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CROP YIELD INDICATORS WITH CROP ROTATION OF SOYBEANS, WINTER WHEAT, BARLEY AND CORN

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ПОКАЗАТЕЛИ УРОЖАЙНОСТИ ПРИ СЕВООБОРОТЕ СОИ, ОЗИМОЙ ПШЕНИЦЫ, ЯЧМЕНЯ И КУКУРУЗЫ

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Abstract. The article provides comparative results of crop rotation and continuous cropping based on the diversification of soybean, winter wheat, barley and corn crops in 2018-2020. During crop rotation, significant results were obtained in the effective use by other plants of organic substances created in the soil by the root mass of one plant and plant residues. Thus, according to the results of the study, depending on the crops, the formation of green mass and dry biomass of soybeans and corn differed in development phases.

Аннотация. В статье даются сравнительные результаты севооборота и длительной культуры на основе диверсификации посевов сои, озимой пшеницы, ячменя и кукурузы в 2018–2020 годах. При севообороте были получены значительные результаты в эффективном использовании другими растениями органических веществ, созданных в почве корневой массой одного растения и растительными остатками. Таким образом, по результатам исследования в зависимости от посевов формирование зеленой массы и сухой биомассы сои и кукурузы различались по фазам развития.

Keywords: soil, plants, crop rotation, continuous cropping, biodiversity, crop yield.

Ключевые слова: почва, растения, севооборот, длительная культура, биоразнообразие, урожайность.

The President of the Republic of Azerbaijan signed a decree approving the “National Strategy for the Protection and Sustainable Use of Biological Diversity in the Republic of Azerbaijan for 2017-2020” in accordance with the sixth article of the United Nations Convention on Biological Diversity. The main goal of the National Strategy is to implement measures for the protection of natural resources and the efficient use of genetic resources, the protection of biological diversity and its transfer to future generations, the regulation of the ecological balance and the transition to a “green economy”. One of the main directions of the National Strategy is the widespread use of crop rotation schemes and other effective agrotechnical measures for cultivation, taking into account the soil and climatic conditions in the regions and the adoption of the necessary measures for the cultivation of traditional crops. In each farm, crop rotation is organized in accordance with the size of the field, the characteristics of the planted plants, and the soil and climatic conditions of the area where crop rotation is applied [2].

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In the regions of the country engaged in the production of grain, it is important to include fodder crops in the crop rotation without compromising the specific gravity of this plant. This includes the creation of biological diversity and the creation of a forage base in accordance with the current needs of animal husbandry, taking into account the specifics of natural and economic zones. Proper crop rotation on arable land improves phytosanitary conditions and minimizes diseases and pests. Soy is of great importance in agriculture as a nitrogen storage and a valuable precursor for crops. Soybean accumulates 100 kg of biological nitrogen per hectare. With the right choice of place in the crop rotation, fewer weeds will form on the field the next time you plant it. Therefore, when sowing cotton and grain crops after this crop, the yield per hectare increases significantly [1, 3, 4].

Taking into account the requirements of the state, in 2018-2020, research work was carried out in two regions to develop crop rotation schemes to protect soil and increase yields from a single plot based on the diversification of soybeans, winter wheat, barley and corn.

Materials and Methods

The survey was carried out in triplicate, the area of each site was 120 m^2. The crop rotation system, which restores soil fertility, was carried out according to the following schemes.

I. In gray-brown and medium clay soils of the Apsheron subsidiary experimental farm of the Research Institute of Agriculture:

1. Crop rotation: alternation of soybeans, winter wheat and corn;

2. Permanent planting: permanent planting of soybean, winter wheat and corn.

II. On light chestnut soil with a humus content of 2.0-2.5%, and on medium clay soils in terms of mechanical composition in the territory of the Tartarskaya ZOS:

1. Crop rotation: alternation of soybeans, winter wheat, corn and barley;

2. Permanent planting: permanent planting of soybeans, winter wheat, corn and barley.

Observations and agrotechnical measures were carried out in accordance with the recommendations for the cultivation of crops in short-rotation crop rotations and permanent crops of grain and inter-row crops under irrigation [2].

In March, 90 kg of nitrogen fertilizer was applied per hectare of soil for wheat and barley, 150 kg for corn at the 3-5 leaf stage, 45 kg for soybeans before branching and 45 kg during the formation of beans.

Results and Its Discussion

One of the most important issues is the development of the main direction of agriculture - animal husbandry, providing it with green fodder and dry grass. In fodder production, green mass, grain and soybean straw are used. Soy grain and grass flour is also used as a highly effective ingredient in the poultry industry. To determine the effect of crops on the harvest of surface green and dry biomass of soybean and corn, 10 plants were cut from the root collar from the first and third repetitions at different stages of development, weighed, then dried in the open air and re-weighed. According to the results of the study, the formation of green and dry biomass of soybeans and corn at different stages of development, depending on the crops, was different (Table 1).

In the Apsheron Subsidiary Experimental Farm, an increase in soybean green mass in the branching phase by 3.2 g, in the flowering phase by 8.0 g, in the bean formation phase by 7.6 g and grain formation by 4.7 g in the crop rotation was determined compared to permanent sowing. According to the data in the Tartarskaya AIA, 2.9 was determined; 9.1; 8.7 and 6.8 g green mass product. Over the years of research, the highest yield of green mass of corn was obtained in the phase of milky-wax ripening, which amounted to 49.0 centners per hectare in the Apsheron

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subsidiary experimental farm and 50.6 centners per hectare in the Tartarskaya AIA in crop rotation compared to permanent sowing.

Table 1

INFLUENCE OF CROP ROTATION AND PERMANENT SOWING ON THE DYNAMICS OF ACCUMULATION OF GREEN AND DRY BIOMASS BY PHASES OF PLANT DEVELOPMENT, IN GRAMS (average of 10 crops)

Crop rotation	*Stages of development Apsheron subsidiary experimental farm*				*Tartarskaya ZOS*			
	Permanent sowing		*Crop rotation*		*Permanent sowing*		*Crop rotation*	
	Green mass	*Dry mass*	*Green mass*	*Dry mass*	*Green mass*	*Dry mass*	*Green mass*	*Dry mass*
				Soya				
Branching	29.6	5.4	26.4	4.7	30.5	5.5	27.6	5.0
Flowering	87.1	18.9	79.1	17.2	91.4	19.9	82.3	17.8
Bean production	101.8	25.9	94.2	22.4	106.7	27.4	98.0	25.1
Grain formation	98.0	32.5	93.3	31.1	102.8	34.0	96.0	32.0
				Corn				
7-8 leaves	328.0	59.6	300.9	54.2	357.0	64.9	322.0	58.5
Basting	852.8	185.3	775.5	172.8	927.8	201.7	883.0	180.4
Cob stalk formation	963.6	247.1	860.2	200.7	1021.0	252.0	920.1	235.8
Milk-wax maturation	1067.0	355.2	978.8	326.5	1109.1	388.0	1017.0	339.0

The impact of crop rotations on fertility elements at the end of the growing season, providing biological diversity in these regions, is presented in Table 2.

Table 2

STRUCTURAL ELEMENTS OF PLANTS IN CROP ROTATION AND PERMANENT CROPS BY REGION (average for 2018-2020)

Crops	*Culture*	*Structural elements*																	
		Soybean				*Winter wheat*					*Corn*				*Barley*				
		The number of beans per 1 plant, pcs.	*Number of grains per 1 plant, pcs.*	*Weight of grain in 1 plant, g*	*Weight of 1000 grains, g*	*Number of spikes, pcs. / m²*	*Spike length, cm*	*Weight of grain per ear, g*	*Weight of grain, from a sheaf, g*	*Weight of 1000 grains, g*	*Number of cobs per 1 plant, pcs.*	*Cob length, cm*	*Cob diameter, cm*	*Qty. grains from the cob, g*	*Weight of 1000 grains, g*	*Number of spikes, pcs. / m²*	*Spike length, cm*	*Weight of grain per ear, g*	*Weight of grain, from a sheaf, g*	*Weight of 1000 grains, g*
		Apsheron Experimental Farm																	
Crop rotation	Soya	45.6	106.3	12.5	118.4														
	Wheat					270.4	9.1	1.62	420.4	41.8									

Crops	*Culture*	*Structural elements*																		
		Soybean				*Winter wheat*					*Corn*					*Barley*				
		The number of beans per 1 plant, pcs.	*Number of grains per 1 plant,*	*Weight of grain in 1 plant, g*	*Weight of 1000 grains, g*	*Number of spikes, pcs. / m^2*	*Spike length, cm*	*Weight of grain per ear, g*	*Weight of grain, from a sheaf, g*	*Weight of 1000 grains, g*	*Number of cobs per 1 plant, pcs.*	*Cob length, cm*	*Cob diameter, cm*	*Qty. grains from the cob, g*	*Weight of 1000 grains, g*	*Number of spikes, pcs. / m^2*	*Spike length, cm*	*Weight of grain per ear, g*	*Weight of grain, from a sheaf, g*	*Weight of 1000 grains, g*
	Corn										1.4	20.4	5.1	155.4	260.4					
Permanent sowing	Soya	41.6	97.3	11.3	111.0															
	Wheat					250.0	8.5	1.51	387.9	38.7										
	Corn										1.2	19.3	4.7	150.0	256.5					
Tartar Zonal Experimental Station																				
Crop rotation	Soya	52.5	128.0	13.9	110.3															
	Wheat					291.8	9.7	1.83	529.0	40.9										
	Barley															242.7	10.2	1.77	419.0	41.4
	Corn										1.5	21.9	5.9	155.9	293.8					
Permanent sowing	Soya	48.2	115.7	12.6	107.1															
	Wheat					270.7	9.0	1.67	490.0	37.5										
	Barley															224.4	10.0	1.61	387.0	38.4
	Corn										1.3	19.4	5.2	150.2	287.3					

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As can be seen from the table, certain differences in the structural elements of plants were obtained depending on the crops in both studied regions. Thus, in the Apsheron Experimental Farm, the number of grains per soybean in crop rotation and permanent crops is 45.6 and 41.6 pieces, the number of grains per plant is 106.3 and 97.3 pieces, the weight of grain per plant is 12.5 and 11.3 g, the weight of 1000 grains is 118.4 and 111.0 g, at the Tartar Zonal Experimental Station 52.5 and 48.2 pieces; 128.0 and 115.7 pieces; 13.9 and 12.6 g; 110.3 and 107.1 g respectively.

The number of ears of winter wheat per square meter in the Apsheron Subsidiary Experimental Farm, depending on the crops, is 270.4 and 250.0 pieces, the length of the ear is 9.1 and 8.5 cm, the weight of grain from one ear is 1.62 and 1.51 g, the weight of grain from the 1st sheaf is 420.4 and 387.9 g, the weight of 1000 grains is 41.8 and 38.7 g, at the Tartarskaya ZOS 291.8 and 270.7 pieces; 9.7 and 9.0 cm; 1.83 and 1.67 g; 529.0 and 490.0 g; 40.9 and 37.5 g respectively.

The number of ears of barley per square meter at the Tartarskaya ZOS, depending on the crops, was 242.7-224.4 pieces, the length of the ear was 10.2-10.0 cm, the weight of grain from one ear was 1.77-1.61 g, the weight grains from the 1st sheaf 419.0-387.1, weight of 1000 grains 41.4-38.4 g.

The structural elements of corn also differed depending on the crops in both regions. The number of cobs per plant, the length and diameter of the cob, the weight of the cob and the weight of grain per ear were higher in the crop rotation.

Depending on the influence of natural factors and the composition of fertilizers, the role of elements accumulated in the surface and underground organs of plants entering the soil in the formation of soil fertility should be emphasized. The balance of nutrients of biological nitrogen and mineral fertilizers in the nutrition of crops provides a balance in the environment [5].

From the results of the study, it is clear that crop rotation plays an important role in the efficient use of organic matter (created in the soil by root mass and plant residues) under other plants (Figure 1, 2).

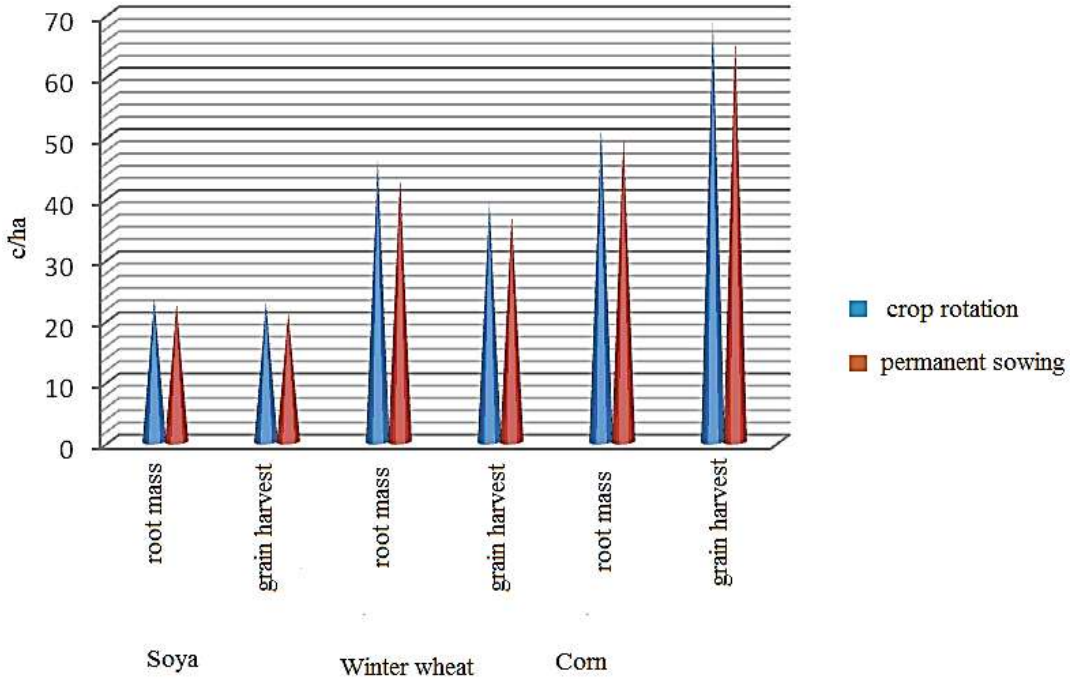

Figure 1. In the Apsheron subsidiary experimental farm in crop rotation and permanent crops, root-straw residues of plants at a depth of 0-40 cm and yield, cwt/ha

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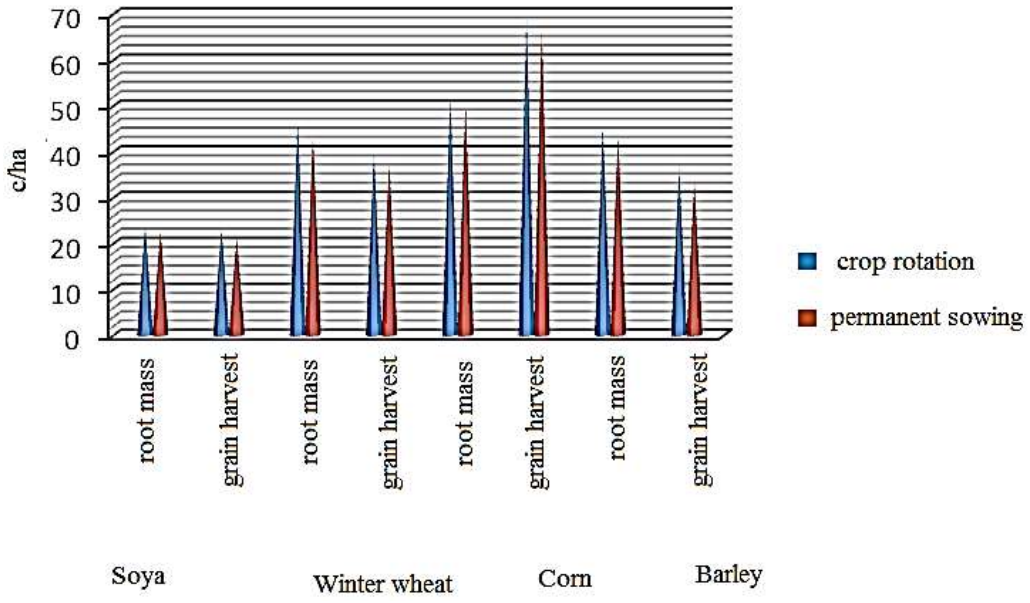

Figure 2. On the Tartarskaya AIA in crop rotation and permanent crops, root-straw plant residues at a depth of 0-40 cm and yield, cwt/ha.

In the crop rotation at the Apsheron Experimental Farm after corn, root-straw residues and soybean yields per hectare were 29.7 and 26.5 cwt, winter wheat after soybeans 48.8 and 40.4 cwt, corn after wheat 56.1 and 68.4 cwt, at the Tartar Zonal Experimental Station 31.5 and 26.3 cwt, winter wheat 53.5 and 48.1 cwt, barley 40.6 and 37.9 cwt, corn 65.7 and 74.6 cwt, respectively.

As can be seen from the figures, in both regions, root-straw residues and the yield of crops grown in crop rotation were higher than in permanent crops.

In order to preserve soil fertility and achieve high environmental sustainability of agricultural crops grown in the same area, it is necessary to strictly observe the creation of effective biological diversity and irrigated agriculture in the crop rotation system. This is one of the important conditions for obtaining high crop yields in sustainable agriculture and achieving crop diversification.

References:

1. Aliev, D. A., Musaev, A. D., & Ibragimov, A. K. (1982). Vyrashchivanie kormovykh kul'tur v Azerbaidzhanskoi SSR. Baku. (in Russian).

2. Musaev, A. D., Guseinov, Kh. S., & Mamedov, Z. A. (2008). Metodika polevykh opytov dlya nauchno-issledovatel'skikh rabot v oblasti selektsii zernovykh kul'tur. Baku. (in Azerbaijani).

3. Rzaev, M. Yu., Abdullaeva, Z. M., & Feizullaev, Kh. M. (2018). Rol' sevooborota v sozdanii biologicheskogo raznoobraziya. In *Sbornik nauchnykh trudov instituta,* 29. Baku, 324-328. (in Azerbaijani).

4. Movsumov, Z. R. (2006). Nauchnye osnovy effektivnosti elementov pitaniya rastenii i ikh balansa v sisteme sevooborota. Baku. (in Azerbaijani).

5. Posypanov, G. S. (2006). Rastenievodstvo. Moscow. (in Russian).

Список литературы:

1. Алиев Д. А., Мусаев А. Д., Ибрагимов А. К. Выращивание кормовых культур в Азербайджанской ССР. Баку, 1982. 42 с.

2. Мусаев А. Д., Гусейнов Х. С., Мамедов З. А. Методика полевых опытов для научно-исследовательских работ в области селекции зерновых культур. Баку, 2008.

3. Рзаев М. Ю., Абдуллаева З. М., Фейзуллаев Х. М. Роль севооборота в создании биологического разнообразия // Сборник научных трудов института. 2018. Т 29. Баку. С. 324-328.

4. Мовсумов З. Р. Научные основы эффективности элементов питания растений и их баланса в системе севооборота. Баку, 2006. 248 с.

5. Посыпанов Г. С. Растениеводство. М: Колос, 2006. 612 с.

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