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Effects of Fertilizer Rates and Compost Application on the Amount of Organic Waste Left Winter Wheat and Reproductive Crops in the Soil

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Abstract

In this article, data are given about the effect of application of semi-rotten black manure of cattle and compost on the background mineral fertilizers recommended for winter wheat N_{200} P_{140} K_{100} kg / ha, as well as the effect of left stubbles of the crops and nutrients in the soil and nutrients in their content. In addition to the recommended rates of mineral fertilizers for winter wheat, the application of 10; 20 t / ha of semi-rotten black manure and compost on average from 3.72 tons to 4.05 tons per hectare of organic residue provided, and thus, it was left 11.5-12.9 kg / ha of nitrogen in the soil, 5.2-6.0 kg / ha of phosphorus, 6.7-7.7 kg / ha of potassium, on average from 2.29 to 2.46 tons per hectare by semi-rotten black manure of cattle and compost, it was found that 32.4-37.2 kg / ha of nitrogen, 17.5-20.5 kg / ha of phosphorus and 27.5-31.8 kg / ha of potassium are returned to the soil due to organic residues.

Keywords: Winter wheat, repeated crop mung bean, manure, compost, nitrogen, phosphorus, potassium, roots, stubble

Introduction

It is known that cotton, which is currently being introduced in large areas in the country, excludes secondary crops: cotton left 8-10 tons, and except for secondary crops, cotton and winter cereals left 11-12 tons per crop, from a total of 1 hectare area to 19-22 tons of organic matter per rotation. The total amount of mineral and organic fertilizers applied to the soil does not exceed 1-2 tons, which leads to a decrease in soil fertility from year to year.

The decline in soil fertility is primarily due to the chronic disruption of the system of regular sowing of the same type of crop and crop rotation and agro-technical work. Such negative conditions seriously damage the share of cotton, wheat and other agricultural crops. It is known that the level of soil fertility in agriculture is directly related to the amount and ratio of scientifically based mineral fertilizers and the application of organic fertilizers, crop rotation, land and water conservation and the introduction of other advanced technologies [4].

Due to sowing the secondary and intermediate crops after winter wheat in short-rotation crop rotation systems, the root residues of these crops remain in the soil layers in a certain amount, which over time under the influence of microorganisms turn into different forms of nutrients and maintain soil fertility. At

the same time, the effect of humus on maintaining soil fertility was significant, and an increase in the amount of humus was observed by synthesizing the remaining root residues in the soil [12, 18].

The influence of legumes on the change in the total and mobile forms of humus, nitrogen, phosphorus and potassium content in the soil by secondary crops planted after winter wheat has unique feature. This is due to the fact that the amount of root residues in legumes, which are quickly converted into various forms of nutrients, has a positive effect on soil fertility, and increasing the yield of crops planted following year [1, 13, 17].

According to sowing date, which carried out the research, winter wheat left an average of 1.18-1.65 t / ha of stubble and 2.18-2.66 t / ha of root residues at the end of the growing season, while mung bean grown as a second crop was 0.64-0,95 t / ha of root and 1.17–1.99 t / ha of root residues. It was found to leave 1.14-1.43 t / ha of stubble and 1.84-2.35 t / ha of root residues of rye, planted as an intermediate crop [7].

Introduction of legume crops in short-crop rotation system as a repeat and mixed crop after winter cereal crops in the 1:1 (cotton: grain) system allows to accumulate an average of 5.97 to 8.24 tons of organic residue per hectare per year, and thus, it provides accumulation of nitrogen in the amount of 37,8-48.0 kg / ha, phosphorus in the amount of 12.8-23.7 kg / ha, potassium in the amount of 22.6-45.8 kg / ha.

X.N.Atabaeva, F.B.Namozov, A.A.Kurbanov and S.Sh.Khayrullayev (2020), in their experiments in 2018-2020, found that when micronutrients affected soybean crops, micronutrients affected stem height, leaf and root development, root nodule formation, grain quality and yield, and provided high yields [16].

According to R.Juraeva, J.Tashpulatov, A.Iminov, H.Bozorov, Khatamov S.R, Khayrullaev S.Sh and L.Zaynitdinova (2020), in their experiments in 2015-2017, mineral fertilizers and rhizobium were applied to soybeans. When exposed to strains of azotabacteria belonging to the group, it was observed that the yield increased by 12.6-12.8 c / ha compared to the control variant, [6]; [5].

According to Khayrullayev Sardor Shamsiddin ugli (2021), the application of micronutrients in the suspension method 2 times during the application period of soybean varieties in the conditions of meadow-swamp soils provides an increase in grain quality [9].

According to data of Atabayeva Khalima Nazarovna, Khayrullaev Sardor Shamsiddin o'g'li, and Usmonova Shohista Usmon qizi (2020), sulfur has a positive effect on the branching of soybean varieties on the background of mineral fertilizers, and in 2018 the number of branches in the variety "Orzu" increased by 0.8-1.3 compared to the control option due to the micro element sulfur. In the "Nafis" variety, this figure was 0.3-0.4, and good results were obtained from medium and high sulfur standards. In 2019, these indicators increased by 0.3-0.7 in the variants of sulfur compared to the control in the "Orzu" variety, increased by 0.1-0.3 in the "Nafis" variety, and good results were obtained from the medium and high standards of sulfur [3].

According to Iminov Abduvali Abdumannobovich, Khayrullayev Sardor Shamsiiddin ugli, et al, Nitragine treatment of soybean and mung bean seeds before sowing had a positive effect on seed germination under both laboratory and field conditions, the germination rate of seeds in the laboratory under the conditions of cotton cultivation in the following year under the background of non-treatment by nitragine before sowing the seeds of soybean and mung bean crops grown as a secondary crop after winter wheat was 0.3-1.3%, and field fertility was 0.2-0.8% higher. Also, it was found that the use of phosphorus and potassium fertilizers in soybean and mung bean crops grown as a secondary crop was 0.6-1.0% higher in the laboratory, and 0.6-0.7% higher in the field than in the control options without mineral fertilizers in studies [2].

According to Umarova Nigora Sadriddinovna, Bo'riboyev Bekzod Yetmish ugli, Khayrullayev Sardor Shamsiddin ugli, Usmonova Shokhista Usmon kizi, & Turdaliyeva Shokhista Tulkinjon kizi, the demand of the soybean plant for mineral fertilizers, it was observed that when NPK and liquid fertilizer were used together, all the biometric parameters and yields of the plant increased by varieties compared to other methods. The use of mineral fertilizers in different ways in typical sierozem soil conditions affects the grain yield of local and foreign varieties. In other words, the average yield of medium-ripe soybean varieties "Nafis" was 43.4 c / ha, "Vilana" was 42.4 c / ha, and the best way to increase the yield is to apply fertilizers as NPK in combination with liquid fertilizer [19].

According to data of Khayrullayev Sardor Shamsiddin o'g'li and Usmonova Shhista Usmon qizi, the location of the lower first pod in soybean varieties is 12.8-15.9 cm in Orzu variety, 3-3.1 cm in Radimax stimulator, 2.2-2.4 cm in Gummat stimulator, 2.1 cm in Tecamin stimulator and 3.1 cm in Algora stimulator was found to be high. The most effective results were observed in Radimax, Gummat and Algora bio-simulators, and the location of the lower first pod was detected 14.7-17.6 cm in the "Nafis" variety, which was 2.5-2.9 cm higher in the Radimax stimulator, 2.2-2.5 cm higher in the Gummat stimulator, 2.1 cm higher in the Tecamine stimulator, and 2.4 cm higher in the Algora stimulator than in the control variant. The most effective results were observed in Radimax, Gummat and Algora biosimulators [8].

According to data of Kayrullayev Sardor Shamsiddin ugli and Usmonova Shokhista Usmon kizi, Mineral fertilizers and sulfur microelements activate the symbiotic activity of the soybean variety "Orzu", averaging 32.4-42.3 million pieces per hectare, the number of nodules due to the background of mineral fertilizers increased by 13.6%, and found to have increased 19.4-23.4% due to sulfur. Also, the average weight of nodules was 6.46-9.56 c / ha, due to the background of mineral fertilizers the weight of nodules increased by 5.3%, and 17.1- 32.4%due to sulfur. During the validity period, according to the studied variants, the mass of nodules was accumulated at 6.46-9.56 c / ha per hectare, which contributes to the increase of nitrogen and organic matter in the soil and a slight increase in biological efficiency [10].

Method and Materials

Our research was conducted in 2011-2015 in the fields of the experimental plot of the Tashkent State Agrarian University. The soil of the experimental field is a typical sierozem, which has been irrigated for a long time, the mechanical composition is sandy, the groundwater is located at a depth of 15-18 meters.

The study examined the application of mineral fertilizers N_{200} P_{140} K_{100} kg / ha in winter wheat, as well as the use of 10, 20 t / ha of semi-rotten black manure and compost in addition to these mineral fertilizers. In these backgrounds, mung bean was cultivated as a secondary crop, and the effect of winter wheat and secondary crop mung bean on the amount of roots and stalks left in the soil and the amount of nutrients remaining in the soil through them was determined by the norms of compost and fertilizers applied in winter wheat. The norm of mineral fertilizers N_{30} P_{90} K_{60} kg / ha was applied in the repeated crop. The field experiment included 10 variants, placed in 3 repetitions, and variants were placed in 1 tier. The total area of each option was 240 m^2, of which 120 m^2 was accounted for.

From mineral fertilizers, ammonium nitrate (N 33-34%), superphos (N 5-6%, P_2O_5-22%) and potassium chloride (K_2O-60%) fertilizers were used. In the preparation of compost, rice and wood filings - 25 percent, manure - 25 percent, chicken manure - 35 percent, phosphogypsum -15 percent were taken, mixed and stored in amassments 2 m high for 4 months, covered with a 10 cm layer of soil. According to the experimental system, compost and black manure were applied under the autumn plough before sowing winter wheat.

The research was conducted in the field and in the laboratory, including the placement of field experiments, calculations and observations "Methods of field experiments", soil and plant analysis "Methods of agrochemical analysis of soil and plants", "Methods of agrochemical, agrophysical and microbiological methods of field research" conducted on the basis of guidelines [11, 14, 15].

In the conducted experiments, the amount of root and root remnants left in the soil separately at the end of the application period of each plant was studied up to 0-50 cm layer of soil.

After harvesting the winter wheat and repeat crops, the amount of root and stalk residues was determined by washing and drying the soil monoliths.

Results and Discussion

Based on the purposes and functions of our research, short crop rotation system 1:1, in winter wheat + repeat crop mung bean:cotton system, the amount of root and root residues left in the soil by winter wheat and repeated crop mung bean and their total nitrogen, phosphorus, potassium content the amounts of nitrogen accumulated in the field per hectare were determined.

These data determine the degree of change in soil fertility in terms of the effects and final effects of mineral fertilizers, semi-rotten black manure and compost used in the care of agricultural crops used in our research.

In our field experiments, the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha in winter wheat and in addition to the norms of these mineral fertilizers 10, 20 t / ha of semi-rotten black manure and 10, 20 t / ha of compost were grown as a secondary crop, and their effect on nitrogen, phosphorus, and potassium levels were studied. The norm of mineral fertilizers N_{30} P_{90} K_{60} kg / ha was applied in mung bean grown as a secondary crop.

In the conducted experiments, the amounts of root and root remnants left in the soil at the end of the praxis period of winter wheat were studied up to 0-50 cm layer of soil.

According to the study, in the control variant, where the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha was applied, it was found that after harvesting the winter wheat crop left an average of 1.59 t / ha of stubble, 1.88 t / ha of root residues. N_{200} P_{140} K_{100} kg / ha norm of mineral fertilizers in winter wheat + 10 t / ha semi-rotten black cattle manure was applied. In option 2, 1.70 t / ha of manure, 2.02 t / ha of root residues were found, while mineral fertilizers N_{200} P_{140} K_{100} kg / ha norm + 20 t / ha semi-decomposed black cattle manure applied in variant 3 1.81 t / ha stubble, 2.13 t / ha root remains.

In addition to the recommended mineral fertilizer standards for winter wheat, it was found that the application of compost in the amount of 10, 20 t / ha affected the amount of root and dung residues left by the plant in the soil. The norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 10 t / ha of compost In variant 4, 1.75 t / ha of manure, 2.06 t / ha of root residues were found, while the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 20 t / ha where compost was applied in variant 5, it was found that 1.87 t / ha of manure and 2.18 t / ha of root remains remained (Table 1).

Analysis of the total amount of manure and root residues left in the soil of winter wheat in the experimental variants showed that the highest values were observed in variant 5, where the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 20 t / ha compost was applied, totaling 4.05 t / ha organic residues were found. The lowest values were observed in experimental Control 1, where the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha was applied and amounted to 3.47 t / ha.

It can be seen that in addition to the recommended mineral fertilizer standards for winter wheat care, the use of semi-rotted black manure and compost ensured that mineral fertilizers alone contained large amounts of organic residue in the amount of 0.25–0.58 t / ha compared to the control variant used.

As mentioned above, any crop takes with it different amounts of nitrogen, phosphorus and potassium elements from the soil. If some of these extracted elements are lost along with the crop, some are lost due to the harvested stem composition. However, these elements can also return to the soil at the expense of plant stubble left in the soil, especially root stubble.

In order to clarify the issue, the amounts of nitrogen, phosphorus and potassium in the stalks and roots of winter wheat were analyzed in the laboratory. According to the data, in the control variant with the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha, 0.402% nitrogen, 0.147% phosphorus, 0.203% potassium were found in the root part of winter wheat, and 0.212% nitrogen, 0.120% phosphorus, 0.143% potassium element in the root part.

Table 1. Effect of application of local and mineral fertilizers on winter wheat on the amount of organic residues remaining in the soil, t / ha

№	Norms of local and mineral fertilizers in winter wheat	Root residue, t/ha	Stubble residue, t/ha	Total
1	N_{200} P_{140} K_{100} kg/ha	1.59	1.88	3.47
2	N_{200} P_{140} K_{100} kg/ha + 10 t/ha manure	1.70	2.02	3.72
3	N_{200} P_{140} K_{100} kg/ha + 20 t/ha manure	1.81	2.13	3.94
4	N_{200} P_{140} K_{100} kg/ha + 10 t/ha compost	1.75	2.06	3.81
5	N_{200} P_{140} K_{100} kg/ha + 20 t/ha compost	1.87	2.18	4.05

The norm of mineral fertilizers is N_{200} P_{140} K_{100} kg / ha + 10 t / ha of semi-rotten black cattle manure. In variant 2, 0.415% nitrogen, 0.156% phosphorus, 0.218% potassium, and 0.221% nitrogen, 0.126% phosphorus in the root part of winter wheat. In the presence of 0.148% potassium element, the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 20 t / ha semi-rotten black manure was applied. In variant 3, 0.422% nitrogen, 0.162% phosphorus, 0.223% potassium, in the root part of winter wheat, and 0.225% nitrogen, 0.131% phosphorus, and 0.154% potassium.

The norm of mineral fertilizers in winter wheat is N_{200} P_{140} K_{100} kg / ha + 10 t / ha compost in variant 4, 0.418% nitrogen, 0.158% phosphorus, 0.221% potassium, 0.22% nitrogen, 0.129% phosphorus, 0.151% the presence of the element potassium was determined in the root part of the plant. The norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 20 t / ha of compost was the highest in variant 5, with 0.425% nitrogen, 0.166% phosphorus, 0.227% potassium and 0.228% nitrogen, 0.134% phosphorus, 0.158% potassium was detected in the root part of winter wheat. (Table 2).

If we multiply these data by the amount of plant and root residues in the plant, we can calculate how much nitrogen, phosphorus, and potassium are returned to the soil through the plant's root and stubble.

According to our data, in variants 3 and 5 of the experiment, it was found that the highest amounts of nitrogen, phosphorus and potassium were returned to the soil through the roots and stubbles. In these variants, the parameters were N-12.3-12.9 kg, P_2O_5-5.7-6.0 kg, K_2O-7.3-7.7 kg / ha, respectively, while the mineral fertilizers N_{200} P_{140} K_{100} kg. N-11.5-11.9 kg, P_2O_5-5.2-5.4 kg, K_2O- at rate of 6.7-7.0 kg/ha in variants 2 and 4 with the addition of 10 t / ha of semi-rotten black manure and compost in addition to the norm nutrients were found to return to the soil. It was found that in the control variant of the experiment, which

applied mineral fertilizers only in itself, the amount of nutrients returned to N-10.4 kg, P_2O_5-4.6 kg, K_2O-5.9 kg /ha.

Table 2. The content of roots and stubble residues in nutrients of winter wheat,%

№	Norms of local and mineral fertilizers in winter wheat	In the content of root residues			In the content of stubble residues		
		nitrogen	phosphorus	potassium	nitrogen	phosphorus	potassium
1	N_{200} P_{140} K_{100} kg/ha	0.402	0.147	0.203	0.212	0.120	0.143
2	N_{200} P_{140} K_{100} kg/ha + 10 t/ha manure	0.415	0.156	0.218	0.219	0.126	0.148
3	N_{200} P_{140} K_{100} kg/ha + 20 t/ha manure	0.422	0.162	0.223	0.225	0.131	0.154
4	N_{200} P_{140} K_{100} kg/ha + 10 t/ha compost	0.418	0.158	0.221	0.222	0.129	0.151
5	N_{200} P_{140} K_{100} kg/ha + 20 t/ha compost	0.425	0.166	0.227	0.228	0.134	0.158

According to the data on root and root residues left in the soil by replanted mung bean, the average yield of replanted mung bean grown in winter wheat was used N_{200} P_{140} K_{100} in the background, after harvesting mung bean harvest, it was found to have left root remnants 0.83 t/ha stubble residues, 1.29 t/ha root residues. N_{200} P_{140} K_{100} kg / ha norm of mineral fertilizers used in winter wheat + 10 t / ha of semi-rotten black cattle manure of mung bean grown in the background, it was taken 0.91 t / ha stubble, 1.38 t / ha of root residues were found, the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 20 t / ha of mung bean in winter wheat, where used semi-rotten black cattle manure was applied, 0.97 t / ha of stubble and 1.43 t / ha of root remains were left in the background.

It was found that the application of compost in the amount of 10, 20 t / ha in addition to the recommended mineral fertilizer norms in winter wheat affected the amount of root and root residues remaining in the soil by the mung bean crop grown as a secondary crop. The norm of mineral fertilizers in winter wheat was used N_{200} P_{140} K_{100} kg / ha + 10 t / ha of compost in the background in variant 4, where mung bean cultivated repeatedly, it was determined to leave 0.93 t/ha stubble residues, 1.41 t/ha root residues, the rate of fertilizer N_{200} P_{140} K_{100} kg / ha + 20 t / ha compost in used variant was found to be 0.99 t / ha of stubble, 1.47 t / ha of root residues in variant 5 where mung bean was grown as a secondary crop in the background (Table 3).

Table 3. Effect of application of local and mineral fertilizers on winter wheat on the amount of organic residues left in the soil by repeated crop mung bean, t / ha

№	Norms of local and mineral fertilizers in winter wheat	The norm of mineral fertilizers applied in repeated mung bean crop, kg / ha	Root residues, t/ha	Stubble residues, t/ha	Total
1	N_{200} P_{140} K_{100} kg/ha	N_{30} P_{60} K_{90} kg/ha	1.29	0.83	2.12
2	N_{200} P_{140} K_{100} kg/ha + 10 t/ha manure	N_{30} P_{60} K_{90} kg/ha	1.38	0.91	2.29
3	N_{200} P_{140} K_{100} kg/ha + 20 t/ha manure	N_{30} P_{60} K_{90} kg/ha	1.43	0.97	2.40
4	N_{200} P_{140} K_{100} kg/ha + 10 t/ha compost	N_{30} P_{60} K_{90} kg/ha	1.41	0.93	2.34
5	N_{200} P_{140} K_{100} kg/ha + 20 t/ha compost	N_{30} P_{60} K_{90} kg/ha	1.47	0.99	2.46

Analysis of the total amount of manure and root residues left in the soil by repeat crop mung bean in the experimental variants showed that the highest results were observed in variant 5, where the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 20 t / ha compost was applied in winter wheat with a total of 2.46 t / ha of organic residue remaining. The lowest values were observed in experimental Control 1, where the norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha in winter wheat was observed in the 1st variant, where the mung bean crop was cultivated as a secondary crop amounted to 2.12 t / ha.

The norm of mineral fertilizers in winter wheat is N_{200} P_{140} K_{100} kg / ha + 10 t / ha of semi-rotten black cattle manure in the background, the mung bean crop was cultivated as a secondary crop in variant there were 1.46% nitrogen, 1.01% phosphorus, 1.09% potassium in the part of root, and 1.35% of nitrogen, 0.40% of phosphorus, 1.38% of potassium in the part of stubble, the norm of mineral fertilizers in winter wheat is N_{200} P_{140} K_{100} kg / ha + 20 t / ha of semi-rotten black manure in the background, or in variant 3, 1.52% nitrogen, 1.06% phosphorus, 1.14% potassium, and 1.42% nitrogen, 0.45% phosphorus, 1, 44% potassium was found to be present (Table 4).

Table 4. Amount of nutrients in the root and stubble residues of repeated mung bean,%

№	Norms of local and mineral fertilizers in winter wheat	In the content of root residues			In the content of stubble residues		
		nitrogen	phosphorus	potassium	nitrogen	phosphorus	potassium
1	N_{200} P_{140} K_{100} kg/ha	1.42	0.98	1.06	1.31	0.36	1.35
2	N_{200} P_{140} K_{100} kg/ha + 10 t/ha manure	1.46	1.01	1.09	1.35	0.40	1.38
3	N_{200} P_{140} K_{100} kg/ha + 20 t/ha manure	1.52	1.06	1.14	1.42	0.45	1.44
4	N_{200} P_{140} K_{100} kg/ha + 10 t/ha compost	1.48	1.04	1.12	1.39	0.43	1.42
5	N_{200} P_{140} K_{100} kg/ha + 20 t/ha compost	1.55	1.09	1.18	1.46	0.46	1.47

N_{200} P_{140} K_{100} kg / ha norm of mineral fertilizers in winter wheat + 10 t / ha compost applied in the 4th variant of mung bean crop as a repeated crop in the background, it was found to be 1.48% nitrogen, 1.04% phosphorus, 1.12% potassium in the root part of the plant, and 1.39%, nitrogen, 0.43% phosphorus, 1.42%

potassium in the part of stubble. The norm of mineral fertilizers N_{200} P_{140} K_{100} kg / ha + 20 t / ha of compost in winter wheat, is the highest in the background of variant 5, where mung bean is grown as a secondary crop, it was found to be 1.22% nitrogen, 1.09% phosphorus, 1.18% potassium in the part of root of mung bean, and 1.46% nitrogen, 0.46% phosphorus, 1.47% potassium in the stubble part.

If we multiply these data by the amount of plant and root residues in the plant, we can calculate how much nitrogen, phosphorus, and potassium are returned to the soil through the plant's stubble and root parts.

According to our data, in variants 3 and 5 of the experiment, it was found that the highest amounts of nitrogen, phosphorus and potassium were returned to the soil through the roots and stubbles. In these variants, the indicators were N-35.5-37.2 kg, P_2O_5-19.5-20.5 kg, K_2O-30.3-31.8 kg / ha, respectively. In addition to the norm of mineral fertilizers N_{200} $P_{140}K_{100}$ kg / ha in winter wheat, 10 t / ha of semi-rotted black cattle manure and compost were applied to the mung bean crop as a repeat crop in the backgrounds in options 2 and 4, It was found that nutrients in the amount of N-32.4-33.8 kg, P_2O_5-17.5-18,7 kg, K_2O-27.5-29.0 kg / ha return to the soil. Experiments have shown that in winter wheat mineral fertilizers are applied only in the background in the controlled variant of mung bean crop as a secondary crop, the amount of nutrients returns to N-29.2 kg, P_2O_5-15.6 kg, K_2O-24.9 kg / ha.

Conclusion

In addition to the recommended norms of mineral fertilizers for winter wheat, the application of 10, 20 t / ha of semi-rotten black manure and compost, it provides on avarage from 3.72 tons to 4.05 tons per hectare of organic residue, and thus 11.5-12.9 kg / ha of nitroge, 5.2-6.0 kg / ha of phosphorus, 6.7-7.7 kg / ha of potassium in the soil. Mung bean grown as a secondary crop has an average of 2.29 to 2.46 tons of organic residue per hectare, and thus 32.4-37.2 kg / ha of nitrogen, 17.5-20.5 kg / ha of phosphorus, 27.5–31.8 kg / ha of potassium elements return in the amount.

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