4 mg/kg, and mobile potassium was found to be 150-172 mg/kg.

Norms of nitrogen, phosphorus, and potassium fertilizers in all variants studied in the experiments were 250, respectively; 175; 125 kg/ha. Nitrogen fertilizers were applied to 3-4 leaves of cotton, during the mowing and flowering periods, phosphorus fertilizers were applied to the autumn plow (70%) and during the cotton mowing period (30%), potassium fertilizers were applied to the autumn plow (100%).

The results of the analysis of soil samples taken at the end of the cotton growing season showed that the content of humus in the driving and subsoil layers was 0,820-0,831%, total nitrogen 0,093-0,107%, total phosphorus 0,152-0,170%, total potassium 1,52-1,65%. It was also observed that mobile nitrogen was 13,40-22,27 mg/kg, mobile phosphorus was 11,2-14,0 mg/kg, and with mobile potassium was 146-160 mg / kg and decreased depending on the underlying layers (Table 3).

In the conditions of irrigated fallow soils, deep cultivation between rows of cotton increased the yield of cotton, and the water-physical properties of the soil, the amount of nutrients that plants can absorb, changed in a positive way compared to the initial state.

It was noted that the active nitrogen, phosphorus and exchangeable potassium elements in soils decreased towards the end of the growing season. This condition can be explained as a result of assimilation by plants during the growing season. Based on the data obtained, it can be concluded that in the conditions of irrigated fallow soils of Kashkadarya region, when the cotton is deeply cultivated at a depth of 30-32 cm between rows, the soil nutrient regime can be improved and high yields can be achieved.

Table 3. Agrochemical characterization of experimental field soil

Options and Processing Depth	Layer, see	Amount of humus,%	Total amount,%			Motion value, mg/kg		
			N	P	K	NO_3	P_2O_5	K_2O
Option 1 (control, 14-16 cm)	0-30	0,826	0,093	0,161	1,52	22,27	13,8	160
	30-50	0,735	0,079	0,151	1,49	20,11	11,8	145
2-variant (18-20 cm)	0-30	0,827	0,099	0,164	1,55	19,97	14,0	158
	30-50	0,738	0,083	0,153	1,46	17,94	10,3	143
3-variant (22-24 cm)	0-30	0,823	0,095	0,168	1,61	20,24	13,7	160

	30-50	0,733	0,078	0,156	1,49	18,12	11,2	142
4-variant (26-28 cm)	0-30	0,828	0,101	0,170	1,63	17,23	13,7	160
	30-50	0,738	0,082	0,160	1,52	16,91	11,2	138
5-variant (30-32 cm)	0-30	0,831	0,107	0,170	1,63	17,73	13,5	156
	30-50	0,745	0,088	0,164	1,55	14,37	11,6	140
6-variant (34-36 cm)	0-30	0,831	0,106	0,170	1,65	18,78	13,9	152
	30-50	0,748	0,090	0,164	1,59	15,76	11,6	140

Soil fertility and productive properties are inextricably linked to the development and activity of soil microorganisms.

Microorganisms are actively involved in soil processes with high biochemical energy. They carry out the basic biological process in the soil, breaking down organic residues and forming new organic matter humus. In addition, by using plant residues in the life process, it creates the conditions for optimal growth and development of the crops grown by cleaning the environment.

In the research of B.M. Khalikov [11] it was found that the increase in the amount of oligonitrophilic microorganisms in short-rotation rotation led to the accumulation of more carbon-containing organic compounds, and the decrease in the index of pedotrophils and denitrifying microorganisms led to less nitrogen-containing compounds.

According to the data on the activity of microorganisms in the soil, intercropping of cotton in the intercropping field, increasing its depth during cultivation leads to an increase in the amount of oligonitrophilic and micromycetic microorganisms in the soil, which leads to more accumulation of carbon-containing organic compounds, ammonifiers and phosphorus-degrading microorganisms. It is noted that this leads to less loss of nitrogen-containing compounds, which prevents the wastage of nutrients needed for cotton in the soil and increases the efficiency of plant utilization.

The main task of research in agriculture, especially in cotton, is to scientifically substantiate the impact of agro-technical measures and external factors on cotton yield. It should be noted that the deep inter-row cultivation of cotton, as mentioned above, had different effects on the agrophysical, agrochemical and microbiological properties of the soil, which was ultimately reflected in the yield of cotton.

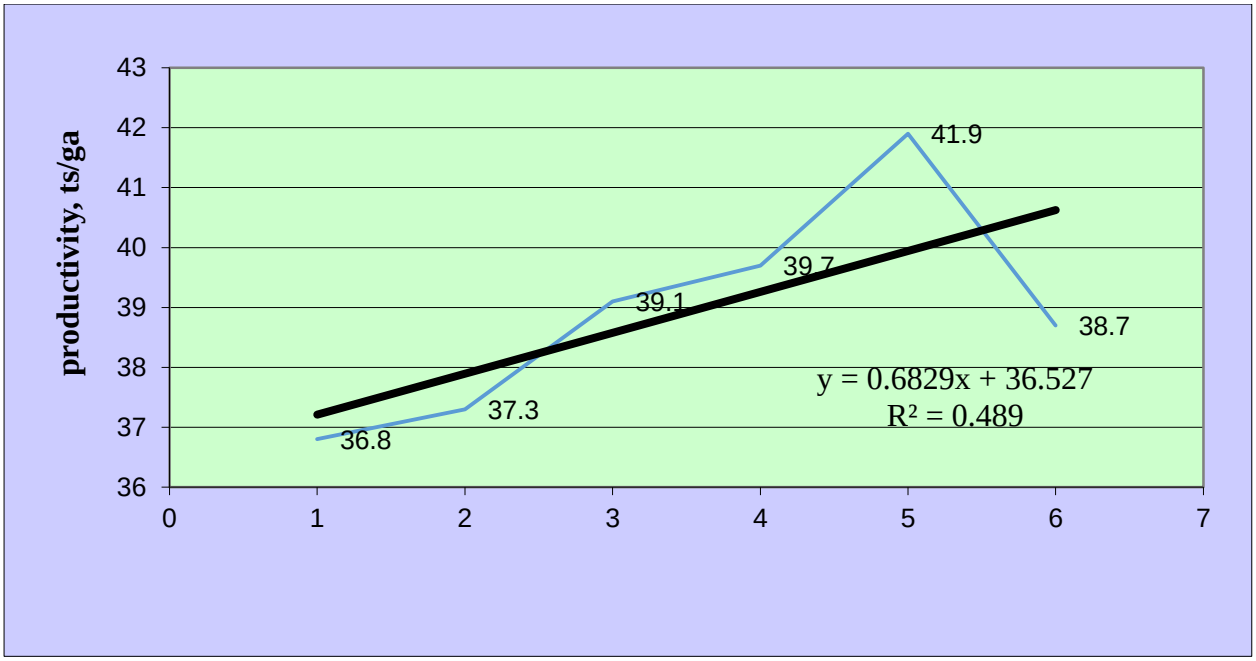

Figure 2. The correlation between the depth of tillage and yield between rows of cotton

In the experiment conducted in the conditions of irrigated fallow soils of Kashkadarya region, the lowest cotton yield was obtained from the experimental control variant, this figure was 37,4 ts / ha, and the highest yield was observed in the 5th variant, 42,8 ts / ha. In this study, the yield was 38,5 ts / ha when the cotton was processed at a depth of 18-20 cm between rows, 1,1 ts / ha compared to the additional yield control option, and 40.1 ts / ha when processed at a depth of 22-24 cm; 2,7 ts/ha, 26-28 cm. 41,1 ts/ha when processed at depth; 3,7 ts/ha, 30-32 cm 42,8 ts/ha when working at depth; 5,4 ts/ha, 32-34 cm 40,5 ts/ha when working at depth; 3,1 ts/ha.

According to the results of the study, a moderate correlation between the depth of tillage and yield between rows of cotton was found to be $R^2 = 0.489$ (Fig. 2).

Conclusion: Based on the data obtained, it can be concluded that in the conditions of irrigated fallow soils of Kashkadarya region during the period of cotton weeding between cotton rows at a depth of 26-28 cm and 30-32 cm to improve agrophysical, agrochemical and microbiological properties of soil for high yields and efficient use of water resources. creates the ground.

Increasing the depth of tillage has a positive effect on reducing the weight of the soil volume, increasing the porosity. This condition improves soil aeration (water, air exchange) and has a positive effect on plant growth and, consequently, the weight of the cotton crop. It was noted that when cotton was treated at a depth of 30-32 cm between rows, its root system, drive and sub-drive layers absorbed mobile nitrogen, phosphorus and exchangeable potassium elements, and the amount of some beneficial microorganisms increased. In addition, deep intercropping of cotton resulted in a decrease in the density of the subsoil and good development of the root system of cultivated crops, improvement of water-physical and agrochemical properties of fallow soils, as well as an increase in cotton yield.

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