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Ecological Problems of Land Cover in Azerbaijan and Ways to Eliminate Them

Abstract

Azerbaijan, in addition to being a country with diverse natural and geographical conditions, also has a rich soil cover. However, in recent decades, as a result of improper use of land resources, the impact of agricultural and industrial activities, ineffective irrigation systems, as well as weak environmental control, the soil cover has faced serious ecological problems. In various regions of the country, soil erosion, salinization, pollution, and a decrease in soil productivity are observed as a result of anthropogenic impacts. Soil erosion occurs mainly as a result of deforestation in mountainous and foothill areas, excessive exploitation of pastures, and improper cultivation of the soil on slopes. This results in soil washing and a decrease in productivity. In the lowland region, improper construction of irrigation systems and poor development of the drainage network lead to soil salinization, which negatively affects agricultural productivity. In addition, industrial waste and excessive use of pesticides and chemical fertilizers in agriculture cause chemical pollution of the soil cover.

Keywords: *soil degradation, erosion, salinization, chemical pollution, land reclamation measures*

Introduction

Azerbaijan's rich natural resources and diverse climatic conditions play an important role in the formation of the country's land cover. These lands not only constitute the main basis of agriculture, but also are one of the main factors ensuring the sustainability of ecosystems. However, in recent years, intensive industrialization, population growth and unsustainable use of natural resources have turned the protection of land resources into an important ecological and social problem. In this regard, the issues of land protection, restoration of their quality and sustainable use have become an object of urgent scientific and practical research (Hasanov, 2001, p. 32). Although the factors affecting land cover in modern times are different, their common result is the deterioration of soil quality indicators. The ineffectiveness of traditional farming methods, improper use of water resources and changes in natural landscapes complicate the restoration of land resources. All these situations pose a serious threat to food security, environmental protection and sustainable development of agriculture in the country. Ecological problems of soil cover are among the issues discussed not only at the local level, but also in the regional and international context. To solve these problems, it is necessary to apply both regulatory and legal mechanisms at the state level and implement scientifically substantiated measures. Research conducted in this area in Azerbaijan requires a deeper study of factors such as soil degradation, erosion processes, salinization and pollution and the identification of ways to eliminate identifies the main sources of danger, and focuses on practical and scientific approaches recommended for eliminating existing problems. The goal is to formulate effective approaches aimed at the protection and sustainable use of soil resources (Mammadov, 2007, p. 856).

Research.

Ecological Status and Prospects for Sustainable Use of Land Resources in Azerbaijan

Land resources are vital components of nature, playing a key role in ecosystem productivity, the water cycle, and biodiversity. Azerbaijan’s diverse climate and geography have led to various soil

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types. However, in recent decades, soil quality has significantly declined—evidenced by reduced arable land, falling productivity, degraded structure, and weakened biological activity. These changes stem largely from human activities, such as unsustainable agricultural practices, poor irrigation management, and chemical overuse. Climate change has further intensified erosion and salinization. Given this, sustainable and planned land use has become essential. Soil degradation not only disrupts ecosystems but also threatens food security and socio-economic stability. Thus, land use strategies must consider long-term environmental and social impacts alongside short-term economic gains (Aliyev, Aliyev, 2023, p. 33). Sustainable use involves protecting, restoring, and preserving land for future generations. This requires science-based management, land monitoring systems, and stronger environmental legislation. The study explores local and regional causes of soil degradation, analyzes their geographical distribution, and proposes priority actions to restore ecological balance—laying the groundwork for land reform and technological innovation in agriculture (Abdulaliyeva, Alekperova, 2017).

Table 1. Distribution and Coverage of Land Cover in Azerbaijan by Ecological Problems (as of 2023)

Type of Problem	Approximate Area Covered (thousand ha)	Proportion of Total Land Fund (%)	Most Affected Regions
Eroded soils	1,200	14.3%	Guba-Khachmaz, Shaki-Zagatala, Ganja-Gazakh
Salinized soils	620	7.4%	Aran region, Kura-Araz lowland
Chemically polluted soils	210	2.5%	Sumgayit, Mingachevir, Absheron
Land lost to urbanization	180	2.1%	Baku, Absheron, Ganja
Soils with decreased biological fertility	950	11.3%	All regions (especially cultivation zones)

Source: FAO. (2023). Assessment of environmentally sensitive areas on soil salinization and desertification. https://storymaps.arcgis.com/stories/0459ecde8b05451cb93dbee7d0b51fcb

The data shown in the table presents various problems reflecting the ecological state of the soil cover in Azerbaijan and the areas they cover. Eroded soils account for 14.3% of the country's land fund in total and are mainly widespread in the Guba-Khachmaz, Sheki-Zagatala and Ganja-Gazakh regions. This problem leads to soil erosion, reduced productivity and damage to agriculture. Salinized soils account for 7.4% and are especially observed in areas with insufficient irrigation and drainage systems in the Aran region and the Kur-Araz lowland (Babayev, 1995). Soils associated with chemical pollution account for 2.5% of the country's land fund and are more widespread in areas under the influence of industrial waste in industrial cities such as Sumgayit, Mingachevir, Absheron. Lands lost as a result of urbanization account for 2.1% and lead to the destruction of land plots in areas such as Baku, Absheron, Ganja due to the intensification of road infrastructure and construction projects. The table shows the general picture of the state of soil resources and how each environmental problem manifests itself in specific regions (Azerbaijan State Agrarian University, 2021).

Table 2. Protection Measures Taken Against Ecological Threats to Land Resources in Azerbaijan (as of 2023)

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Ecological Problem	Type of Measure	Area Covered by Measure (thousand ha)	Most Commonly Applied Regions
Soil erosion	Soil conservation, crop rotation	1,100	Guba-Khachmaz, Shaki-Zagatala
Salinization	Modernization of irrigation systems	500	Aran region, Kura Araz lowland
Soil chemical pollution	Application of organic fertilizers	300	Sumgayit, Mingachevir, Baku
Land loss (urbanization)	Land rehabilitation	150	Baku, Absheron, Ganja
Forest soil erosion	Afforestation and reforestation	180	Gadabay, Guba, Shaki

Source: (Aliyev, Aliyev, 2023).

The table shows the protective measures adopted against the ecological hazards of soil resources in Azerbaijan and the areas they cover. Soil protection and crop rotation measures are implemented to combat soil erosion, these measures cover a total of 1,100 thousand hectares and are mainly applied in the Guba-Khachmaz and Sheki-Zagatala regions. Measures to renew irrigation systems are being taken to combat salinization, these measures cover a total of 500 thousand hectares and are mainly applied in the Aran region and the Kur-Araz lowland. The application of biological fertilizers to combat soil chemical pollution is being carried out on an area of 300 thousand hectares, and this is mainly done in the Sumgayit, Mingachevir and Baku regions. Afforestation and restoration measures are being implemented to combat forest erosion, covering an area of 180 thousand hectares and are particularly applied in the Gadabay, Guba and Sheki regions. The table shows that measures implemented to solve land problems in Azerbaijan are aimed at improving the condition of soils in different regions and strive to ensure the sustainability of the ecosystem (Hajiyev, Huseynov, 2009).

Table 3. Territorial Changes Due to Ecological Impacts of Land Use in Azerbaijan (2010-2023)

Land Use Type	Land Area in 2010 (thousand ha)	Land Area in 2023 (thousand ha)	Change (%)	Most Affected Regions
Agriculture	3,800	3,500	-7.89	Aran region, Shaki-Zagatala, Guba-Khachmaz
Forestry	300	250	-16.67	Gadabay, Shaki, Guba
Urbanization and infrastructure	100	250	+150	Baku, Absheron, Ganja
Irrigated lands	1,200	1,100	-8.33	Aran region, Kur-Araz lowland
Nature parks and ecotourism	50	70	+40	Gabala, Guba, Barda

Source: (BMT, 2024).

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The table shows changes in land use in Azerbaijan from 2010 to 2023 and their ecological impacts. While the total area of agricultural land was 3,800 thousand hectares in 2010, this area decreased to 3,500 thousand hectares in 2023, which is a decrease of 7.89%. This decrease is mainly observed in the Aran region, Sheki-Zagatala and Guba-Khachmaz regions. The area of forestry has also decreased. The forest area, which was 300 thousand hectares in 2010, decreased to 250 thousand hectares by 2023, which indicates a decrease of 16.67%. On the contrary, the area of urbanization and infrastructure development increased from 100 thousand hectares to 250 thousand hectares. This represents a huge increase of 150% and indicates the acceleration of urbanization processes, especially in the Baku, Absheron and Ganja regions. These changes have increased the impact of land use on ecosystems and led to the depletion of natural resources. The area of irrigated land has also decreased by 8.33% since 2010, from 1,200 thousand hectares to 1,100 thousand hectares. This table presents the changing areas of land use in Azerbaijan and their ecological consequences, highlighting the next steps to be taken for sustainable development and ecosystem protection (Ministry of Agriculture of the Republic of Azerbaijan, 2022).

The ecological state of land resources in Azerbaijan is of great importance both for the country's economic development and the standard of living of the population. Various methods and approaches are applied for the sustainable use and protection of land. However, land problems in the country still cause serious concerns. These problems are not only related to farming and agriculture, but also lead to environmental difficulties that hinder social and economic development. Improper use of land resources, ecological degradation and, as a result, a decrease in agricultural productivity have a negative impact on the well-being of the population living in these areas. Soil erosion, salinization, chemical pollution and other environmental problems require special measures to restore and protect the land (Hajiyeva, 2024, p. 24). North One of the main problems facing the country is the correct application of crop rotation and intensive use of land in order to restore eroded lands (Ministry of Agriculture of the Republic of Azerbaijan, 2022).

Conclusion

Improving the ecological status and ensuring sustainable use of land resources in Azerbaijan is an important component of the country's overall development strategy. The measures taken for this purpose serve the purpose of optimal land use, environmental protection and increasing agricultural productivity. At the same time, the problems arising in land resource management, in particular factors such as erosion, salinization and chemical pollution, require serious appropriate measures. The solutions presented should not be limited only to soil protection methods, but should also be aimed at promoting sustainable land use policies, education and more active participation of local communities. Such an approach, in addition to ensuring the protection of ecosystems and biodiversity, will also give impetus to the future development of agriculture. As a result, by strengthening the legislative framework for land resource management at the state level, as well as taking advantage of modern technologies and international practices, progress can be made in the efficient use of the country's land resources, improving the quality of arable land and restoring land. The work carried out in this direction is also of great importance for improving the well-being of the population in Azerbaijan and protecting land resources for future generations.

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