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Role Of Soil Condition Assessment In The Development Of Farming Biologization Techniques.

Svetlana Vasilievna Okrut*, Elena Evgenievna Stepanenko, Oleg Yurievich Gudiev, Tamara Georgievna Zelenskaya, and Aleksandra Olegovna Kasatkina.

Stavropol State Agrarian University, Zootekhnicheskiy lane, 12, Stavropol 355017, Russia.

ABSTRACT

Article assesses the current state of agricultural land in the zone of sufficient moisture in the Stavropol Territory, analyzes the degree of soil contamination by degradation processes, soil fertility, identifies factors for its decline, discusses the direction of transition to organic farming.

Keywords: soil degradation, erosion, erosion processes index, fertility, farming biologization, organic farming.

Corresponding author

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INTRODUCTION

The basis for the effective development of agriculture is the preservation of the main natural resource of the soil. The current state of the land indicates problems such as a decrease in soil fertility and their contamination by residual pesticides, heavy metals and radionuclides. This situation requires the development and implementation of measures to improve the condition of the soil cover. Global trends are aimed at the biologization of farming, the use of farming methods that ensure maximum crop yield with minimal impact on the environment.

The development of agricultural activities on large areas changes the natural landscapes, disrupts the activities of ecosystems, which leads to a decrease in their stability and the development of negative processes. The availability of reliable information is important in the management of agro-geo-ecosystems and agricultural landscapes.

Assessment and analysis of existing problems of agricultural land are relevant in the development of corrective measures for the transition to organic farming.

MATERIAL AND METHODS

The studies were carried out in accordance with the technical specifications for the implementation of research, development and technological work to meet the needs of the Stavropol Territory on the theme "Developing a model of organic agriculture in the Stavropol Territory with the aim of obtaining environmentally friendly crop production with preservation of soil fertility."

Assessment and analysis of the current state of agricultural lands, identifying the causes and assessing the degree of soil contamination by degraded natural and anthropogenic processes were carried out on the basis of the following theoretical and methodological principles: a landscape approach focused on the selection of the landscape, taking into account its regional characteristics, the concept of an agricultural landscape and the concept of an adaptive landscape landscape agriculture (Stavropol agriculture systems ..., 2011; Agriculture system of a new generation, 2013), the principles of optimizing agrolandscape and biodiversity conservation, GOST 7.32.2001 "System of standards for information, librarianship and publishing. Research Report. Structure and design rules. The method of optimizing the structure of land in an agricultural landscape on a non-energy basis (Volodin, Masyutenko, Eremenko, 2000).

Selection, transportation, storage, preparation for the analysis and analysis of soil samples was carried out in accordance with the approved regulatory documents (GOST 17.4.4.02–84, GOST 17.4.3.01–83), taking into account the functional areas of the city.

RESULTS AND DISCUSSION

The main degradation processes in the zone of sufficient moisture in the Stavropol Territory include the following processes: salinization, salt marshes and salt marsh complexes, waterlogging, waterlogging, deflation, erosion, joint water and wind erosion, rockiness.

However, within the zone these processes are developed unevenly.

Salinization, salt marshes and solonchak complexes. Analysis of salinization data of the zone showed that salinization processes affect the southern part of the Shpakovsky district most strongly (about 50% of the territory); in the territory of the Kochubeevsky district, the area of distribution of degradation processes is about 35% and is localized in its northern part; the processes of salinization in the foothill region are the least pronounced (about 23%) with localization in the northern part. The average salinity of the zone is 2.7.

The main cause of flooding the area of sufficient moisture is a violation of the natural runoff of surface water, siltation and clogging of rivers and streams, rising groundwater levels during floods, leaks from the irrigation system. With the consolidation and expansion of residential and industrial development, the saturation of the territory with water-carrying communications, irrigation systems, the process of flooding is only aggravated. Under natural conditions of humidification, water logging develops in the bottoms of river

valleys of large rivers and their tributaries, as well as in areas with close bedding of the aquifer. Currently, flooding is largely due to man-made factors: water leaks during the operation of industrial, civil, irrigation and hydraulic structures. The city of Stavropol and the settlements located within the zone are flooded over a large area. Our observations and calculations showed that in the territory of the Shpakovsky district an average level of water logging was noted - 7% of the territory; in the territory of the Kochubeevsky district, about 12% of the territory is affected by water logging processes, which corresponds to a high degree of degradation; about 10% of the territory in the Predgorny district, which also corresponds to a high level of water logging. Virtually throughout the zone, flooding is primarily of an anthropogenic character, and only the second - natural, which is of the same type not only for a zone of sufficient moisture, but also for the entire territory of the Stavropol Territory. The average score of anthropogenic water logging zone is 2.7.

On the territory of Shpakovsky district, water logging is present only slightly, which according to the scale of degradation is characterized as “conditionally absent”. A low degree of water logging is noted in Kochubeevsky district - about 1% of the territory. Predgorny district is subject to the second (medium) degree of anthropogenic swamping - up to 1.5% of wetlands. Water logging coefficient of anthropogenic water logging in the Stavropol Territory is 1.63.

Due to the fact that only 6% of the territory of the Stavropol Territory is adequately precipitated, this is confirmed by our calculations. Thus, the zero (conditionally absent) degree of deflation was noted on the territory of the Predgorny district, the average level - on the territory of the Shpakovsky and Kochubeyevsky districts. The degree of degradation by wind erosion equals a coefficient of 1.3.

Analyzing areas of sufficient moisture that are degraded by erosion of land, it can be noted that a fifth (catastrophic) degree of degradation is marked on the territory, when more than 25% of land is subject to erosion. The average degree of degradation from erosion was 5.

Joint manifestation of deflation and erosion. On the territory of the zone, the first and second degrees of land degradation from the combined manifestation of deflation and erosion are noted. Zero (conditionally absent) degree of degradation from this phenomenon was noted in the Predgorny district. The first degree of degradation - up to 1% of degraded lands - in the Shpakovsky district and up to 1.5% of degraded lands in the Kochubeevsky district. The average degree of land degradation in the zone of sufficient moisture is 1.

The fifth (catastrophic) degree of degradation is noted in the Predgorny and Shpakovsky districts - more than 15% of degraded lands. The third (high) degree of anthropogenic stoniness of agricultural lands was noted in Kochubeevsky district - up to 12% of degraded lands. In the whole zone, the degradation factor was 4.3.

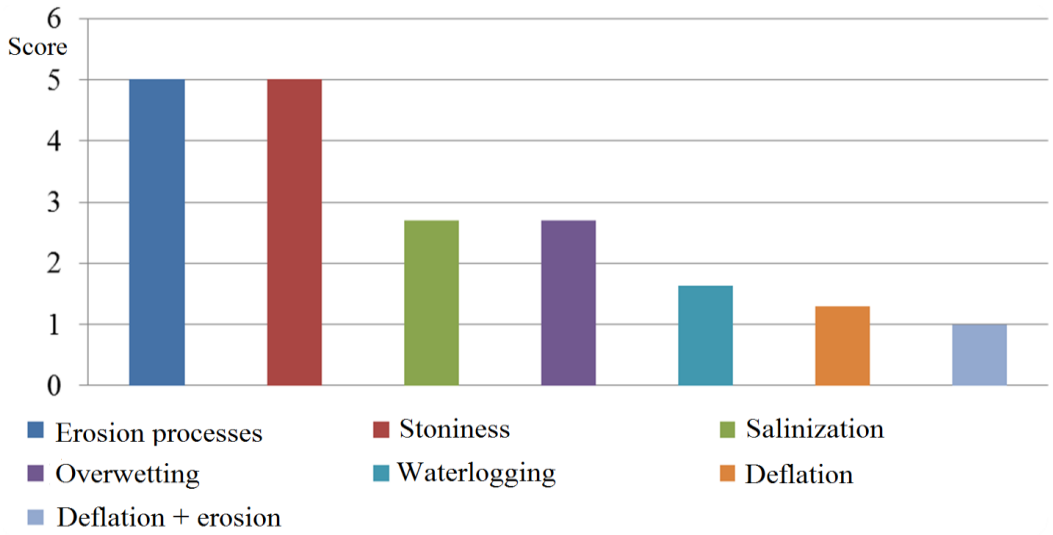

Figure 1: Causes and degree of manifestation of degradation processes in the zone of sufficient moisture of the Stavropol Territory

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Thus, as a result of the survey of agrolandscapes of the zone of sufficient moisture, it was found that the most significant processes in the zone are erosion processes (5 points), anthropogenic stony agricultural lands (4.3 points), salinization, salt marshes and solonetz complexes (2.7 points), water logging (2.7 points), water logging (1.63 points) in some areas of the zone, deflation processes (1.3 points) and the joint manifestation of water and wind erosion (1 point) (Fig. 1).

At the same time, the anthropogenic load and causes of degradation of agricultural land in different areas differ.

In Kochubeevskiy district, the main causes of land degradation are erosion, salinization associated with the overmoistening of land, and stoniness.

In Shpakovsky district - erosion, salinization and high rockiness of the soil cover. The least degradation processes are expressed in the Predgorny district (Figure 2).

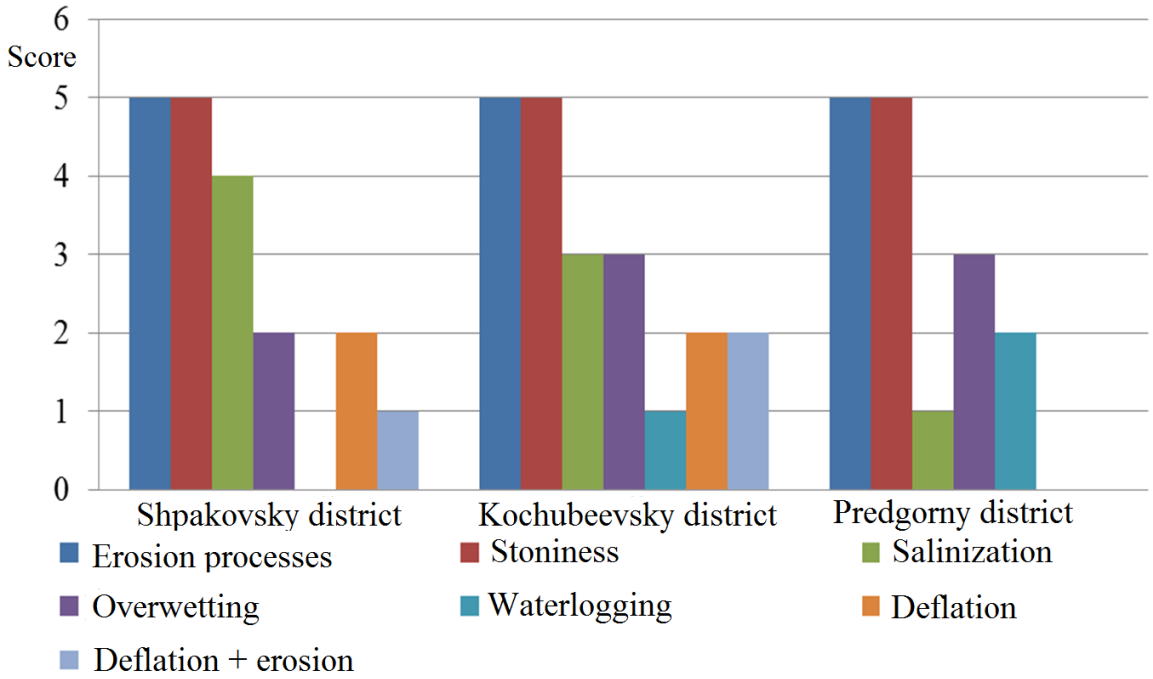

Figure 2: Degree of manifestation of degradation processes in different parts of the zone of sufficient moisture of the Stavropol Territory

Thus, the degree of land degradation varies from high - 3 points in the Piedmont region to catastrophic (5 points) in Shpakovsky and Kochubeevsky districts. On average, the degree of degradation processes in the zone of unstable moistening is 4.3 points, which corresponds to a very high degree of degradation.

Comparison of data with similar data from previous years allows us to conclude that in the zone of sufficient moisture, the processes of over-wetting of lands increased by 0.2 points and the associated salinity by 0.4 points. And although in sum this increase has not yet aggravated the overall situation in the zone, further processes may lead to a transition of the degree of land degradation according to these indicators from high to very high (in the northern and central part of the zone), which will make the situation even more critical (Fig. 3).

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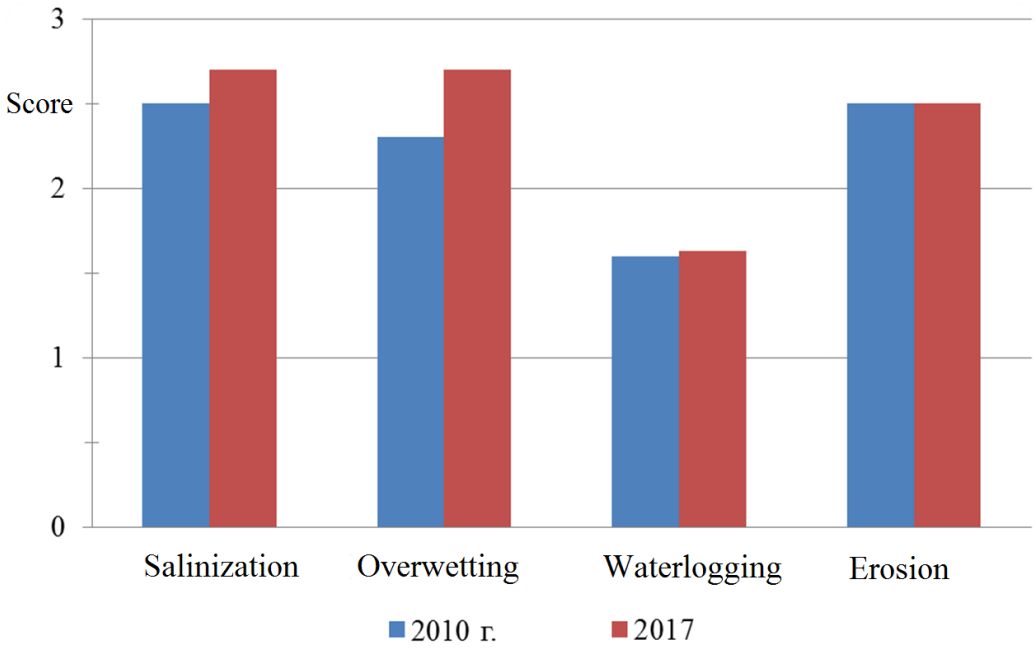

Figure 3: Dynamics of changes in degradation processes in the zone of sufficient moisture of the Stavropol Territory.

Analysis of degradation processes indicates the dominant position of erosion processes in the studied areas.

In the course of the research, an assessment of the stability of agrolandscapes was carried out on the basis of calculating the erosional dissection index of the territory.

On the agricultural lands of the zone, the total index of erosion processes in the zone of sufficient moisture is 22 points (degradation score - 2.5), which corresponds to the average level. The most common erosion processes in the Kochubeevsky district received an intensity index of 9.0 (degradation score of 3) and an intensity index of 8 in the southern part of the Shpakovsky district (degradation score of 2.7). In the Predgorny district, the intensity index of the manifestation of erosion processes is 1.7 times lower than in previous areas and is 5 or 1.7 points on the scale of land degradation.

The degree of development of the ravine network throughout the zone ranges from a moderate 4 km / 100 km^2 in the Predgorny district to a significant - 21 km / 100 km^2 in the Kochubeevsky region and strong on the slopes of the Stavropol Upland - 67 km / 100 km^2. The average increment rate of ravines within the zone is 0.5-1.0 m / year.

The coefficient of erosional dissection of the territory of the zone of sufficient moisture was 0.73, which corresponds to a strong dissection and extreme ecological condition of the territory.

The most important property of the soil is soil fertility, the ability to produce crops of plants. The soil does not change its natural essence due to the fact that the herbicide was introduced into it. However, the introduction of the herbicide significantly affects its fertility. Fertility is selective, some plant species can grow on soil containing the herbicide, while others do not. With a very high content of toxicant in the soil, even resistant plants will not be able to grow on it, but there may be no changes in the morphology, physical and chemical properties of the soil.

It is established that herbicides have a depressant effect on soil microflora. One cubic centimeter of healthy soil contains millions of bacteria involved in soil formation processes. When the green part of weeds are treated with pesticides, soil microorganisms are exposed to negative effects through the entry of a pollutant into the soil with root excretions or after the death of plants. Short-term exposure to a toxicant can

cause strong suppression of soil bacteria, which leads to long-term effects, such as changes in the water balance of the soil, a decrease in the concentration of humus, and the intensity of nitrogen fixation processes. As a result, all of the above process leads to a decrease in soil fertility.

Analysis of soil fertility showed a slight decrease in the proportion of soils with low humus content, which amounted to 1.1%. The most noticeable changes occurred in the content of mobile phosphorus, so part of the soils highly secured by this element (11%) moved into the group of moderately secured.

A slight increase in the proportion of soils with a low content of organic matter was 2.1%, mobile phosphorus - 4.2% and copper - 3.1%, and the proportion of soils poorly supplied with exchangeable potassium decreased, which amounted to 0.5%.

Analysis of the data suggests that soil fertility continues to decline in the province, despite the fact that there has been a tendency for these processes to decline in recent years. The use of methods of biological farming in a number of districts of the region contributes to the stabilization, preservation, and further and to an increase in the level of soil fertility.

CONCLUSION

Studies have shown the prevalence of erosion processes. Restoration of soil fertility and productivity to a large extent affected by water and wind erosion, on the one hand suggests preventing erosion processes, on the other creating agrocenoses that are competitive and sustainable on such soils with the participation of perennial grasses in crop rotations.

The introduction of environmentally friendly technologies in agriculture, the transition from chemical technology to an environmentally balanced direction of agricultural development will help to preserve the biota of agricultural landscapes.

The transition to biologized farming systems involves the introduction into the rotation of various biological and agrotechnical field crops. This allows you to effectively use the morphological and biological characteristics of plants, soil fertility.

Biologized crop rotations make it possible to preserve and accumulate organic matter in the soil, maintain a balanced nitrogen balance, and improve the agrophysical and biological properties of the soil through organic fertilizers, straw, green manure leaves, root residues, aftermath of annual and perennial grasses.

Taking into account the energy saving and biologization of agriculture, it is necessary to revise the structure of the sown areas in each farm and make significant changes in the alternation of crops in crop rotation.

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