ОБЗОРНАЯ СТАТЬЯ

"The destiny of the land – is the destiny of the country"
N.A.Nazarbayev

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STATE AND RATIONAL USE OF SOIL AND LAND RESOURCES OF THE REPUBLIC OF KAZAKHSTAN

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Abstract. The article provides information on the state and rational use of soil and land resources of Kazakhstan. The state of soil surface of the territory of Kazakhstan is under the impact of current environmental problems resulting from anthropogenic pressure and irrational use of natural resources.

Key words: soil, soil surface, fertility, land resources, degradation, environmental problems

Soil and land resources and people living on them are the main sources of viability and prosperity of any State. About 70 % of the planet's land is subjected to degradation and about 30 % to desertification, which significantly reduces the possibilities of the humanity to provide food, since currently about 96 % of the world's population eats food which is grown on soil. In this regard, issues of soil fertility conservation are of great importance, and particularly food security of each country depends on soil fertility.

According to various estimates, more than 7.5 mln people live on the planet Earth. The annual population growth is approximately 90 mln people; in this connection, the demand for food is also increasing.

The modern land fund worldwide is characterized by the following data, in (%): arable lands - 10, meadows and pastures - 20, forests - 30, other lands - 40, including glaciers, deserts, tundra, etc. The growth of population on earth urges the need to increase arable lands and their fertility to obtain food products, but in practice, the opposite is happening.

According to the report of the UN Food and Agriculture Organization in view of the situation with food security in the world, by 2020, hunger may affect a quarter of the world's population. In the next 40 years, according to foreign experts, the problem of food shortages will be the top issue in the world. Many experts talk about the end of the oil era and the beginning of the era when food becomes a leading factor in world politics. The growing globalization processes aggravate the problem of food security for our country as well. Currently, the issue of food security has become global, as a factor determining the health of the nation [1].

In general, to meet the growing demand for food products, first of all, it is needed to protect the soil resources of the planet. Modern knowledge of ecology leads to the conclusion that the role of soil surface of the planet is crucial. In this regard, the provision of the population with food products remains an urgent issue which is due to the intensive decrease in soil fertility and crop yields, as well as livestock productivity as a result of land degradation and desertification processes development.

According to the UN experts, it is expected that by 2050 the population of Central Asia will increase annually by 9.7 mln people, with more than 80 % of the population living in urban areas, and therefore the demand for food and fodder will increase. Changes in lifestyle and income growth will lead to the changes in consumption patterns and demand for

certain types of products and commodities. This will create an additional load on existing natural resources, including land and water, which are already threatened by such ecological processes as deforestation, land degradation, desertification and salinization, and soil pollution associated with their unsustainable use. It is projected that by 2050 the population of Central Asian countries, such as Tajikistan and Kyrgyzstan, will increase by 68.5 % (or 5.8 mln people) and 38.9 % (or 2.3 mln people), respectively. Another major problem in Central Asia is climate change. By 2050, a further increase in the average temperature level of about 2.6°C is expected in all countries of the region. In the northern part of the region, more significant temperature changes will occur in the winter period, while in the southern part, warming will be more noticeable in summer. It is assumed that by 2030-2049 there will be 22-37 hot days a year more than now; at the same time, the duration of hot weather periods is most significant in the Urals and in Kazakhstan. The general conclusion of the experts is that the demand for food in the region is growing, consumption patterns are changing, and the pace of urbanization is increasing. At the same time, many production systems are already overloaded, and a further increase in productivity becomes a challenge. In order to achieve food security in these conditions, sustainable growth of agricultural production, more efficient use of natural resources and increased resistance to external factors will be required [2].

The state of food security of the Republic of Kazakhstan cannot be fully described as satisfactory, since the situation in AIC of the RK, which is aimed to ensure the food security of the country, and especially in its agricultural sector, has been difficult and ambiguous for the last 20 years [3].

World experience shows that the border of food security is at the level of food imports in the amount of 18–35 percent of the needs. According to the Ministry of Agriculture of Kazakhstan, about 40 percent of dairy products are imported, 29 percent are meat, and about 43 percent - fruits and vegetables [4]. That is, the country is heavily dependent on imported products, which creates a real threat not only to the food, but also to the economic security of the country. An important aspect is the ecological situation on the planet. Environmental degradation is a threat to all sectors of economy, but the greatest damage is undoubtedly caused to food production. Today, the measures taken by the Government of the Republic of Kazakhstan are aimed at increasing the investment attractiveness of agro-industrial complex and increasing its efficiency, which should have a favorable impact on the level of food security and macroeconomic situation in the country. At the same time, Kazakhstan has great potential to meet the demand for agricultural products on domestic market, and increasing production for export to the world markets [4].

The mankind in the XXI century faces the most acute ecological crisis caused by limited soil resources and their intensive irrational use. The current area of arable land in the world is 1.5 mln. ha or 0.25 ha per capita. Only in the last 25 years, the quantity of arable land per capita has decreased in half. If the pace of loss of arable land in the world remains at present level, then even in case of full use of reserves, about 1 bln ha of arable lands will remain [5].

The unfavorable situation on the use of land resources has developed in our republic. The Republic of Kazakhstan occupies a territory (272.5 mln. ha) at the junction of two continents in the center of the Eurasian continent. The diversity of soil surface is due to different climatic and geological conditions. At the same time, the distribution of soils is subject to the laws of horizontal and vertical soil zonality. The

flat territory of the Republic of Kazakhstan in the direction from north to south is represented by four soil zones: moderate wet forest-steppe zone of gray forest soils, leached black and meadow - black soils; moderate - arid steppe zone of black ordinary and southern soils; dry steppe and desert-steppe zone of chestnut soils and desert zone with brown and gray-brown soils.

More than 85 % of the arable land of the republic is located in forest-steppe, steppe and dry-steppe zones, in the areas of desert and semi-desert zones arable land is less than 1 %. In the category of agricultural land (as of November 1, 2017) there is 86 % of all black soil, 76 % of dark chestnut and 58 % of chestnut soil, which is the most valuable in agricultural terms [6].

In terms of land area and diversity of natural resource potential, the Republic of Kazakhstan is among the largest countries in the world, and in terms of land supply, per capita, it occupies one of the leading places. The remoteness from the oceans and a large territory determine the sharply continental nature of Kazakhstan's climate, its zoning and precipitation deficit. In foothill and mountainous areas, from 500 to 1600 mm of precipitation falls annually, in steppe areas from 200 to 500 mm, in desert areas from 100 to 200 mm. However, depending on climatic conditions, there are fluctuations in the direction of water and moisture shortage [7]. Over the past 77 years (1941-2017) , there has been a general increase in the average annual and seasonal surface air temperatures in Kazakhstan. On average in Kazakhstan, the rate of increase in average annual air temperature is 0.28^0C every 10 years [6].

The area of agricultural land in Kazakhstan is 215.4 mln ha, of which 179.9 mln ha are pastures, 24.8 mln. ha arable lands, including 1.4 mln ha of arable land with regular irrigation.

The soil surface of Kazakhstan develops in arid and extreme conditions, differs from the soils of other countries and is easily vulnerable, low resistant to anthropogenic pressures, and is subject to degradation and desertification processes. Currently, about 76 % of the territory of Kazakhstan is subjected to degradation and desertification, 48 mln. ha of pastures have reached an extreme degree of degradation. The areas of under-fertilized land in Kazakhstan make up

75 % of the total area which require the adoption of appropriate measures aimed at soil fertility reproduction.

The Food and Agriculture Organization of the United Nations (FAO) addresses not only food security issues worldwide, but also provides a platform for sharing knowledge in the field of agriculture. Therefore, at present, FAO together with the Global Environment Foundation (GEF), Central Asian countries and Turkey are launching the project "Integrated management of natural resources in drought and saline agricultural production terrains of Central Asia and Turkey". All countries of Central Asia and Turkey, including scientists from Kazakhstan, will take part in the project. The scientific potential of Kazakhstan will be maximally involved [8].

Erosion is one of the most dangerous types of land degradation, causing soil destruction, according to the qualitative characteristics of land in the Republic of Kazakhstan as of November 1, 2017 there are more than 90 mln ha of eroded and erosion-dangerous lands, of which 29.3 mln ha are actually eroded.

Land areas subjected to wind erosion occupy 24.25 mln ha, while the greatest soil erosion is observed under irrigation conditions, in irrigation it reaches up to 97 %. The largest share of eroded agricultural land (more than 30 %) of the total area is located in Almaty, Atyrau and South Kazakhstan regions. In the northern regions of the republic, the main areas of arable land are the most fertile black and dark chestnut soils, where 17.8 mln ha of land are potentially subject to deflation

and 2.6 mln ha suffer from strong wind erosion.

To reduce the negative impact of erosion processes on the state of land, it is necessary to use integrated anti-erosion measures – such as agrotechnical, forest reclamation, hydrotechnical, the transition to an adaptive terrain system.

The main zones of environmental stress and land degradation in Kazakhstan are the Caspian Sea region and the Aral Sea region. The progressive growth of anthropogenic load on soil surface, greatly complicated the ecological situation of oil-producing regions [9].

In the territory of Western Kazakhstan in the post-Soviet period, Kapustin Yar, Lyra and Azgir test sites were located and about 3 million hectares of soil were contaminated with radioactive strontium, cesium and plutonium, which require the improvement of environmental situation. In this regard, the rational economic use of natural resources of the oil fields remains an important governmental task.

In southern Kazakhstan, on gray soils, gray-brown and brown soils intensive salinization and soil degradation is observed.

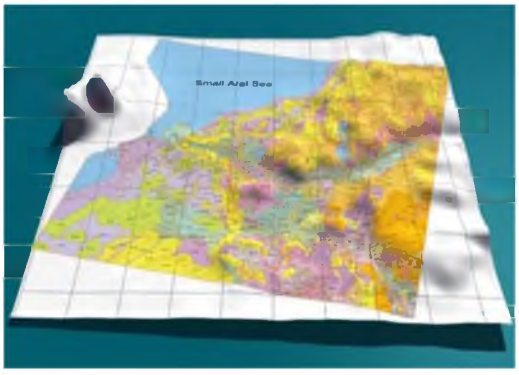

Figure 1 - A three-dimensional model for the territory of the modern delta of Syrdarya river and the adjacent part of dried bottom of the Aral Sea (Scale 1: 500000)

At present, the problem of their ameliorative condition has sharply aggravated on the irrigated massifs of the south and south-east of Kazakhstan, the areas of so-called "unused", "waste" lands have increased. In this regard, due to the high degree of degradation and the impossibility of their further use, certain land plots with fallow "unused" soils were simply transferred to the fallow land category.

In the republic, the main environmental problem is associated with drying of the Aral Sea. The problem of the Aral Sea is becoming increasingly urgent as political and economic tensions increase in the regions adjacent to it. Annual dust storms spread salt to the vast territories of Eurasia. On adjacent lands, the level of saline groundwater rose to 1.5–2 meters, which led to the decrease of the fertility of irrigated land in the Aral Sea region [10].

The soil studies carried out by scientists indicate the increase in erosion-deflation processes both in the delta and on the dried bottom of the sea. The sand and salt aerosol removal from the Aral Sea region to the east reaches 150-200 km, and in the west direction, the tailing plume stretches 700 km towards the Caspian Sea, the distribution of salts covers about 25 million hectares [11].

The ecological crisis in the Aral Sea region urges the scientific assessment and development of measures aimed to prevent further desertification of the ecosystem, rational use and protection of natural resources [10].

According to the results of long-term soil researches and observations by scientists of the U. Uspanov Kazakh Institute of Soil Science and Agrochemistry, the scientific foundations and approaches for the rational use and preservation of soil fertility and increasing the biological productivity of transformed soils of the dried bottom of the Aral Sea have been developed. The research results were accompanied by the development of soil maps (1956, 1968, 1990, 1996), on paper basis using only a topographical basis, without using materi-

als of space information. At present, scientists of the institute using satellite images and GIS technologies have compiled soil maps of the territory of the modern delta of Syrdarya and dried bottom of the Aral Sea, zonal soils of Eastern Aral area, South Kazakhstan and Kyzylorda regions. Their advantage, compared to traditional ones, is connected not only with an increased degree of reliability due to the use of remote sensing materials, but mainly with information and openness. Based on digital soil maps, a three-dimensional model was created for the territory of the modern delta of Syrdarya and the adjacent part of the dried bottom of the Aral Sea (M 1: 500000), which was presented at the XVII World Congress of soil scientists (Thailand, 2002). Since the shallowing of the Big Aral aggravates the ecological situation in the adjacent territory, all this indicates the need for deep soil studies in the Aral Sea area in order to develop a new soil-information system, including modern information on soil properties and their spatial distribution, which will serve as a basis for developing schemes of sustainable development of the region.

As part of the implementation of the Action Plan for the transition of the Republic of Kazakhstan to "green economy", a project aimed to preserve forests and increase the forest cover of the territory of the republic is currently being implemented. At present, phytomelioration of the dried bottom of the Aral Sea has been carried out by planting saxaul over an area of 5 thous. ha. In the future, the volume of work on reproduction of forests in the republic by 2020 is planned to increase by 80.0 thous. ha annually [7]. The creation of forest plantations reduces dust and salt emissions, improves the ecological situation in the region, and most importantly, the process of sand fixing.

In the irrigated fields of the Syr Darya delta intensive soil and groundwater pollution with toxic chemicals and radionuclides occurs. According to the scientists of the U. Uspanov Kazakh Research Institute for Soil Science and Agrochemistry, in the soils of the main rice-growing regions of Kazakhstan an excess of the maximum permissible concentration (MPC) of lead, nickel and copper has been observed. So, for example, on the ancient delta alluvial plains of the Syr Darya river and on the Shiely rice sowing area, the MPC exceeded 2 times, for both mobile and gross forms of lead, the mobile forms of nickel 1.5 times. A high degree of environmental tension is also observed in the Shu-Moinkum and Balkhash-Alakol regions. At the same time in the upper part of the modern delta of Ili river the processes of drying and salinization of soil are enhanced, in the central part of the delta - drying, desertification and salinization, in the peripheral part of the delta - desertification and destruction of soil. In the future, these processes can progress with a possible increase in the volume of water intake in the middle and upper parts of the river. All this leads to a gradual degradation of land and vegetation cover, desertification of the territory, decrease in soil fertility and productivity of forage lands [11].

The problem of disturbance and pollution of soil surface continues to worsen in regions due to the development of resource-extracting and processing industries.

According to the land balance data, as of November 1, 2017, there are 249.8 thous. ha of disturbed land in the republic, on which dumps of overburden rocks, tailing pits, ash dumps, coal and mining quarries, oil fields and barns are located. In the East Kazakhstan region, land is polluted with compounds of copper, zinc, cadmium, lead, arsenic, most adversely between the cities of Ust-Kamenogorsk, Ridder, Zyryanovsk. In the Pavlodar region, sources of pollution are the enterprises of mechanical engineering, chemical, coal and Ekibastuz GRES. In the Karaganda region, land pollution is associated with waste from mining and metallurgical industries.

There are more than 350 industrial and household waste storage sites in the region. In the Kyzylorda region, sources of pollution are oil and gas production enterprises. Technologically polluted lands of the Kostanay region are widespread in industrial zones of cities, in zones of mining and processing of minerals, where the issue of environmental pollution caused by the ash dumps of the Troitsk GRES and tailing dumps of the Sokolovsko-Sarbaysky mining and processing plant is acute. In the North Kazakhstan region, the development of gold and polymetallic deposits causes land contamination with arsenic and heavy metals, moreover in agriculture there is an acute problem of obsolete and unusable pesticides, their chemical identification, and requires their disposal [6].

Thus, it should be noted that soil-ecological state of the territory of Kazakhstan is extremely tense. The destabilization of ecological situation has reached such an extent that the processes of soil self-restoration have become impossible. The available information does not provide a complete picture of the level and nature of pollution of all lands of Kazakhstan. Therefore, it is necessary to pay special attention to the soil-ecological state of the territory of Kazakhstan and, to develop recommendations for the prevention and stabilization of ecological situation based on scientific data.

As a result of the ongoing intensive processes of degradation and desertification and the deterioration of ecological situation, there has been an intensive decrease in soil fertility, i.e. according to the agro-chemical service of the republic, not only the effective, but also the potential soil fertility decreased by 40 %, and the productivity of agricultural crops also decreases. The use of fertilizers plays an important role in the preservation and reproduction of soil fertility and increasing the productivity of agricultural crops. Many participants in the global food market also recognize the direct relationship between global food security and the availability of mineral fertilizers.

World experience in production and use of mineral fertilizers in various soil-climatic zones and in different regions of the globe showed that mineral fertilizers ensure the preservation of soil fertility, increase crop productivity and produce up to 50 percent and higher of additional yield. For example, American scientists range 41 % of fertilizers in improvement of crop yields, German scientists half crop increase, French - from 50 to 70, Russian - up to 50-60, and Kazakhstan - from 35 to 50 %.

According to the Republican Scientific and Methodological Center of Agrochemical Service for the last 10 years, for all types of soil there was a decrease in the weighted average humus content to 20.5 %. For the research period 2007 - 2017, it was revealed that soils with low humus concentration occupy 76.6 %, medium - 22.4 % and high - 1.0 % of the explored arable land.

The main reason for the decreased soil fertility, in addition to natural factors, is the reduction in the use of mineral and organic fertilizers, non-compliance with agrotechnical requirements, as well as the lack of science-based crop rotation systems.

At present, the state of use of mineral fertilizers in Kazakhstan is as follows: the volume of fertilizers applied per 1 ha of agricultural crops is much lower than in the CIS and foreign countries. Thus, in 2016, only 8 % of biological need of crops was applied, in 2017 14 %, and in 218 this figure was 17 %. Whereas, annually the removal of nutrients from the soil with yield is 100 times higher than their intake with fertilizers. Obviously, in such quantity of applied fertilizers, it is impossible to guarantee high yields and reproduction of soil fertility. In this regard, in the future, according to the State Program on AIC De-

velopment in RK, it is planned to increase the use of mineral fertilizers to 20 % by 2021. As we can see, there is a dynamic increase in the supply and use of mineral fertilizers. However, this is not enough to get a good quality crop and provide the population of the republic with food products.

In order to fully meet the biological need of crops in mineral nutrition, it is necessary to take urgent measures aimed at production and supply of mineral fertilizers to the country's agriculture.

In this regard, the strategy for the sustainable development of agricultural sector of the country's economy includes the development of the domestic chemical industry, in particular production of mineral fertilizers based on the construction of factories in such cities as Aktobe, Uralsk and Mangystau and modernization of the existing plant in Taraz, which to a certain extent gives the possibility, in the future, to ensure the preservation and improvement of soil fertility and productivity of agricultural crops. Also, the revision of the mechanism of subsidizing mineral fertilizers allows to increase their application volume.

Currently, agrochemical studies by State order are conducted separately in the republic and they are among general issues of land cultivation of AIC of the country, and insignificant financial resources are allocated which do not provide solutions of the global problems and in-depth research in the field of agricultural chemistry.

The results of long-term researches carried out by agrochemical institutions and agrochemical service, scientists of our Institute, as well as the practice of fertilization of agriculture shows that high productivity of modern agriculture is achieved in case of the strict observance of the laws of scientific management of production. At the same time, there should be sufficient amount of nutrients in soil, and specialists should have knowledge of not only the patterns and characteristics of mineral nutrition of plants, but also the state of soil fertility.

The analysis of agrochemical studies of the republic shows long-term stationary experiments conducted in conditions of various soil types and crop rotations and the possibility of purposeful regulation of soil fertility. When using scientifically-based fertilizer systems, it is possible not only to preserve, but also to increase soil fertility, and on this basis to obtain stable good quality yields. Thus, the results of the studies of Chernenok V.G., conducted on dark-chestnut soils of the dry-steppe zone of northern Kazakhstan under strict experimental conditions for 15 years of extensive use of arable land, showed a decrease in humus concentration by 8.1 % compared to the original.

Whereas, if used correctly even in dry conditions, fertilizers can increase crop yields by 30-50 %. This suggests that fertilizers contribute to economical use of moisture per unit of production, especially in dry periods. A huge amount of experimental material on black soils of southern northern Kazakhstan has been accumulated, which makes it possible to get an idea of transformation processes of humic substances. Studies on total humus concentration before sowing wheat showed that a high amount of humus is contained in the variant with permanent wheat sowing. Humus consumption per 1 c of grain on the background without fertilizers in the 3 field crop rotation was 1.86 and in 5 fields crop rotation - 1.5 kg, and on the background of fertilizers - 0.85 and 0.65 kg, respectively.

In the conditions of light chestnut and dark chestnut soils of the south-east of Kazakhstan by the research of Ramazanova S.B. and according to our data, the observance of scientifically-based crop rotations with the use of organic fertilizers contributed to the expanded reproduction of soil fertility. Optimization of tillage systems in crop rotation can transfer it from a

factor of destruction into a factor of creating soil fertility and make it less energy- and labor-intensive. In conditions of crop rotation on irrigated dark-chestnut soils, the combination of tillage systems and fertilizers provides an increase in productivity of crop rotation fields by 22 %. The organomineral fertilizer system is the most effective fertilizer system on the background of optimal tillage system in crop rotation. However, the long-term cultivation of crops in crop rotation without use of fertilizers led to the decrease in humus concentration in soil, and the use of organic-mineral fertilizers – to the reproduction of soil fertility. At the same time, the systematic use of mineral fertilizers provided an increase in crop yields in the range of 1.3-3 times compared with the variant without use of fertilizers.

On irrigated dark chestnut soils, according to the data of Aitbayev T.E. and our research, the use of organic fertilizers and development and introduction of vegetable -grass crop rotation ensured the conservation and tendency of expanded reproduction of soil fertility. Humus concentration in the topsoil increased by 14.7 %, compared with the control variant of intensive vegetable crop rotation. According to academician Eleshev R.E., on meadow chestnut soils of southeastern Kazakhstan, long-term use of fertilizers (for 4 rotations) under conditions of fodder crop rotation had a positive effect on soil agrochemical properties, enriching it with mobile forms of nitrogen, phosphorus and potassium. It has been determined that application of double and triple doses of phosphate fertilizers forms a high level of phosphate stock in soil, which makes it possible to cultivate crops (Sudanese grass and alfalfa) without applying phosphoric fertilizers.

In preservation and reproduction of soil fertility, the observance of science-based crop rotations plays an important role. Experiments which focus on agronomic matters and are intended primarily for the development of rational methods of crop cultivation in specific environmental conditions, provided methodological assessment of agroecosystem and its sustainability under the influence of agronomic influences for decades. Particularly long term field experiments resulted in the leading achievements in agricultural science [12]. Long-term experiments make it possible to trace the effect of the tested techniques (or their system) on crop yield during a number of years. This makes it possible to identify the effect of the technique which is explored in the experiment, depending on different meteorological conditions in different periods. Among the investigated factors, fertilizers are on the first place (55 %), then crop rotation (25 %), soil tillage system (11 %) [13]. Currently, issues related to the resistance of agro-ecosystems to global climate change are raised which "... are not comparable with anything that the mankind has experienced throughout the whole known history, and those that are ahead can bring changes of even greater scale. The Earth that will be inhabited by grandchildren and grand-grandchildren in the middle of the XXI will be very different from the present Earth"[14].

Researches in the system of long term field experiments allow to cover many related issues in other areas of science: soil science, agriculture, crop production, ecology. They are of great historical value and significance for economy and sociology [14].

Based on the results of long-term experiments in assessing the use of fertilizer nutrients in various weather conditions, the need to maintain stationary experiments and improve the effectiveness of their research has been shown.

In recent years, funding for research Institutes of the Ministry of Agriculture has sharply decreased, which has led to a reduction in the number of researchers and technical staff. In such conditions, it is more convenient to conduct short-term experiments, and therefore targeted sup-

port is needed for long-term experiments as the basis for experimental research in the field of sustainable agriculture. It is necessary to create an electronic database that will increase the demand for the results of the experiments.

Currently, soil scientists and agrochemists of Kazakhstan justified scientific approaches to the rational use and preservation of soil fertility and developed a unified methodology for a systemic approach to agrochemistry of biogenic elements in "soil-plant-fertilizer" system in terms of crops and soil-climatic zones. Methods of optimizing plant nutrition and effective ways of obtaining high and stable yields of major crops in harsh hydrothermal conditions have been developed.

When using scientifically justified fertilizer systems, it is possible to preserve and improve both soil fertility and crop productivity. Today, land cultivation should be highly productive, sustainable, cost-effective based on rational use of land.

Proceeding from the above, it should be noted that in order to improve farming systems, it is necessary to conduct large-scale integrated cartography, including assessment of the current state and diagnostics of degradation processes. It requires the development of comprehensive programs and solution of environmental problems and soil protection and restoration of fertility of disturbed soils, measures to prevent further soil degradation, restoration of fertility of eroded, dehumused and technologically disturbed lands, improvement of pastures, etc.

Effective use of soil resources requires fundamental knowledge of soil nature, soil-forming process based on the study of genesis and geography of the soil surface in the country.

Scientists of the U. Uspanov Kazakh Research Institute of Soil Science and Agrochemistry, awarded Labor Red Banner Order conducting fundamental and applied research in the field of soil and agrochemical science, are developing measures aimed to reduce and improve ecological situation of soil surface of the republic.

In each specific region, a special scientifically based approach is needed in view of the natural and climatic conditions, knowledge of the laws of nature, and development and implementation of new innovative technologies. Gradually, by soil-climatic zones, an assessment of modern soil-reclamation, agro-ecological state of soil of the republic is carried out using methods of remote sensing of land (RSL), geographical information system (GIS technology). Developed scientifically-based methods of detoxification of contaminated soils and methods of improving humus status and biological activity of soil by using methods of soil biotechnology; soil fertility reproduction technologies based on new bio-mineral and bio-organic fertilizers.

Developments of the Institute are in great demand among producers and provide high and stable crop yield on degraded lands. Thus, new technology of development of highly saline alkaline soils (NTHS) and its modifications contribute to reduction of doses of ameliorants and fertilizers and increasing soil fertility and crop productivity. Production tests of the developed technologies in cultivation of rice and corn on degraded lands of Almaty, Kyzylorda and Turkestan regions allowed increasing their productivity from 30 to 90 %. The use of modified poly-functional zeolite fertilizers on degraded soils contributes to the preservation of soil fertility and increase the yield of soybean, rice, grain crops and potatoes by 30-50 %. In terms of irrigation, organic farming, by incorporating bio-ameliorants into soil, it ensures production of environmentally friendly products and increase in rice yield from 14 to 80 %.

Based on soil-geographic, soil-reclamation, soil-erosion and agrochemical studies, the Institute's scientists assessed

soils in all natural areas using GIS-technologies. A data bank was including cartographic, analytical and textual information on soils and providing great opportunities for the development of new directions and use of electronic soil maps, recommendations on protection and rational use of soil resources were was developed.

The Republic of Kazakhstan entered a new century and faced the most serious environmental problems, like most other States, the solution of these problems has been included to the rank of State policy. The Strategy 2050 of the Republic of Kazakhstan provides measures for sustainable development of agricultural sector, in particular, the improvement of existing and development of new agricultural technologies for crop cultivation based on preservation and reproduction of soil fertility. Ensuring food security is one of the main trends in the country's sustainable development in the XXI century.

The issue of ensuring food security of the population of the country is possible on the basis of rational use of agricultural land and targeted management and regulation of soil fertility. In this regard, we believe that more than ever it is necessary to adopt the Laws "On soil protection", "On State regulation of ensuring agricultural land fertility", as in other countries, or to develop a unified State program "Fertility", creating the basis for ensuring food security country.

In this article, we tried to highlight aspects related to the causes of global problems, each of which has its own specific content, and all of them are closely interrelated. Solving one of the problems is impossible without considering the others.

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ТҮЙІН

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ҚАЗАҚСТАН РЕСПУБЛИКАСЫНЫҢ ТОПЫРАҚ ПЕН ЖЕР РЕСУРСТАРЫНЫҢ ЖАЙ-КҮЙІ МЕН ТИІМДІ ПАЙДАЛАНУ

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Мақалада топырақ пен жер ресурстарының бүгінгі жағдайы мен тиімді пайдалану туралы ақпарат келтірілген. Қазақстан территориясының топырақ жамылғысының жағдайы , антропогендік қысымдар мен табиғи ресурстарды тиімді пайдаланбаудан туындайтын қазіргі заманғы экологиялық мәселелерге байланысты.

Түйіндіі сөздер: топырақ, топырақ жамылғысы, құнарлылығы, жер ресурстары, деградация, экологиялық мәселелер.

РЕЗЮМЕ

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СОСТОЯНИЕ И РАЦИОНАЛЬНОЕ ИСПОЛЬЗОВАНИЕ ПОЧВЕННЫХ И ЗЕМЕЛЬНЫХ РЕСУРСОВ РЕСПУБЛИКИ КАЗАХСТАН

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Аннотация. В статье приведена информация о состоянии и рациональном использовании почвенных и земельных ресурсов Казахстана. На состояние почвенного покрова территории Казахстана оказывают влияние современные экологические проблемы, возникшие в результате антропогенной нагрузки и нерационального использования природных ресурсов.

Ключевые слова: почва, почвенный покров, плодородие, земельные ресурсы, деградация, экологические проблемы