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AB ANCIENT, MODERN INNOVATSION THAT IMPROVES SOIL FERTILITY METHODIS, TECHIQUIS.

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Abstract: Ensuring food security in the worlt in the next years, soil Along with mineral fertilizers, great attention is paid to the use of organic fertilizers in farming to increase the productivity and productivity of agricultural crops. Among the organic fertilizers, manure, humus, compost, soil exstracted from manure, ash green fertilizers (siderates) are widely used. Because organic fertilizers are always a problem and are always in short supply due to the dwindling stock of gung, which its basis. Therefore, the use of green manures,precursors and straw of grain residues compensates for the missing organic matter in the soil, and at the same time has a positive effect on the agrophysical, agrochemical, microbiological properties of the soil As a result, improving technology of using siderates, growing them and using them in practice, regardless of the type, type, composition of the tupe,tupe, composition of the soil, is considered one of the important and urgent issues of farming.

Key words: Microbiological, agrochemical, biofertilizer, amino acid, intensive, innovative, siderate crops, green manure, predecessor, straw, millet, meadow gray soil, blue pea, white mustard, mush, summer plow, biohumus, biomass, mountain, desert, forest, swamp.

Enter: People have been engaged in agriculture since ancient times, and until now, farming has been carried out in four methods - systems of agriculture. They are as follows:

1 - Method, primitive - ancient method of farming. In this case, soil fertility is restored without human intervention. Farming is done on small plots of land in forests, mountains, reserves, deserts, steppes and swamps.

2 - Method, extensive - medieval method of farming. In this, soil fertility is achieved partly by humans, partly by the laws of nature. Soil fertility is restored and maintained by humans through plowing and partly by land reclamation.

3 - Method, the current method of farming. In this, all fields are planted with crops that are cultivated between rows. Large amounts of mineral fertilizers are used to increase soil fertility. It requires high-quality soil cultivation, chemical control of weeds, diseases and pests, and mechanization of work, which increases and maintains soil fertility.

4 – Method, is an innovative future method of farming. In this case, soil fertility is increased naturally with the participation of people in the cultivation of agricultural crops. Instead of chemical mineral fertilizers, natural fertilizers are used, and biological natural means are used to combat weeds, diseases and pests. As a result, it allows for the possibility of increasing soil fertility in a short time, which will lead to a several-fold increase in productivity compared to the current one, and the restoration of soil fertility.

Compared with the intensive method of farming, the innovative method has the following advantages:

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Firstly, soil fertility increases significantly, and the quantity and quality of high-quality ecologically pure agricultural products increase several times.

Export products are grown; Secondly, when cultivating the soil, plants are replaced with natural biohumus instead of chemical mineral fertilizers;

In the fight against weeds, diseases and pests, chemical means are replaced with biological natural means.

Due to the increase in soil fertility and the use of cheap natural biohumus and biological natural means, the cost of agricultural products produced will decrease several times compared to the current one, and the efficiency of soil use will increase several times.

As a result, new innovative methods of farming will enhance the farming culture in the countryside, open up opportunities for the further development of diversified farms, and ensure financial independence.

What are the innovative and future methods of increasing soil fertility?

In the modern intensive farming method, high yields of agricultural crops are achieved mainly as a result of the use of large amounts of mineral fertilizers. Plants absorb 10-12 percent of these mineral fertilizers, 20-22 percent evaporate into the air, the atmosphere, and the remaining 70-74 percent remain in the soil, affecting soil fertility, leading to soil structure destruction, and a decrease in soil fertility. Therefore, crop yields are decreasing year by year. For several decades, farmers in the grain-cotton sector have been alternating the same agricultural crops, namely cotton and wheat, which has led to a decrease and deficiency of microelements in the soil, which has led to a decrease in the soil's fertility by 2-3 points every year. This is evidenced by the fact that in the last five years, cotton and grain yields in some regions have decreased by 5-10 centners.

An innovative method of increasing soil fertility is the cultivation of agricultural crops in the future. In this method, soil fertility is increased naturally with the participation of people. Instead of chemical mineral fertilizers, natural fertilizers, namely biohumus, are used.

First, let's study biohumus (humus), which is a high-molecular, dark-colored organic substance of the soil, its composition is complex and has not been fully studied so far, it contains: Humic acids and Fulvic acids.

Humins and fulvones are composed of a number of substances. In addition, humus contains many aromatic compounds, amino acids, lipids, organic acids and their derivatives. All elements of the periodic system are found among the mineral components of the soil. It contains nutrients that are absorbed by plants, and their decomposition leads to an increase in productivity. Humus contains a complex of amino acids that are very necessary for plants, formed as a result of the combined decomposition of algae and minerals.

Where is biohumus found naturally? There are melioration ditches dug around the arable land of farms to drain stormwater, which are dug and cleaned every 5-6 years.

The mud that comes out of them is converted into biohumus by nature itself in 5-6 years. It is known that nitrogen in the atmosphere, along with precipitation, i.e. snow, rain, hail and mudslides, brings 5-8 kilograms of nitrogen per hectare per year to the soil, which is absorbed by plants, as a result, 25-36 kilograms of nitrogen accumulate in the soil over 5-6 years. In addition, over the course of 5-6 years, weeds grow, their roots and free-living microorganisms also absorb atmospheric nitrogen, producing 6-8 kilograms of fertilizer per hectare of land per year in the soil, of which 36-48 kilograms of nitrogen, phosphorus and potassium compound fertilizers are

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produced in 5-6 years. In total, 51-84 kilograms of natural nitrogen, phosphorus and potassium fertilizers are produced in the soil, which are absorbed by plants.

– One of the advantages of biohumus is that it enhances the activity of soil microflora, dissolves complex salts that have passed into the state of gypsum in the soil, and turns it into a state that is easily absorbed by plants.

– Since 2007, experiments have been conducted on growing cotton and grain from biohumus - natural humus - on an area of 10 hectares, and later on an area of one hectare, and its usefulness has been proven. The following conclusions were drawn from the experiments:

– for wheat cultivation, 2 tons of decomposed 5-year-old sod soil are sown on each hectare of sod land before sowing wheat. During the wheat cultivation period, 1 ton per hectare is sown before each irrigation, 5 tons per 5 irrigations, a total of 7 tons of decomposed sod soil are sown. This is 800 kg of pure nitrogen per hectare, 200 kg

– is considered a natural fertilizer that can replace 50 kg of pure phosphorus and 50 kg of pure potassium fertilizers.

– In cotton cultivation, 1 ton per hectare of land was applied 5 times, a total of 5 tons of water, to the soil to a depth of 10-15 cm by mixing rotted manure with running water. The result was proven to increase cotton yield from 26 to 33 centners..

– Instead of fighting diseases and pests, a stimulant, i.e. “Bioenergy-M” bioproducts, was used to prevent them. It was used to increase seed germination, and during the cultivation of cotton and grain, it was fed with a suspension 3 times and water at the rate of 5 kg per hectare per irrigation.

– Instead of chemical agents, i.e. insecticides and fungicides, the “Umid” preparation prepared from natural plants was used to combat pests and insects, i.e. sucking and rodents, and diseases, because the preparation prepared from seven types of naturally growing plants is used to prevent diseases and protect against pests.

With this method, the cotton yield at the “Naynavo Akshomi” scientific experimental seed farm increased from 28.1 centners in 2011 to 38.2 centners by 2022, and the wheat yield from 38.2 centners in 2011 to 63.3 centners in 2022, while the soil fertility index increased from 42.1 points in 2011 to 68.8 points by 2022, which is a guarantee of the farm’s achievements.

It is appropriate to make the following conclusion in the future innovative method of increasing soil fertility and increasing the productivity of agricultural crops: Cotton and grain farms, in the first year, 7 tons of rotted ditch soil per hectare are given to the land areas planted with cotton. planted kashqarbeda is processed. After two harvests, the third harvest is plowed in the fall. In the third year, cotton is planted again and the process continues. It is observed that the soil fertility will increase by two points compared to the previous year.

One of the methods of increasing the productivity of cotton, grain and fodder crops from agricultural products in the republic is to organize crop rotation and repeated planting of crops in the fields of farms where cotton, grain and vegetable crops are grown. In the harvested fields, the remains of plant stems and straw of grain crops are plowed into the ground or mixed with the soil with a tiller, which gives effective results in increasing soil productivity.

The methods of increasing soil productivity in farms that are already known to us include double-layer plowing of the land, the application of organic and mineral fertilizers, leaching of the soil, and crop rotation. However, these methods have not yet allowed farms to obtain high

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yields of cotton, grain, and fodder crops. At the same time, increasing soil fertility remains one of the urgent tasks facing cotton and grain farms across the republic

Another way to increase the soil fertility in the fields of cotton farms is to crush the stalks of the harvested cotton fields and scatter them on the field, and then plow the land. But this method, like the above methods, has become ineffective to date.

In cotton and grain farms, according to the crop rotation scheme, after harvesting the grain in some cotton-picked fields in May-June using "Case" and "Class" grain combines, the straw mulch is plowed together with the straw mulch and prepared for cotton production next year. Straw mulch in the fields is considered an effective method of increasing soil fertility or the agglutinous layer of the soil.

It has been observed that it is possible to accelerate the increase in soil fertility by plowing the land in place without removing the straw from the field. For this, in many farms of the republic, seeds of siderat crops imported from foreign countries are sown and grown in the fields where cotton is harvested at a rate of 10...20 kg per hectare of land in the winter-spring, spring-summer and summer-autumn seasons of the year, and then plowed in place, and the soil fertility is increased.

Siderat crops are plants that are sown in order to naturally increase soil fertility by enriching the soil with organic matter and nitrogen compounds, and legumes, namely lupine, kashkarbeda, seradella, millet, rapeseed, exparcet, etc., are added to the soil with their green mass and plowed. Crop rotation scheme - in order to increase soil fertility, it is necessary to organize a plan to plant cotton in the first year, winter wheat and one of the siderat crops in the second year, and in the third year, cultivate the siderat crops, incorporate them into the soil in the fall, and plant cotton again in the fourth year..

The current world wheat crop is 776.5 million tons. While the area under wheat has increased by 2.8 million hectares in Australia, 2.8 million hectares in India, and 2.0 million hectares in Russia, there has been a trend of decrease by 1.5 million hectares in the European Union. Currently, countries such as India (31.4 million hectares), Russia (28.7 million hectares),China (23.4 million hectares), the USA (14.9 million hectares), and Australia (13.0 million hectares) are leading in terms of the size of the area under wheat, while countries such as Germany (75.3 tons/hectare), France (68.0 tons/hectare), Egypt (64.0 tons/hectare), and China (57.0 tons/hectare)are distinguished by their high productivity. In these countries, such high results are achieved due to the fact that 472.5 kg/ha of Biogums - humus remains in the soil in return for 2 t of organic carbon input to the soil (4.5*0.42=1.89 t) from the plowing of 4.5 t/ha (42% S) of straw in the autumn wheat field.

S.Soldatov [2011, 20-6] stated that siderate crops - green fertilizers are the only means and source of increasing soil fertility in European and Asian countries and play a decisive role in the development of agriculture.

V.G. Loshakov [2018 [pp. 28-31] studies show that in medium-loamy soils around Moscow, applying 20 t/ha of manure increased potato yield by 48%, applying an equivalent amount of mineral fertilizers by 36%, applying 15-20 t/ha of white mustard green mass increased potato yield by 49.8%, and applying 5-6 t/ha of white mustard green mass in combination with straw increased potato yield by 58.6%.

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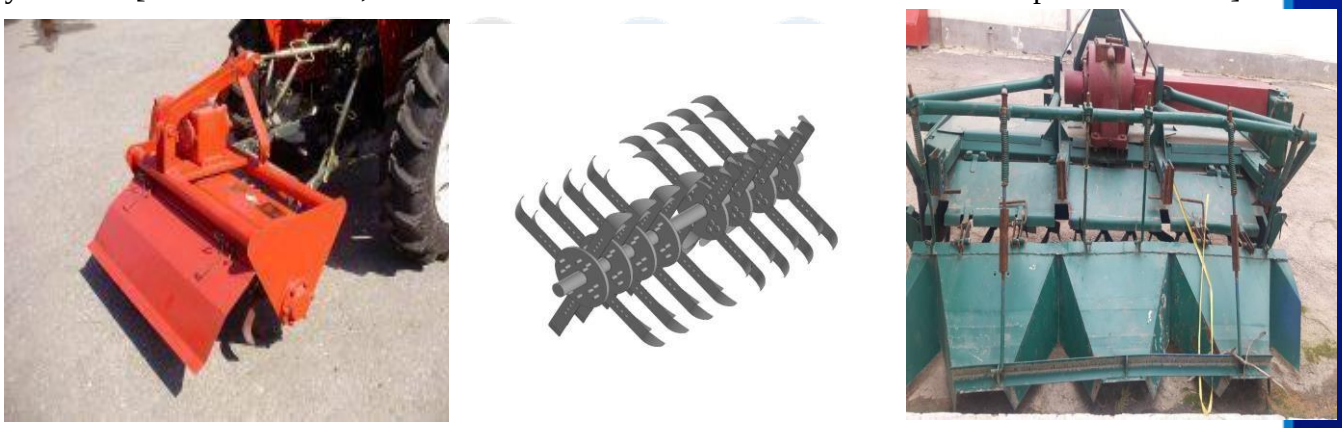
In the experiments of N. Usmonov [2007, 24-6.], it was found that due to the use of green fertilizers, the bulk density of the soil decreased from 1.27 to 1.19 g/cm, porosity increased by 6-11%, earthworms increased by 7-8 times, soil structure improved, and potatoes grew and developed favorably,and their yield increased.

When straw was used in combination with mineral fertilizers, it was observed that the yield of winter wheat was 22% higher than when straw was used alone. When growing spring wheat, the use of straw in the fall without mineral fertilizers allowed to obtain an additional 9-24% grain yield [Sorokin I.B., Titova E.V. et al. 2004. p. 163-165].



General views of a tiller for cultivating the soil surface

In order to obtain high and high-quality winter wheat yields, great attention is paid to maintaining and increasing soil fertility, as well as to the effective use of other available opportunities. Currently, in irrigated conditions, it is possible to harvest 2-3 times a year, and maintaining and increasing soil fertility in agriculture is directly related to the use of green manures, intercrops, and straw. Taking this into account, the widespread use and implementation of leguminous crops (as intercrops) and siderate crops (green manures) in winter wheat cultivation is an urgent issue in agriculture.

Today, in our country, in order to increase and maintain soil fertility, it is necessary to rotate agricultural crops based on a special scheme, determine the place of predecessors and siderate crops in the rotation of crops, use advanced methods of cultivation technology, and apply and implement all advanced technologies in a coordinated manner. The Action Strategy of the Republic of Uzbekistan for 2017-2021 sets out as important strategic tasks "the consistent development of agricultural production, further strengthening of the country's food security, the introduction of intensive methods, primarily modern agrotechnologies, into the production sector." The implementation of the identified tasks is considered to be of great importance, and the selected topic is based on comprehensive relevance and necessity.

Materials and methods: Scientific research work Field experiments were conducted in 2015-2018 in the conditions of meadow-gray soils of the "Bakhriddinov Shokhjahon" farm in the Tailak district of the Samarkand region, and the research program was aimed at studying the effect of straw, green manure and companion crops of green peas, mustard, and mung beans on soil fertility, its agrophysical and agrochemical properties, and the yield and quality of winter wheat.

Scientific research work "Methodology of field experiments" (1985), "Methods of conducting field experiments" (2007), Ministry of Agriculture and Water Resources of the Republic of Uzbekistan, Uzbekistan Research Institute of Plant Science; Andijan Research

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Institute of Grain and Legumes on Irrigated Lands; It was conducted based on the methodological manuals of the agricultural research and development centers of Uzbekistan (1995-2000).

Field experiments were conducted with 8 variants of green manures and predecessors in 4 replications. In the field experiments, the length of the plot was 60 m, the width was 5.6 m, and the surface of each plot was 336 m, of which 168 m was taken into account. The experimental variants were systematically placed in one tier.

Soil bulk density (g/cm3) was determined in early spring, before the first and last irrigation, in the 0-20 and 20-40 cm layers of soil using a cylinder, relative density (g/cm) was determined by the pycnometer method, and soil porosity (%) was determined in the 0-20 and 20-40 cm layers of soil before the first and last irrigation.

The agrophysical properties of the soil were determined according to the methods of "Metody agrokhimcheskih, agrofizicheskih i mikroobilochicheskih issledovaniy v polivnyx khlopkovyx rayonakh" (1963). The agrochemical properties of the soils of the experimental field were checked by the following methods:

The amount of humus was determined by the method of I.V. Tyurin (GOST-26213); total nitrogen, phosphorus and potassium in one sample by the method of I.M. Maltseva, L.P. Gritsenko; nitrogen in the form of nitrate - by the ionoselective method (GOST-13496-10), mobile phosphorus in 1% ammonium carbonate solution by the method of B.P. Machygin; exchangeable potassium by the method of P.V. Protasov with a flame photometer.

Results and their analysis: Increasing soil fertility has always been an urgent issue and the main problem in agriculture. Field experiments, usually lasting more than 50 years, are considered long-term experiments (Dospekhov, 1979). The scientific results obtained in these experiments differ sharply from the scientific results obtained from conventional experiments, they are significant for their mutual compatibility and systematic interrelationship.

For optimal growth and development of agricultural crops, it is necessary to have favorable conditions in the soil layer where the main part of the root is combed. From this point of view, it is important from the theoretical and practical point of view to determine the change of the soil volume mass and the optimal type of siderate crop under the influence of green manures planted in the summer in fields empty of grain.

An increase in soil density by 0.1 g/cm decreased grain yield by 6 t/ha, corn yield by 15-25 t/ha, and cotton yield decreased by 40% when soil density was 1.5 g/cm3. In order to determine the effect of the green fertilizers tested in the experiment on the volume mass of the soil, samples were taken from the 0-20 and 20-40 cm layers of the soil and analyzed.

fter green manure application, changes in soil bulk density were observed in the top layer (0-40 cm) of the soil before the first and last irrigation of winter wheat. In field conditions, soil bulk density was determined by taking undisturbed soil samples from the top layer using a cylinder (Table.1).

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	Experience options		In early spring		Winter wheat growing season			
					Before the first watering		Before the last watering	
			Soil layers, cm					
			0-20	20-40	0-20	20-40	0-20	20-40
	Control) summer plow		1,26	1,29	1,27	1,29	1,28	1,3
	6 t straw + summer plow		1,20	1,23	1,21	1,24	1,22	1,2
	6 t of straw + green peas		1,20	1,23	1,21	1,24	1,22	1,2
	6 t straw + mustard		1Д9	1,23	1,20	1,24	1,21	1,2
	6 t of straw + mash		1,21	1,24	1,22	1,25	1,24	1,2
	Blue peas		1,22	1,25	1,23	1,27	1,25	1,2
	Mustard		1,20	1,23	1,20	1,24	1,21	1,2
	Mosh		1,21	1,24	1,22	1,25	1,23	1,2

Table 1. Effect of green fertilizers on soil volume mass, g/cm (2015-2018)

Before the first watering of the autumn crop in the options where green fertilizers were used, the soil volume mass was 0.04-0.07 g/cm and 0.02-0.05 g/cm less in the 0-20 and 20-40 cm soil layers compared to the summer plow option. was determined.

Also, the bulk density was higher in the lower 20-40 cm layer than in the surface 0-20 cm layer. The greatest decrease in bulk density in the soil tillage layer compared to the summer plowing (control) variant (1.20 and 1.24 g/cm or 0.07 and 0.05 g/cm) was observed in the green fertilizer application of 6 t of straw + mustard or.

Observed in mustard variants. A relatively large decrease in soil volume mass in the khaydov layer was noted in the blue pea and mustard variants, and it was found that the volume mass decreased from 0.06 to 0.05 g/cm compared to the summer plow (control) variant.

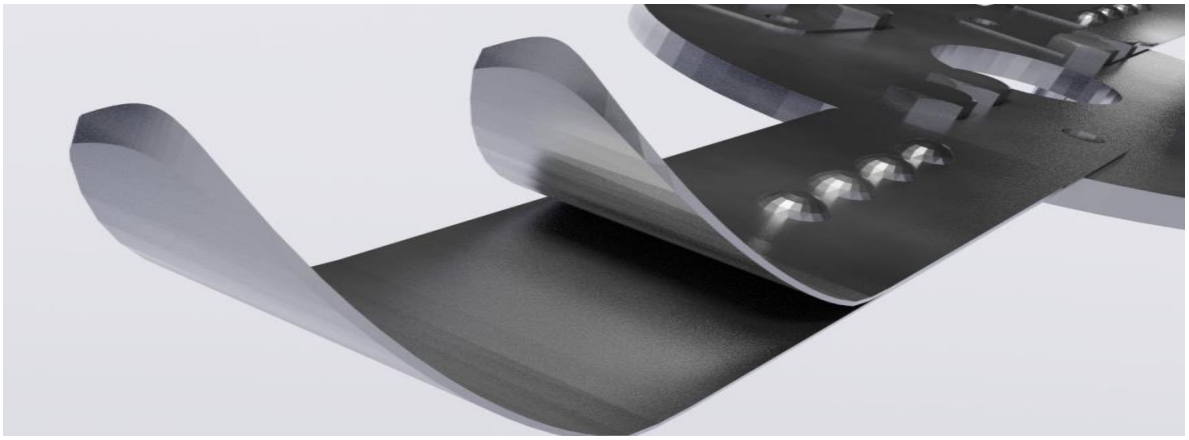

Illustration of the primary and secondary blades of a tiller

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Thus, in the summer plowing (control) variant, an increase in the bulk density of the soil was observed in the tillage layer before the first and last irrigation of winter wheat, while in the green manure variants, a decrease in the bulk density of the soil was detected.

In general, when green manure was used, the bulk density of the tillage layer decreased the most compared to the control variant, and it was observed that it practically did not change due to irrigation. When green manure was used, a decrease in the bulk density of the tillage layer was detected by 0.07-0.05 g/cm3. When green manure was used, a favorable density was created for good root growth and branching of winter wheat.

In the experiment, along with determining the bulk density of the soil, the specific gravity was also determined. According to the results of the study, the specific gravity was 2.63 g/cm in the upper 0-20 cm layer of the soil, and 2.70 g/cm in the 20-40 cm layer. Accordingly, when calculating the porosity of the soil, the porosity was 52.2-54.6% in the 0-20 cm layer before the first irrigation, 51.6-53.7% in the 20-40 cm layer, and 51.7-54.2% in the 0-20 cm layer and 51.2-53.3% in the 20-40 cm layer before the last irrigation (Table.2).

Therefore, when crops such as chickpeas, mustard, mung bean are planted in the fields freed from grain in the summer and when they are used as green manure, the agrophysical properties of such fields are improved, as well as a high and quality harvest of winter wheat is grown..

№	Experience options	During the growing season of winter wheat			
		First watering before		Last watering before	
		Soil layers, cm			
		0-20	**20-40**	**0-20**	**20-40**
1	(Control) summer plow	52,2	51,6	51,7	51,2
2	6 t straw + summer plow	54,3	53,5	53,9	53,0
3	6 t of straw + green peas	54,5	53,7	53,8	53,3
4	6 t straw + mustard	54,6	53,7	54,2	53,3
5	6 t of straw + mash	53,8	53,1	53,2	52,4
6	Blue peas	53,5	52,5	52,8	52,0
7	Mustard	54,6	53,5	54,2	53,0
8	Mash	54,1	53,1	53,6	52,8

Table 2. Effect of green manure on soil porosity,% (2015-2018)

The experiments revealed that when processing harvested grain fields with a milling machine with improved blades for processing straw on the soil surface, the yield of the crop was further increased.

Conclusions: In conclusion, when using green manure and straw, the bulk density of the topsoil was significantly reduced compared to the control option, and it was almost unchanged due to irrigation. When using green manure and straw, the bulk density of the topsoil was reduced

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by 0.07-0.05 g/cm3. When using green manure and straw, winter wheat seeds germinate well, and a favorable density is created for good root growth and branching. Experiments have shown that when the harvested grain fields are cultivated with improved milling cutters that incorporate straw into the soil surface, the productivity of the soil increases even further.

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