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Assessment of balance of nutrients of grain-potato crop rotation at traditional and alternative fertilizer system

Goal. Under the conditions of radioactive contamination in central Polissya, the influence of traditional and alternative fertilizer systems on the fertility of turf and podzolic soils and the productivity of short-rotation grain grazing crop rotation are to be determined. Methods. Field, analytical, bioenergy. Results It is established that traditional and alternative fertilizer systems in crop rotation have a positive balance of phosphorus with intensity of 128 - 248% and potassium 128 - 202%. Conclusions The positive influence of organomineral fertilizer system on the soil fertility and crop rotation crops irrespective of the type of organic fertilizer was noted. Traditional organo-mineral fertilizer systems in comparison with alternative provide a much higher level of productivity of short-rotation crop rotation.

Key words: fertility, soil, fertilizer, crop rotation, crop, nitrogen, phosphorus, potassium, productivity of crop rotation.

In modern conditions of land use, there is a process of reducing crop rotation, reducing the number of fields and even practicing monoculture. In addition, in the conditions of the Polissya with high diversity of soil fertility, fineness and contamination of radionuclides, the transition to short rotation crop rotation allows them to increase their dynamism by reducing rotation and ensuring that certain groups of crops are planted on homogeneous agricultural lands. A fertilizer system, especially in crop plant specialization holdings, plays a large role in maintaining soil fertility [1, 2, 6, 9, 11]. Therefore, it is important to study the influence of different fertilizer systems on soil fertility, in particular nitrogen contents and stocks, mobile phosphorus and exchangeable potassium, and, in general, their balance in crop rotation. Under the traditional organo-mineral fertilizer system (manure + NPK) and alternative organomineral (straw + siderates + NPK) yields practically the same productivity of crop rotation, a balanced nitrogen balance of up to 100% intensity, a high-positive phosphorus balance with an intensity of 207-208% control. The balance of potassium for the use of by-products and siderates as organic fertilizers amounted to 202%, manure - 128%. An increase in the dose of mineral fertilizers to the poultice increased the productivity of crop rotation to only 7%.

The determination of the effectiveness of traditional and alternative fertilizer systems is an actual task of maintaining the soil fertility and the productivity of grain and potato crop rotation in the farms of planting specialization in the absence of traditional organic fertilizers - manure.

The purpose of the research - is to determine the influence of traditional and alternative fertilizer systems on the fertility of sod-podzolic soils, productivity of crops and the balance of nutrients in the grain-potato crop rotation.

Research methodology. The research was conducted in a stationary field experiment, commissioned in 2004 at the Institute of Rural Affairs of Polissya in the village. Grodno of Korosten district, Zhytomyr region.

Ground - sod-podzolic sandy loam, characterized by the following agrochemical parameters: humus content - 1.27%, mobile phosphorus - 8.4%, potassium - 10.2% mg / 100 g of soil, Ng - 2.25 mg / 100 g of soil , pHkcl - 4.8-5, contamination with radionuclides - up to 5 Kyu / km2. Croup: lupine - triticale - potatoes - oats. Scheme of experiment is shown in Table 1. Fertilizer options: fertilizers (control), traditional fertilizer system (manure + NPK), alternative - organic fertilizers used byproducts (PP) and biomass siderates (Sd) - (PP + Sd + + NPK) and traditional with high dose of MI - fertilizers (manure + 1,5 NPK). The amount of by-products, post-harvest plant residues and roots was determined on the basis of the crop yields of the main products equal to Levin's.

Research results. Nitrogen of lightlyhydrogenated organic compounds is a fairly accurate indicator of nitrogen supply to the soil. For the systematic application of traditional fertilizers (manure + NPK) and alternative (ПП + Сд + NPK) fertilizer systems, the stock of lightly hydrolyzed nitrogen in the layer 0-40 cm increased compared with the control, respectively, at 98 and 112 kg / ha, or 25 and 29%. Thus, the effectiveness of these fertilizer systems in improving the nitrogen regime of the soil was practically the same [3]. For increasing the dose of mineral fertilizers in 1.5 times the reserves of nitrogen in the layer 0 - 40 cm increased compared with the control of 135 kg / ha, or 36%. The difference in the content of lightly hydrolysed nitrogen in traditional and alternative fertilizer systems was insignificant - 4-11%.

Phosphorus in the soil is characterized by low mobility. During the years of conducting the experiment for organo-mineral fertilizer systems, irrespective of the type of organic fertilizer, the content of mobile phosphorus in the layer 0 - 20 cm increased from a low initial level of provision - from 5.5 to 7.6 mg / 100 g of soil to the average - 11.0 - 11.8 mg / 100 g of soil. In the layer of 20-40 cm in all fertilizer systems, its content remained very low. In the high dose of fertilizers, the stocks of mobile phosphorus in the soil were also only at the level of average safety.

The influence of traditional and alternative organo-mineral fertilizer systems on the content of exchangeable potassium in comparison with the content of nitrogen and mobile phosphorus was respectively lower by 2 - 2.8 and 3.2 - 3.5 times.

For the introduction of potash with mineral fertilizers in the amount of 62 kg / ha and manure, 10 kg / ha, that is, in the amount of 72 kg / ha, its content in the arable layer still remained at a low level of provision. This is due to the fact that on soddy podzolic soils, in addition to its removal with the harvest, under high-water conditions there are high losses of potassium due to its leaching.

Consequently, in order to increase the potassium content on the dermis-podzolic soil to an optimal level, it takes about 20 years, which is also confirmed by the results of GA studies. Mazur and others. [6, 8].

Crop yields are the criterion for assessing the impact of fertilizer systems on soil fertility crop rotation In traditional and alternative organo-mineral fertilizer systems, the crop rotation productivity increased by 82% compared with control (see Table 1). The semi- dose of mineral fertilizers in relation to the single productivity of crop rotation increased by only 5-7%, that is, the further increase in the dose of mineral fertilizers was ineffective [3].

In determining the nitrogen balance in crop rotation, in addition to the nitrogen of organic and mineral fertilizers, nitrogen of the symbiotic nitrogen fixation of lupine is also taken into account. The expense balance sheet for the traditional fertilizer system (manure + NPK) was the removal of nutrients from the main and by-products of crop rotation crops. Under the alternative fertilizer system (PP + Sd + NPK), the contents of the batteries in the secondary products, together with the minerals, were included in the revenue item of the balance, and its expense item was determined by the removal of the elements of the feed only with the main product of the harvest [2, 4 , 7].

In determining the balance of nitrogen in the expense article was also added its gaseous losses (25%). Under the traditional fertilizer system (manure + NPK) and the alternative (PP + Sd + NPK), there is practically an equilibrium balance of nitrogen. A slight increase in the intensity of the balance of this element was observed only at an increased dose of mineral fertilizers (Table 2).

2. Balance of elements of nutrition for different fertilizer systems in 4-way grain-seed crop rotation

In the traditional and alternative systems, fertilizers in crop rotation have a positive balance of phosphorus and potassium, in particular phosphorus with a intensity of 128 - 248%, and potassium - 128 - 202% (see Table 2). The most positive balance of potassium was due to the alternative fertilizer system, which is due to the high recirculation of this element with by-products and biomass of siderate for use as organic fertilizers. In the traditional system with an increased rate of mineral fertilizers (manure + NPK), the balance of nitrogen, phosphorus and potassium was positive and in fact counterbalanced [1].

Conclusions

In the zone of Polissya on sod-podzolic soils in short-rotation grain-potato crop rotation, the positive influence of traditional and alternative fertilizer systems on the soil fertility, crop rotation productivity and the balance of feed elements was noted. The efficiency of the alternative fertilizer system according to these indicators was practically equivalent to the traditional organo-mineral fertilizer system. An increase in the

dose of mineral fertilizers to one and a half contributed to a slight increase in the productivity of grain-potato crop rotation.

In light soddy podzolic soils, exchangeable potassium has a high lability and therefore is lost in a significant amount during infiltration. In view of this, an increase in its amount in the soil to the optimal values, even if its positive balance is due to alternative and traditional fertilizer systems, is a long process and requires the use of higher doses of potassium fertilizers.

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