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**POLLUTION OF AGRICULTURAL LAND UNDER ANTHROPOGENIC IMPACT
IN THE REPUBLIC OF KAZAKHSTAN**

Abstract

The article deals with the current problem of agricultural land degradation. The main objectives - the organization of rational use and protection of land, creation of a favorable ecological environment and implementation of land legislation, as well as the process of negative anthropogenic impact on soil fertility - are outlined.

The current ecological situation in agricultural land use makes the problem of rational use of contaminated lands urgent. The leading role in its solution belongs to land management, for the purposes of which nowadays materials of ecological assessment of the territory and analysis of factors of technogenic impact on natural environment are widely used.

Like any existing natural resource on which society depends and with which it closely interacts at every stage of its life, land resources are subject to structural and qualitative changes. The direction and speed of these changes are determined by a large number of factors: the socio-geopolitical and economic development of society, the level of human capital development, strategic government priorities at certain stages of national development, the organization of the land use system, and others. Based on the changes currently taking place in the structural and qualitative state of land resources, it is necessary to state that their nature, especially in terms of agricultural land, is clearly negative.

Key words: *agriculture, agricultural land, land management, environmental pollution, man-made pollution, land protection, heavy metals.*

Introduction

Land as the main basis for all processes of society in the political, economic, social, industrial, environmental and other spheres has a value, an objective assessment of which is one of the most important conditions for the normal functioning and development of a multiform economy.

At present, pollution of the environment by wastes, emissions, sewage of all types of industrial production, agriculture, urban utilities have become global [1].

Recently, a steady trend of both qualitative land degradation and quantitative reduction in the area of agricultural land, including arable land, has been outlined and established. However, negative phenomena concerning the state of lands not only reduce the land and resource potential of the country and its individual regions, but also have a negative dynamic on the quality and quantity of other natural resources: water, forests, flora and fauna, etc. All these factors create the need to form such a system of land use, which would ensure rational, economically efficient and environmentally safe use of land resources.

The experience of the last decades shows an increase in the number of natural and anthropogenic disasters that have serious ecological and socio-economic consequences. Environmental risks associated with the presence of dangerous natural and anthropogenic factors are a prerequisite for the occurrence of disasters. Identification of the main environmental risks

affecting the economy of Kazakhstan makes it possible to develop and implement a more effective state policy in the field of ecologization of the economy, production, development of nature-saving technologies, especially in the leading industries.

Environmental problems of the present time, their trends resulting from anthropogenic overload and irrational use of natural resources directly affected the condition of the soil cover in the territory of Kazakhstan. Disturbance of balance of ecological situation has led to degradation of soil cover in all natural zones of the republic. Self-renewal of soils has become an impossible phenomenon. At the moment there is an urgent need to develop a program of rational use, protection and restoration of natural disturbed soils, measures to prevent soil degradation, restoration of fertility of eroded and technogenically disturbed soils, as well as pastures and lands.

Under these conditions, land management is the main mechanism for organizing the rational use of contaminated land and mitigating the negative effects of pollution.

Materials and research methods

In the modern theory of land management, the questions determining its ecological and economic function as the effective mechanism of maintenance of ecological and economic balance of development of land tenure in the conditions of negative anthropogenic influences caused by pollution of environment are not sufficiently worked out.

Land management in conditions of technogenic pollution of lands should be based on a comprehensive assessment of the pollution of the territory of the Republic of Kazakhstan, which will contribute to the organization of its differentiated use.

In the course of the study various methods of economic research were used: economic-statistical - in the analysis and assessment of the current state, abstract-logical, used in identifying sectoral and regional peculiarities. In addition, the results of analyses and studies conducted by the authors of this article were used.

Research results

The main condition of carrying out land management on contaminated lands is ensuring a balance between economic aspirations of economic use of the territory and restoration, as well as preservation of the existing ecological systems disturbed as a result of pollution [2].

Statistically, the most productive, intensively used and densely populated lands are always the most exposed to pollution. In addition, these problems are exacerbated by a lack of financial resources to prevent and remediate the effects of pollution.

Everyone knows that the irrational use of land has led to a reduction in productive land, reducing its fertility and environmental degradation, which affect the reduction of agricultural production. According to researches of Russian scientists: Bogolyubov S.A., Kutliyarov A.N. and Kazakh scientists Kerimova U.K., Tireuov K.M., Pentaev T.P. [3-5], land is steadily continuing out of the balance of economic turnover, the level of soil fertility is falling, it is no longer a deterrent to production.

Land is steadily continuing to withdraw from the balance of economic turnover, the level of soil fertility is falling, it is no longer a deterrent to production.

According to the data given below one can judge about the scope of anthropogenic human activity: the contribution of technogenic lead is 94 - 97% (the rest are natural sources), cadmium - 84 - 89%, copper - 56 - 87%, nickel 66 - 75%, mercury - 58%. Transportation is one of the main causes of air and soil pollution. Most heavy metals contained in dust and gas emissions from industrial enterprises are generally more soluble than natural compounds.

The trend of land contamination continues to grow. A 10-20% decrease in yields and suppression of plants is observed in the areas of most agricultural land suitable for agricultural production according to ecological parameters.

The volume of soil contamination significantly affects agricultural production. As a result, significant losses of crop production occur and their quality sharply deteriorates.

As a result of economic activities, the soil loses its fertility, degrades or is completely destroyed. This happens when human activity is irrational, environmentally unreasonable. To

prevent the negative environmental consequences of human impact on the soil, it is necessary to pay the utmost attention to the issues of rational use and protection of soil.

The current environmental situation in agricultural land use determines the problem of rational use of contaminated lands.

In the areas of technogenic pollution of lands, first of all, in the course of land management, environmental problems must be solved, the implementation of which creates environmental and economic feasibility.

In order to improve environmental and economic efficiency, all actions related to land redistribution, organization of rational use of contaminated areas should be based only on land management projects, which brings to the forefront the problem of improving the theory and methods of land management design in areas of active man-made impact.

Anthropogenic pollution of lands, in the conditions of land management, should be based on a comprehensive assessment of territory pollution, which will contribute to the organization of its differentiated use. In this regard, based on the classification of pollutants, identification of the main sources of pollution of the territory of agricultural enterprises, establishment of the impact of pollution of soil, vegetation and air environment on agricultural production the system of indicators used in assessing its territory has been substantiated.

The result of this impact in most cases is the pollution of these environmental components and, as a consequence, deterioration of the ecological situation, reduced productivity of agricultural land, significant costs for the preservation, maintenance and restoration of the disturbed ecological balance of the environment.

The main condition of land management on contaminated lands is to ensure a balance between the economic aspirations of economic use of the territory and the restoration as well as preservation of the established ecological systems disturbed as a result of pollution.

Currently, the leading factor of development and the basis of agricultural land use are technogenically modified agro-ecosystems.

The negative factor of technogenic impact on agroecosystems is pollution, which reduces their productive properties and limits the processes of self-regulation and other biosphere functions of agroecosystems, which causes significant damage to agricultural production and has a negative impact on the development of the environment and public health.

According to the land balance as of November 1, 2018, there were 248.42 thousand hectares of disturbed lands in the country, where overburden and rock dumps, tailings dams, ash dumps, coal and mining pits, oil fields and barns are located. The largest number of disturbed lands is located in Karaganda, Kostanay, Mangistau, Akmola, East Kazakhstan, Aktobe, Pavlodar regions [6].

The largest number of disturbed lands is in Mangistau (78.6 thousand hectares), Karaganda (45.3 thousand hectares) and Kostanay (37.8 thousand hectares) regions.

Technogenically polluted lands of Kostanay region are widespread in industrial areas of cities, mining and processing areas. In the region the issue of environmental pollution by the gold dumps of the Troitskaya GRES and the tailings of the Sokolovsko-Sarbaisky mining and beneficiation plant is acute.

The main regional products of industrial production of Kostanay region are iron-ore products, bauxites, asbestos, engineering products, flour, confectionery products. In republican volume of industrial production the region accounts for 100% of production of iron-ore pellets, bauxites, asbestos. Enterprises of mining, processing industry, production and distribution of electricity, gas and water are functioning. Modern diversified industry is represented by combines, factories, modern small enterprises. About 700 enterprises employing more than 43 thousand people are engaged in industrial production.

Predominant impact on the condition of land resources of Kostanay region has enterprises of mining industry, agriculture, heat and power engineering. Technogenic disturbed and polluted lands are widespread in industrial zones of cities, places of extraction and processing of minerals. At open-cast mining on large territories there is alienation of lands for non-agricultural purposes: for quarries, dumps, tailings ponds, storages of mine and household water. All mining enterprises have

a waste management system that includes all stages of the technological cycle of waste, such as prevention and minimization of waste generation, accounting and control, accumulation, as well as collection, processing, recycling, transportation, storage and disposal of production waste. [7]

In Kostanay region land is polluted by compounds of copper, zinc, cadmium, lead and chromium. Republican State Enterprise (RSE)"Kazgidromet" conducts monitoring of soil conditions in 39 settlements in 14 regions of the republic and in the cities of Astana and Almaty. The following data on the state of soil contamination by heavy metals for the spring period of 2021 in Kostanay region according to the report of the branch of RGP Kazgidromet (**Table 1**) [8].

Ash and slag wastes from coal-fired power plants, placed in ash dumps, occupy large land areas. Ash removal and disposal is one of the main environmental problems of coal-fired power plants. The current practice of using hydraulic ash removal with subsequent storage of ash waste does not meet the promising requirements and does not allow the effective use of ash and slag materials in the construction industry, leading to an increase in the accumulation of ash in the dumps by tens of millions of tons per year.

Table 1 - Status of soil contamination by heavy metals in Kostanay region in 2021

№	Name of the objects	Heavy metal content, mg/kg				
		Lead	Copper	Chrome	Zinc	Cadmium
1	Kostanay city	3,12-62,11	0,36-4,20	0,21-1,20	11,2-19,3	0,11-0,37
2	JSC «Varvarinskaya»	0,20-20,3	0,20-20,3	0,20-20,3	0,20-20,3	0,20-20,3
3	Zhitikara village	0,15- 31,40	0,15- 31,40	0,15- 31,40	0,15- 31,40	0,15- 31,40
4	Arkalyk city	20,0 – 30,11	1,0-2,7	1,0 – 3,2	12,30-20,11	0,25-1,45
5	Aluminstroy industrial zone	normal	normal	normal	normal	2,90
6	Lisakovsk city	0,15-27,1	0,15-27,1	0,15-27,1	0,15-27,1	0,15-27,1
7	Rudniy city	10,0-30,0	2,0-4,0	2,0-4,0	5,0-20,0	0,30-0,50
8	Mayakovsky, Uzinkol, Fedorovka and Auliekol posts	0.1- 10.0	0.1- 10.0	0.1- 10.0	0.1- 10.0	0.1- 10.0

The land legislation of the Republic of Kazakhstan, regulates public relations in the field of use and protection of lands. Under its functional influence the land legal order is formed on the whole territory of the country. The land legal order is an important condition for economic and other activities of the peoples living in the relevant territory [9,10].

Thus, the issue of land protection in an aggravating environmental situation should become one of the most important areas of state policy, since improving the condition of the land opens up significant reserves to increase agricultural production and provides a significant improvement in the environmental conditions of human life.

In order to protect lands, regional, regional and local programs for protection of lands shall be developed which include a list of mandatory activities for protection of lands with due consideration of peculiarities of economic activities, natural and other conditions.

Assessment of the condition of lands and the effectiveness of land protection activities shall be carried out with due consideration of environmental expertise, sanitary, hygienic and other norms and requirements established by legislation [11].

The introduction of new technologies, programs of land reclamation and improvement of soil fertility should be prohibited if they do not meet the environmental, sanitary, hygienic and other requirements stipulated by law [12,13].

During construction and mining operations involving the disturbance of topsoil, the fertile soil layer must be removed and used to improve low-yield lands.

To assess the condition of the soil in order to protect human health and the environment, the Government should establish standards for maximum permissible concentrations of harmful substances, harmful microorganisms and other soil polluting biological substances. Soil,

geobotanical, agrochemical and other surveys should be carried out to check the compliance of soil with environmental standards.

In order to prevent land degradation, restoration of soil fertility and contaminated areas it is possible to allow conservation of lands with their withdrawal from circulation in an order established by the Government.

Conclusion

Pollution of soils with heavy metals are industrial emissions, products of fuel combustion, agricultural chemicals, sewage. Even the use of high doses of fertilizers carries the risk of soil contamination.

The main conclusions are that the main levers of the organizational and economic mechanism of protection of agricultural lands from degradation are: land management, economic stimulation of rational land use and economic responsibility of owners, landowners and land users for violation of the established regimes of land use.

For rational use of agricultural lands and termination of violations of land legislation, it is necessary to timely complete land inventory, to implement actual digitalization of land cadastre and satellite monitoring of land use.

In order to obtain complete and objective data on land contamination it is necessary to carry out detailed ecological and geochemical studies throughout the republic, to develop recommendations on a systematic basis on the elimination and stabilization of negative impacts, using the latest technologies.

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ҚАЗАҚСТАН РЕСПУБЛИКАСЫНДА АУЫЛ ШАРУАШЫЛЫҒЫ ЖЕРЛЕРІНІҢ ТЕХНОГЕНДІК ЛАСТАНУЫ

Аңдатпа

Мақалада ауыл шаруашылығы жерлерінің деградациясының өзекті мәселесі қарастырылған. Негізгі мақсаттары- жерді ұтымды пайдалану мен қорғауды ұйымдастыру, қолайлы экологиялық орта құру және жер заңнамасын іске асыру, сондай-ақ топырақ құнарлылығына теріс антропогендік әсер ету үдерісі көрсетілген.

Ауылшаруашылық мақсаттағы пайдаланудағы қазіргі экологиялық жағдайда ластанған жерлерді ұтымды пайдаланудың өзекті мәселесін тудырады. Оның шешімі бойынша жетекші рөл жерді басқаруға тиесілі, олардың мақсаттары қазіргі уақытта аумақты экологиялық бағалаудың материалдары және табиғи ортаға технологиялық әсер факторларын талдау материалдары кеңінен қолданылады.

Кез келген табиғи ресурс сияқты, қай қоғам, оның өмір сүру кезеңінде өзара әрекеттеседі және оның өмір сүру кезеңінде тығыз қарым-қатынас жасайды, жер ресурстары құрылымдық және сапалы өзгерістерге ұшырайды.

Бұл өзгерістердің бағытталуы мен жылдамдығы қоғамның әлеуметтік-геосаяси және экономикалық дамуымен, адами капиталды даму деңгейімен, ел дамуының белгілі бір кезеңдеріндегі стратегиялық мемлекеттік басымдықтармен, жер пайдалану жүйесін ұйымдастырумен және басқаларымен айқындалады.

Қазіргі уақытта жер ресурстарының құрылымдық және сапалы жағдайында болып жатқан өзгерістер негізінде олардың сипаттамалары, әсіресе ауылшаруашылық жерлері бойынша олардың сипаттамасы айқын болатындығы айтылуы керек.

Кілт сөздер: ауыл шаруашылығы, ауыл шаруашылығы мақсатындағы жерлер, жерге орналастыру, қоршаған ортаның ластануы, техногендік ластану, жерді қорғау, ауыр металдар.

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ЗАГРЯЗНЕНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ ПРИ ТЕХНОГЕННОМ ВОЗДЕЙСТВИИ В РЕСПУБЛИКЕ КАЗАХСТАН

Аннотация

В статье рассматривается актуальная на сегодняшний день проблема деградации сельскохозяйственных земель. Изложены основные цели – организация рационального использования и охрана земли, создание благоприятной экологической среды и реализация земельного законодательства, а также процесс негативного антропогенного воздействия на плодородие почв.

Сложившаяся экологическая ситуация в сельскохозяйственном землепользовании делает актуальной проблему рационального использования загрязненных земель. Ведущая роль в ее решении принадлежит землеустройству, для целей которого в настоящее время

широко используются материалы экологической оценки территории и анализа факторов техногенного воздействия на природную среду.

Так же, как и любой существующий природный ресурс, от которого общество зависит и с которым оно тесно взаимодействует на каждом этапе своей жизнедеятельности, земельные ресурсы подвержены структурным и качественным изменениям. Направленность и скорость этих изменений определяются большим количеством факторов: социально-геополитическим и экономическим развитием общества, уровнем развития человеческого капитала, стратегическими государственными приоритетами на определенных этапах развития страны, организацией системы землепользования и другие. Исходя от изменений, происходящих в настоящее время в структурном и качественном состоянии земельных ресурсов, необходимо констатировать, что их характер, особенно в части земель сельскохозяйственного назначения, носит явно негативную окраску.

Ключевые слова: сельское хозяйство, земли сельскохозяйственного назначения, землеустройство, загрязнение окружающей среды, техногенное загрязнение, охрана земель, тяжелые металлы.