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Research for Soil Fertility Maintenance

Sotvoldi Tursunov
Professor of Namangan Institute of Engineering and Technology,
Namangan Institute of Engineering and Technology, Kosonsoy str. 7, Namangan city, Namangan Region., Uzbekistan

Abstract. The article highlights the importance of planting moss, beans, nuts, and corn as a secondary crop in areas vacated by winter wheat, and their root and anise residues in increasing soil fertility. In the current period of cotton-wheat crop rotation, the technology of re-sowing after winter wheat is absolutely not perfect in terms of increasing soil fertility. At the same time, both cotton, winter wheat, and maize, which are grown as secondary crops, are crops that “consume” soil fertility. That is why scientific research has shown that soil fertility is declining.

Keywords: *Secondary crop, crop rotation, soil productivity, atmospheric precipitation, limited moisture capacity*.

I. INTRODUCTION

Soils feed the plants which in turn feed the animals that feed us. Including soil in this important chain will help guarantee its success. Soil provides the support or foundation for plants and most of the nutrients. Soil is accumulated decomposing plant and animal matter with aging parent material. As the soil components break down, elements are released and become available to plants as nutrients. However, naturally this process takes a long time and the soil will only be a result of the parent material, climate, those living organisms once living there, topography, and time. So what is made available to a plant at a certain time may not be exactly what a growing plant needs. Fertilization is supplementing the existing soil with additional, needed nutrients. Fertilizing wisely increases yield, quality (nitrogen content and digestibility), and profits [1].

Currently, corn is grown as a secondary crop in all soil conditions of Namangan region. Partial lands are left without even replanting and plowing, as a result of which soil moisture in our arid region evaporates into the atmosphere, degrading the agro-physical, agrochemical and ecological properties of uncultivated lands. As a result, weed infestation of these areas is accompanied by an increase in weeds, especially perennials, rootstocks, which are extremely difficult to control. This also leads to a waste of soil fertility.

In addition, at present about 60% of crop yields are due to the use of mineral fertilizers. It is known that mineral fertilizers mobilize the amount of humus in the soil during the transition to the state of plant assimilation. As a result, there is a decline in existing productivity. [2]

When sowing soybeans, mungbeans, beans, peas, walnuts and green peas in the fields of cotton-wheat rotation, 60-100 kg of biological nitrogen per 1 hectare is accumulated in the soil, the soil layer is enriched with humus, it is possible to maintain productivity.

Therefore, in accordance with the soil and climatic conditions of the region, increasing the fertility of the soil, the amount of humus in it, crop yields, ecologically acceptable rotational planting regimes important scientific, practical significance.

The importance of legumes in agriculture has been studied by scientists of our country.

We also planted legumes on winter wheat-free lands to study the effect on soil fertility.

Field experiments were conducted on the farm of “Nurmuhammad, Abdullo Sakhovati”, in Chartak district of Namangan region.

The relief of the farm is lowland, the climate is sharply unstable, winters are cold and summers are hot. January cold to -21C, July hot. It’s may be up to 40^0C. The average annual rainfall is 225 mm. The shelf life of crops is 180-200 days.

The soil of the experimental field is meadow-gray, with a heavy sandy mechanical composition, irrigated from time immemorial, almost unsalted. The amount of humus in the topsoil is 1.1-1.5%, the bulk density is 1.45-1.64 g / cm^3, groundwater is located at a depth of 5-6 m above the ground.

The soils and climate of the farmland are similar to the meadow-gray soils of Namangan region, suitable for crop production.

Atmospheric precipitation occurs mainly in spring and winter, with almost no precipitation in July-August.

After harvesting 62.5 center/ha of winter wheat in the area selected for the experiment, land preparation for replanting began.

After the field was cleared of various residues, all the phosphorus, potassium mineral fertilizers allocated for repeated crops were put under the drive.

II. MATERIALS AND METHODS

The Ploughing was carried out with plows at a depth of 30 cm, and the ground was immediately leveled current. In a well-leveled area, irrigation ditches were made 60 cm apart. After that, the placement of fragments in the field was carried out. Seeds of secondary crops were sown on June 20 at a depth appropriate to the requirements of the crop. After sowing, seed water was given (Table 1).

The annual fertilizer rate for corn is NPK - 200: 170: 100 kg / ha, for other legumes - 75: 75: 50 kg / ha. The sowing rate of corn is 60 kg / ha, sorghum - 30 kg / ha, nuts - 80 kg / ha, beans - 80 kg / ha.

Repeated crops were fed 1 time during the application period, corn 5 times, legumes 4 times watered, 3 times weeded.

Varieties of secondary crops: corn – “NS 205”, “FAO 190”, Mungbean – “Pobeda -104”, beans – “Hybrid-7”, Peanuts – “Kibray-4”.

The grain yield of the replanted crops was determined on 25 October by the sampling method.

Field experiments were conducted on the meadow gray soils of “Nurmuhammad, Abdullo Sakhovati” farm, in Chartak district of Namangan region.

Option 1 - no replanting after fall wheat

Option 2 - After the fall wheat is planted a second crop of corn.

Option 3 - After autumn wheat is planted repeated crop moss

Option 4 - After winter wheat planted beans for repeated crops

Option 5 - a repeated crop of walnuts planted after the fall wheat

Experiment 4 repetitions, two rows of pieces were placed, total area 240 m2, account 120 m^2.

Observations, calculations, determinations, and analyzes conducted during the research process are B.A. Dospekhov and information of scientific-research in.

The following observations, calculations, determinations and the analysis was carried out:

-determination of agro physical properties of soil;

- determination of agrochemical properties of soil;

- to determine the impact of legumes on soil fertility;

- identification of root and root remnants of legumes;

- calculation of seedling thickness at the beginning and end of the period of legumes;

- to determine the growth, development and harvest of legumes;

-determination of the number of legumes;

- determination of grain yield of legumes;

- determination of hay yield of legumes.

Common forms of nutrients in the soil are nitrogen and phosphorus K.V. Ginzburg,

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T.M.shcheglova, humus I.V. In the Tyurin methods, phosphoric acid was analyzed by B.P. Machigin, a potassium flame photometer.

First of all, the initial data on the properties of experimental field soils is explained.

Our experimental field soil layers were identified in 2019, with initial data given in Tables 1, 2, 3, 4.

The bulk density, porosity, and nutrient uptake of the experimental field soil were also determined as the starting material.

It is known that the bulk density of the soil is in the driving layer

1.562 g/cm^3, and in the underlying layer 1.595 g/cm^3, the porosity is proportional to 44.5–40.8% (Table 1).

Table 1

The initial bulk density of the soil is porosity and amount of nutrients.

Layer, (cm)	Weight, (h/cm$^{3)}$	Porosity, (%)	Total amount of nutrients %		
			humus	N	P
0-30	1.562	44.5	0.815	0.065	0.095
30-50	1.595	40.8	0.690	0.050	0.080

The soil of the experimental field is not well supplied with nutrients, so the farm needs to plant legumes in all fields and maintain soil fertility as much as possible. At the beginning of the experiment, we determined the limited field moisture capacity, which is an indicator of the water properties of the soil (Table 2). It is known that the limited moisture capacity of field soil is 25.6% in the 0-50 cm layer, 25.3% in the 0-70 cm layer, and 0-100 cm layer. 25.0%. Hence, the total, average limited field moisture capacity of the field soil we were experimenting with turned out to be 25% in a one-meter layer [3].

We know from scientific sources that the water permeability of the soil consists of 2 stages. In the first stage, the soil particles come first (table 2).

Table 2

Limited field moisture capacity

Layer, (cm)	Limited field moisture capacity,(%)		
	7.06	10.06	13.06
0-10	29,7	26,3	26,0
10-20	29,1	26,6	26,0
20-30	28,4	25,7	25,5
30-40	27,9	25,5	25,2
40-50	27,3	25,5	25,1
50-60	27,1	24,9	25,0
60-70	26,7	24,5	24,7
70-80	26,2	24,3	24,4
80-90	26,0	23,7	24,1
90-100	25,2	23,3	23,4
0-50	28,48	25,92	25,6
0-70	28,02	25,57	25,3
0-100	27,36	25,03	25,0

It absorbs moisture, and in the second stage the process of transfer to the lower layers begins. Hence, the water permeability property of the field soil selected for our experiment on the subject is

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good. In general, the mechanical composition of the experimental field soil is heavy sand, its driving and subsoil layers have a bulk density of 1.5-1.6 g / cm^3, the limited field moisture capacity is 25% in a layer of 0-100 cm, soil nutrients with low supply. Timely sowing of agricultural crops is an important agro-measure. After all, it is possible to create an optimal seedling thickness from flat germinated seeds, and seedling thickness is one of the main factors determining productivity. We considered the germination of repeat crops three times during the experimental process (Table 3). It should be noted that the secondary crops were removed with seed water on June 20, when they were planted when the soil moisture reserve was extremely low. By July 5, after watering the seeds of repeated crops 40.2-33.2% germinated, and as of July 10, 57.5-64.8% of seeds germinated. In general, almost 100% germination of seeds occurred 25 days after sowing or 23 days after sowing. As mentioned above, since seedling thickness is a key factor in productivity, a specific, appropriate seedling thickness for each crop was created during the weeding process.

Table 3.
Germination of repeat crops and actual seedling thickness.

Page	Number of sprouted nests,%			Actual seedling thickness, thousand / ha	
	5.07	10.07	15.07	At the beginning of the validity period	At the end of the validity period
Corn					
2	40,2	68,4	96,7	62,5	61,3
Mungbean					
3	38,4	65,4	96,3	165,3	153,7
Bean					
4	33,2	59,2	94,3	164,1	148,9
Peanut					
5	36,3	61,4	94,2	159,3	151,1

III. RESULTS AND DISCUSSION

In particular, due to the planned planting of corn, we left the seedling thickness at about 60,000 per hectare. In other crops, the seedling thickness given in the current recommendations was formed.

Data on growth, development and yield of secondary crops are given in Table 4. These data show that the height of the repeat crops, the pods corresponded to their biological properties. In particular, on September 20, corn increased to 195.4 cm, and the yield of milk per grain was 65.5 cent / ha. The height of the mash reached almost 58 cm, the grain yield was 18.1 cent / ha. The grain yield of other secondary crops was around 13.9-19.4 cent / ha.

Table 4
Growth, development and yield of secondary crops.

Option number	Repeated crops	20.09		Crop, cent/ha.	
		Height, cm	Number of legumes	Grain	Hay
1	-	-	-	-	-
2	Corn	195,4	1,0	65,5	496,4
3	Mung bean	58,2	31,2	18,1	33,5

4	Bean	60,3	29,1	13,9	13,0
5	Peanut	55,4	26,9	19.4	18.7

The main goal was to enrich the soil with humus and other nutrients, maintaining soil fertility, on account of the remains of roots and angiosperms of repeated crops. From this point of view, we have identified all repeated crops as root and root remains.

According to these data, corn left the most Root residues, while the remains of mung bean with beans were around 30-32 centner per hectare. The root remains of other leguminous crops corresponded to 20,1-16,3 cent/ha.per hectare.

From the corn plant to the hectare remained a total of 47,5 cent, while the remains from mosh 44.9 cent, beans, peanuts were a total of 25.2 cent/ha (table 5).

Table 5
Root and angular residues of repeated crops

Option number	Repeated crops	Relics, cent/ha		
		Root remain	Root	Total
1	-	-	-	-
2	Corn	16.2	31.3	47.5
3	Mung bean	12.4	32.5	44.9
4	Bean	8.8	20.1	28.9
5	Peanut	8.9	16.3	25.2

It is known that a powerful means of maintaining and increasing soil fertility is the alternation of planting. The main purpose of our experiment is to maintain the fertility of the soil through the remains of their roots and angiosperms until it is possible to plant repeated crops after the fall.

We interpreted the above data on the yield of repeated crops, their root and remains of root, as well as we were convinced that the repeated crops planted in our experiment left a certain amount of root and remains of root.

This affected the volumetric weight and porosity of the subsoil layer of soil plow and plow, the amount of humus and nutrients, of course, in the process of decomposition of residues into humus.

One of the agrophysical characteristics of the soil is the volume of weight directly related to the development of the root system of crops, as well as the upper ground stem. At this time, the level of development of the roots, in turn, also affects the volume weight of the soil. If we carefully analyze the table data, we can conclude that repeated crops directly affect the volume weight of the soil layer. In particular, the highest density in the subsurface layer of the soil haydov and haydov turned out to be in the 1-th variant, where the repeated crop was not planted, thrown dry. Because this option was not processed at all after the summer drive to the soil, the moisture was mistyly evaporated.

It turned out that in the 2^{nd}-variant, where the repeated corn is planted, the volume is slightly lighter than the weight control. This is due to the fact that in this variant the root system of corn was formed, which had a slightly positive effect on the volume weight. But on account of the fact that corn was watered 5 times, the volume weight of the soil remained in an undesirable state. We know from scientific sources that for the active development of the roots of most agricultural crops, the

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volume weight of the soil of the haydov layer should be 1,10-1,40 g/cm^3. It can be said that repeated leguminous crops provided a volumetric weight close to the same optimal density.

In particular, the volume weight of the ploughing layer in the options for planting mosh is 1,40-1,39 g/cm3, which we consider this density as a requirement.

Table-6

The effect of repeated crops on the volumetric weight and porosity of soil 10.10.2019

Option number	Repeated crops	Volume weight, (g/cm3)		Worsted, (%)	
		0-30 cm	30-50cm	0-30 cm	30-50 cm
1	Repeated crop is not planted	1,57	1,59	41,9	41,1
2	Corn	1,55	1,55	42,6	42,6
3	Mung bean	1,39	1,55	48,6	42,6
4	Bean	1,48	1,50	45,2	42,2
5	Peanut	1,45	1,57	46,3	41,9

Although other repeated legumes were not as affected by the volume weight of the mungbean, but brought the optimal density into the body. For example, beans, ground nuts, the weight of the soil of the hay layer in the planted options confirms our opinion that it is 1,45-1,48 g/cm^3.

The data we have identified on the porosity of the soil of the ploughing layer is consistent with the volumetric weight effect on the effect of repeated crops on this indicator. That is why, this indicator is determined on the basis of volumetric weight numbers.

So it turns out that legumes have a significant positive effect on the volumetric weight and porosity of the soil.

The amount of humus in the hay layer was 0,815 % before repeated sowing on the experimental field soil. On the account of the fact that the repeated crop was not planted, but turned the autumn tree into a rot of the root and the remains of anise, the amount of humus in the 1th option went to 1,040%, in the 2nd option of corn care, the figure was 1,080 %

We determined that the amount of humus in the soil of the ploughing layer was the highest in the variant where the mungbean was planted by 25 September.

Such a positive change in soil humus occurred even in variants where beans, peanuts are planted. Agrochemical analysis showed that repeated crops, especially leguminous repeated crops, also had a positive effect on the amount of total nutrient elements contained in the soil, albeit slightly.

In the Table 7 of the turn are presented the amounts of soil in the ploughing layer of active nutrient elements in the period of the brewing - onset of the harvest of repeated crops (25 September). This table data showed that after the fall, the amount of nitrogen, phosphorus and potassium nutrients that were consumed in the non-sown control variant of was minimal. Because in this option was not planted a repeated crop, which was left undone by driving the land. As a result, in our arid region, the soil moisture evaporates in vain, as a result of the finally increase in the charisma of the soil layer, the activity of the soil microflore has become incredibly sluggish, and the process of rotting the remains of roots and roots that remained after wheat has also slowed down.

Table-7

Influence of repeated crops on the amount of humus, total nitrogen, phosphorus in the soil of the drive and subsoil layer (%). (25.09.2019)

Option number	Repeated crops	Destruction		Nitrogen		Snap fastener	
		0-30 (cm)	30-50 (cm)	0-30 (cm)	30-50 (cm)	0-30 (cm)	30-50 (cm)
1	Repeated crop is not planted	1,040	1,020	0,070	0,097	0,170	0,146
2	Corn	1,080	1,040	0,076	0,098	0,170	0,147
3	Soya	1,100	1,000	0,103	0,130	0,173	0,152
4	Mung bean	1,150	1,107	0,105	0,140	0,188	0,155
5	Bean	1.090	1,075	0,100	0,108	0,169	0,149
6	Peanut	1,050	1,000	0,100	0,127	0,170	0,146

In the 2nd variant, where corn was planted as a repeated crop, the amount of nitratli nitrogen, phosphoric acid and exchangeable potassium turned out to be slightly higher than the control. This is due to the fact that if the first had an NPK effect on maize puddles, then the second option was to cool the soil with maize and the microolam life was active because the irrigation was standing xar the harrowing subsided. But since the corn plant was by nature a consumer of soil nutrients, a large number of nutrients were absorbed by corn (table 8).

Table-8

Effect of repeated crops on the amount of mobile nitrogen, phosphorus and potassium in the soil of the drive and subsoil layer (%).

Option number	Repeated crops	Nitrate nitrogen		Phosphoric acid		Replaceable potassium	
		0-30 (cm)	30-50 (cm)	0-30 (cm)	30-50 (cm)	0-30 (cm)	30-50 (cm)
1	Repeated crop is not planted	17,0	14,5	34,4	20,5	240	190
2	Corn	18,0	15,6	35,8	22,5	245	175
3	Soya	20,1	15,1	38,1	24,2	250	135
4	Mung bean	21,3	15,2	39,1	24,2	255	180
5	Bean	17,8	11,3	37,3	22,4	245	200

IV CONCLUSIONS

In conclusion, a significant increase in the content of active nutrients in the soil was observed in the planted variants of mosh, beans, peanuts.

So it turns out that after the fall, in the beginning of summer, repeated crops have a positive effect on the fertility of the soil, on its composition, on the amount of nutrients common and dynamic: corn, mungbean, beans and peanuts.

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