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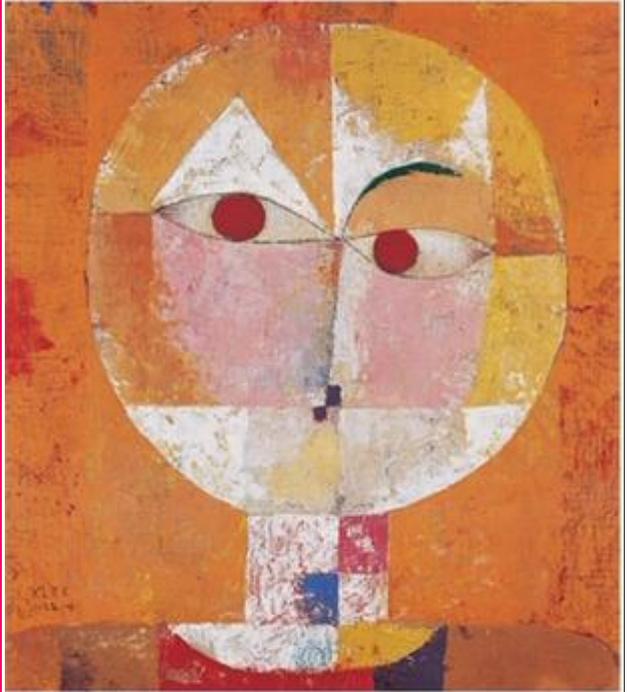
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Land use monitoring on the example of the Iglinsky district

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Abstract

The study aims to investigate the land use monitoring on the example of the Iglinsky district of the Republic of Bashkortostan via the analytical processing aimed to study and to generalize the deciphering materials, field surveys, statistical reports in order to provide valid data. As a result, land monitoring is necessary for the development and determination of cost of rational agrotechnical actions for restoration of fertility and primary cultivation of lands and their effective use. In conclusion, one of the reasons for land deterioration is the unsystematic economic activity of most agro-industrial enterprises.

Keywords: Land, Privatization, Law, Violations, Monitoring.

Monitoreo del uso del suelo en el ejemplo del distrito de Iglinsky

Resumen

El estudio tiene como objetivo investigar el monitoreo del uso de la tierra en el ejemplo del distrito Iglinsky de la República

de Bashkortostán a través del proceso analítico destinado a estudiar y generalizar los materiales de descifrado, encuestas de campo, informes estadísticos para proporcionar datos válidos. Como resultado, el monitoreo de la tierra es necesario para el desarrollo y la determinación del costo de las acciones agrotécnicas racionales para la restauración de la fertilidad y el cultivo primario de las tierras y su uso efectivo. En conclusión, una de las razones del deterioro de la tierra es la actividad económica no sistemática de la mayoría de las empresas agroindustriales.

Palabras clave: tierra, privatización, derecho, violaciones, monitoreo.

1. INTRODUCTION

Land privatization and redistribution in recent decades resulted in significant changes in the use of agricultural lands. Thus, monitoring for determining violations of the intended and permitted agricultural lands use is of particular importance. Land deterioration continues in most of the subjects of the Russian Federation. Iglinsky district of the Republic of Bashkortostan is not an exception.

Iglinsky district is located in the Eastern part of Bashkortostan. Specialists of Bashkir State Agrarian University conducted soil surveys of agricultural lands of Iglinsky district to examine humus content in them. The surveys showed that low-humus soils are the most widespread in this district. They occupy

the area of 51589.6 hectares, which makes 45.5%. Medium-humus soils come second and occupy the area of 45312,7 hectares, accounting for 39.9 per cent. The share of weakly-humus soils makes 4.6 %. Rich soils amount to 3.3%, and the share of micro-humus soils makes 1.3 %. As for the topsoil thickness, here medium-soils predominate occupying the area of 64594,4 ha which makes 56.9 %. Deep soils occupy 33189,2 ha or 29.3%. Minor soils occupy the smallest area and make 8.4% (ISHBULATOV ET AL., 2018).

Such dangerous and negative processes as bog soils genesis, flooding, bush and forest overgrowing of agricultural lands and other processes are developing intensively. They lead to the fertility loss of agricultural lands and to their withdrawal from economic turnover. In recent years, intensive overgrowing of tree and shrubbery vegetation of arable land, especially noticeable in the forest area of the district, has begun. Most of the negative land state changes occur due to various violations of the land and environmental legislation. The number of land offenses increases from year to year. The problem of dealing with them remains topical today (ZOTOVA ET AL., 2015).

Since the beginning of the 70-80s era, large-scale systematic soil and geobotanical surveys have been conducted in Russia. In their turn, enterprises of All-Union Institute of Agricultural and

Aerial surveys provided aerial photography materials. The issues of monitoring and prospects of the land use on the territory of the Russian Federation are considered in many subjects. Special attention is paid to the need for agricultural land use planning in municipal districts in order to make land-use efficient for economic and other activities. Scientists of the Stavropol State center of Agrochemical service and of Federal State Educational Institution of Higher Education Stavropol State Agrarian University Podkolzin and Osaulko successfully applied remote sensing technique for agricultural land monitoring experience. In their studies, they used space information to improve the efficiency of agricultural production on the Stavropol Territory PODKOLZIN AND OSAULKO (2008) which significantly reduced the cost of the information to be obtained, increased its volume and ensured the efficiency of information flows, since the monitoring was carried out in rather simple but high-tech ways.

As you can see, the current situation around the world allows us to consider the issues of land use monitoring to be quite relevant. These issues allow us to make long-term forecasts when providing sustainable development of agriculture as a priority direction.

The goal of this research is to develop a work package for implementing land use monitoring on the example of the Iglinsky district of the Republic of Bashkortostan.

Research problems:

- to analyze the general global trend in land cover change using remote sensing methods;
- to monitor the lands of the Iglinsky district of the Republic of Bashkortostan and to make a map of the revealed violations.

The data obtained will allow to solve the issues of rational land use locally and in time. They will help to assess the risks of large land areas conservation retirement (including agricultural lands), to make objective forecasts for changes in the earth surface based on the data obtained from satellites. The possibility of using modern methods of getting information will allow to increase the satellite data availability on a worldwide basis. This will contribute to solve global problems in the field of agriculture, forestry and urban management, to develop joint algorithms for solving urgent problems depending on the object location and its functional purpose.

2. METHODS AND MATERIALS

The paper presents the results of land monitoring of the Igilinsky district of the Republic of Bashkortostan. Land plots of all categories have been chosen as the survey objects. Agricultural land has been examined as a matter of priority. Special attention has been paid to the areas with active processes of land turnover. According to the data of 2007-2008 and 2013-2014, land on these territories has not been used for a long time or has been used improperly. It has shades of trees and shrubs colonization, littering, soil damage, unauthorized housing development. There are also some objects which are not mentioned in the Unified State Register of Immovable Property, and there are no data on their land title registration. In our research, we did not consider land plots intended for horticulture, gardening, cottage projects. Plots that are given to State Academies of Sciences and to their subordinate institutions also remained beyond the pale of our research (LAUREANO ET AL, 2018; BELARBI ET AL, 2019).

The order of carrying out this kind of monitoring is defined by the Ministry of Agriculture of the Russian Federation according to the Provision for the Ministry approved by the Government Resolution of 12.06.2008 No. 450 (THE DECREE OF THE RUSSIAN GOVERNMENT, 2008). According to this document, there is the Procedure for implementing state monitoring and

supervision of agricultural lands of this category (TARBAEV & DOLGIREV, 2016). The Ministry of Agriculture did not develop a complete package of engineering regulations stipulated in this provision. Based on the above and in order to assess the state of agricultural land use, in our research we applied the method used by the Federal Service for State Registration, Cadastre and Cartography. This method allows to estimate if land plots belonging to owners and land users is suitable for further use irrespective of forms of property. The method of work on the analysis and generalization of land use data monitoring in the district was developed on the basis of Administrative provision of the Federal Service for State Registration, Cadastre and Cartography (SOFFIANIAN & MADANIAN, 2015). For this purpose, we developed an expert system which includes subsystems as follows:

- 1) Laboratory work on the remote sensing data deciphering;
- 2) Fieldwork on materials taking, survey and photographing objects having shades of the land legislation violations on the territory of the district;
- 3) Analytical processing to study and generalize deciphering materials of field surveys, statistical reports, official

information of the Federal Service for State Registration, including the information taken on the Internet.

3. RESULTS

According to the work results, in the area of 4634 hectares, there are 334 land plots having shades of the land legislation violations. Included in Table 1 are some data on these violations.

Table 1: Information on the number of land plots with shades of land legislation violation revealed at the time of the monitoring survey

Name of violation	Number of land plots with land legislation violation	Area, ha
1	2	3
Improper land use	24	24.31
Non-use of land plot	128	2990.87
Unauthorized occupation of a land plot or its use without valid documents of land title executed in the statutory manner	30	50.47
Land damage	15	31.76
Land plot use without valid documents of land	102	1032.08

title executed in the statutory manner or without documents authorizing economic activities		
Land pollution or littering	25	46.8
Use of the land plot out of accordance with its permitted use, established in land title documents	10	458.09
	334	4634.38

The analysis of table 1 allows us to conclude on the most typical signs of land use violations in the district. Below there are problems that we consider to be the most significant and which should be taken into account when making decisions on land management. Trees and shrubs colonization of agricultural land has been galloping recently in the district. This results in a number of problems. One of them is a quantitative decrease in agricultural areas. Meadows grassland and pastures undergo quantitative changes due to the appearance of rough and coarse grasses (SHOMAN ET AL., 2019).

Due to the reduction of horse and cattle population on the farms of the district significant areas of natural forage lands are not used. This leads to the trees and shrubs colonization of agricultural

land. The lack of special machinery and funds necessary for fieldwork, low fertility and negative soil properties (soil waterlogging, erosion and rockiness), remoteness of some lands from human settlements, a decrease in rural and employable population are the reasons for the reduction of land use by agricultural enterprises. Below are examples of trees and shrubs colonization of arable land in agricultural areas (YUAN ET AL., 2019). The data have been obtained during field survey made in October 2014 and are proved by the aerial photography made in 2007 – 2008 and 2014 (figure 1, 2, 3) (figure 4, 5, 6) (Xu et al., 2019).



Figure 1: Example of the beginning of the trees and shrubs colonization of agricultural land, cadastral number 02:26:000000:471, the area of 17.37 hectares according to aerial photography of 2008)



Figure 2: Trees and shrubs colonization of agricultural land in 2014 (according to the materials of space photographing, 2014). The same plot as on the previous photo

The study of images obtained by aerial and space photography shows an increase in the area occupied by trees and shrubs from 15% to 80% over 5 years. Because of the absence of measures taken to restore former land properties (plowing, hay harvesting), weak land overgrowing has become strong. The site is next to be recognized as unsuitable for further agricultural use. Remote sensing data of 2008 and 2014 were confirmed in a field survey, as shown in figure 3 (TSYGANKOV & SYSENKO, 2012).



Figure 3: Land view from figure 1 and 2 got in October 2013, average degree of overgrowing (according to the 2014 field survey)



Figure 4: Example of overgrowing of agricultural lands: grasslands are not used. Overgrowing is of a low severity (based on aerial survey data, 2008)



Figure 5: The same plot as in figure 4: intensive overgrowing. Plot location: Iglinskiy district, Turbasly village council, Bibakhtino village, area of 8.64 hectares, cadastral number 02:26:160602:4, (satellite image of 2014)



Figure 6: Visually observed agricultural land state. Figure 4 and 5 - (according to the field survey of 2014)

The total area of overgrown plots is 2123.45 ha (more than 70% of the area of land plots with signs of long-term non-use). This proves how serious is the problem of the agricultural land state in the Iglinsky district (State (national) report on the land state, 2014). All the violations have been plotted on the cartographic base. According to the results of the surveys, the following maps were made: a 50-thousand-scale map of detected violations (overview map) and maps of detected violations (insets) of scale 1: 5 000.

4. DISCUSSION

The results of the work carried out to monitor the use of land in the territory of the Iglinsky district showed that significant areas of agricultural land are not used. Agricultural lands used before for fundamental improvement are overgrowing now. Government and public owned land are often transferred illegally for citizen's use. Farmland plots are occupied for individual construction and private plot activities without authorization. There are also violations that lead to a significant decrease in the fertility of agricultural land. Among them are land littering, removal of the fertile layer. Sometimes agricultural land is used for purposes not related to agricultural production. Moreover, it is done without following the procedure of land rezoning.

A large number of land users do not make land tax and rent payments. Counts of earlier registered land plots are not performed properly. There was also revealed the imperfection and inconsistency of the legislation governing land relations. Special attention should be paid to the non-use of agricultural land. This violation is most common on the territory of the Iglinsky district and amounts to 2990.9 hectares or 64.5 % of the total number of the detected violations.

In earlier times state and collective farms carried out a complex of cultural and ameliorative actions and did not allow trees and shrubs colonization of arable land. All the heads then were informed of the need to carry out such works. After 1991, during the period of economic reforms, things got worse. Land ownership relations that arose during this period did not lead to the appearance of an effective agricultural producer. Former state and collective farms directors in their turn wanted to enrich at the expense of the commercial land turnover. They did not care about a long-term land-use strategy. Another problem is the use of co-owned land on a leasehold basis. All the above-mentioned reasons lead to a yearly decrease in the use of land by agricultural enterprises.

The process of land colonization with shrubs, trees and forests on the territory of the district is intensively developing.

Laboratory and field surveys conducted in October 2014 showed that fallow was not involved in the arable land. Most fallow areas of overgrown with shrubs and woodlands. New areas of arable land withdrawn from circulation appeared. On the picture of land legislation violations of the region, there can be seen, that the most widespread violation of the land legislation is an unauthorized occupation of a land plot or of its part. There are also cases of the use of a land plot by a person who does not have the rights to this land plot provided by the legislation of the Russian Federation. Regulations of the state surveyor dealing with the issues of rectifying land legislation violations are often broken (Figure 8).

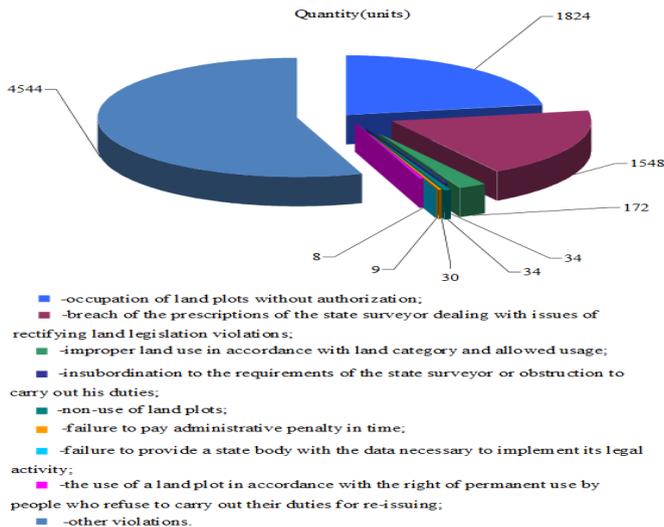


Figure 8: Structure of violations of the legislation detected by the Directorate of the Federal Service for State Registration in the Republic of Bashkortostan in 2018

In connection with the conducted research, it is recommended to carry out the following actions:

- Agricultural land overgrown with trees and shrubs more than for 70 % (high degree of overgrowing) should be transferred to the Redistribution Fund;
- Other agricultural lands with a weak and medium degree of afforestation and shrubbing, less than 70%, should be involved in agricultural turnover;
- Unused land should be conserved (perennial grassing is recommended).

The data of land monitoring allow to conclude on the need to carry out soil and geobotanical inspection of farmlands. This should be done to develop and to determine the volume of crop-engineering actions, to establish technology and cost of their implementation. Land monitoring is necessary for the development and determination of cost of rational agrotechnical actions for restoration of fertility and primary cultivation of lands and their effective use.

However, taking into account current situation in the Iglinsky district, we can suppose that part of the overgrown

agricultural land will not be used in the coming years for the production of agricultural products. So it is not economically rational to restore them in full.

5. CONCLUSION

Current situation confirms the urgent need to organize routine observations of the land state and use in order to obtain relevant information. This information will contribute to reveal negative processes, to forecast their development and dissemination, to implement a set of actions for preventing and eliminating the consequences of negative processes, and to develop a strategy for the rational land use.

In our opinion, one of the reasons for land deterioration is the unsystematic economic activity of most agro-industrial enterprises. Analysis of the current situation shows that many agricultural producers today do not have scientifically based crop rotations and rotation schemes, although, it is known that the productivity of arable land increases by 20...30 % and 30...40 % only due to the proper plant rotation. Moreover, the costs for plant protection and soil treatment are reduced. Crops are located on cultivated lands without taking into account natural soil fertility and the degree of their influence on the volume of organic matter

accumulation in the plough-layer. Farm managers and agronomists do not even have modern cartographic material containing the size of fields and extra plots, not to mention slope ratio maps and territorial erosion degree.

As a result, the soil is cultivated without keeping up to elementary norms of conservation agriculture. The current structure of cultivated areas does not contribute to the soil fertility stabilization too. The dominance of grain crops and sunflower in sown areas at low rates of mineral amendments to be applied significantly reduces soil nutrient-supplying capacity.

Land is the main natural resource in agriculture. When treated properly, it can be used for years and its qualitative properties can improve continuously. The solution of the revealed problems will allow to find ways of rational land use.

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