

ANNOTATION

to the dissertation work of Dariga Sagandykova on the topic
“Development of the scientific bases for use effective technologies in land
management (on the example of Talgar district Almaty region)”, submitted for the
degree of Doctor of Philosophy (PhD) in the educational program
8D07308 – “Land Management”.

Relevance of the research topic. At the present stage, the issues of rational use, protection, and management of land resources in the Republic of Kazakhstan are among the priority directions of state policy. The socio-economic development of the country, ensuring food security, increasing the efficiency of agricultural production, and maintaining environmental sustainability are directly related to the rational use of land resources. In this regard, the improvement of the land management system and the development of its scientific and methodological foundations are of particular importance.

In the field of land management, such important tasks as maintaining the State Land Cadastre, organizing land monitoring, accounting for the land fund, state control over land use and protection, registration of rights to land plots, and assessment of the qualitative and quantitative condition of land resources are carried out. In addition, measures aimed at land protection, increasing soil fertility, restoring degraded lands, involving new lands in agricultural circulation, and rational territorial organization require stable financing and scientifically justified decision-making.

In accordance with the land legislation of the Republic of Kazakhstan, land reform is being implemented, informational support for the State Land Cadastre and land monitoring is being provided, innovative technologies are being introduced, the material and technical base is being improved, topographic-geodetic, cartographic, soil, and geobotanical surveys are being conducted, and land management projects are being developed. The quality and efficiency of these activities directly depend on the level of application of modern digital technologies.

In recent years, Geographic Information Systems (GIS), remote sensing data, Unmanned Aerial Vehicles (UAVs), blockchain technology, artificial intelligence, and big data processing methods have been widely used worldwide in land resource management. These technologies make it possible to automate the processes of collecting, storing, processing, and analyzing spatial data, improve the accuracy and reliability of land cadastre information, and enhance the quality of land-use planning. Geographic Information Systems play a particularly important role by integrating diverse land resource data into a single information environment, enabling their rapid analysis and supporting scientifically grounded management decisions.

The Talgar District of Almaty Region is characterized by diverse natural and climatic conditions, extensive agricultural lands, and increasing pressure on land resources due to population growth. Therefore, the development of scientific foundations for the application of modern digital technologies in land resource management, land parcel registration, land monitoring, and the preparation of land management projects within the district represents an important scientific and

practical challenge.

Under these conditions, studying the effectiveness of applying Geographic Information Technologies, blockchain, and artificial intelligence elements in land management activities, assessing their impact on land resource management systems, and developing practical recommendations for their implementation are of particular importance. Therefore, the research topic devoted to the development of scientific foundations for the application of new efficient technologies in land management activities within the Talgar District of Almaty Region fully meets modern requirements and possesses high scientific and practical relevance.

Aim of the research: the aim of this study is to develop the scientific foundations for the application of new effective technologies based on the use of geographic information systems in land management works for the purpose of studying land resources in the Talgar district of the Almaty region.

Research objectives:

- To conduct a literature review of research in the field of land management works;
- To use geological and geographical data of the study object;
- To develop the scientific foundations for the application of new effective technologies in land management works in the Talgar District of Almaty Region;
- To apply effective Geographic Information System (GIS) technologies in land management;
- To use modern technologies such as Geographic Information Systems, blockchain, and artificial intelligence in land management and land accounting.

Research idea. The study is based on an analysis of the results of theoretical and applied research substantiating the relevance of the topic and the tasks to be solved. It provides a scientific justification for the application of new effective technologies based on geographic information systems in land management works for the purpose of studying land resources in the Talgar district of the Almaty region.

Methodology and research methods:

- Scientific research in the field of land management works, as well as the use of geological and geographical information on the Talgar District of Almaty Region;
- Research aimed at obtaining geological and geographical data on the Talgar District of Almaty Region;
- Scientific foundations for the application of new effective technologies in land management works in the Talgar District of Almaty Region;
- The use of effective Geographic Information System (GIS) technologies in land management;
- The application of modern technologies such as Geographic Information Systems, blockchain, and artificial intelligence in land management and land accounting.

Scientific novelty of the research: The development of scientific foundations for the application of modern effective technologies at the research sites in land management works in the Talgar district of the Almaty region is of significant

importance for improving land resource management and ensuring rational land use. The application of geographic information systems, blockchain, artificial intelligence, and other modern technologies in land management and land accounting makes it possible to determine new optimal parameters of effective technologies based on the use of geographic information systems.

Scientific provisions of the dissertation:

- Based on the generalization of research by scholars in the field of land management, new effective modern methods have been proposed;
- Geological and geographical data of the territory of the Talgar district of the Almaty region have been studied, and their optimal parameters and conditions have been determined;
- Scientific foundations for the application of new effective technologies in land management works in agricultural enterprises of the Talgar district of the Almaty region have been developed;
- A scientific justification of the results obtained using geographic information systems has been established in accordance with the technological patterns of land management;
- Modern technologies such as geographic information systems, blockchain, and artificial intelligence have been applied in land management and land accounting.

Theoretical significance of the research. In the course of the research, the global scientific and theoretical foundations of land management works, their stages of development, as well as the experience of developed countries in this field were systematized and analyzed. In addition, the features of applying blockchain technology in the international practice of land parcel registration and land rights accounting were studied. Taking into account the geological and geographical conditions and characteristics of land resources of the Talgar District of Almaty Region, the scientific and methodological foundations for the application of Geographic Information Systems (GIS), blockchain technologies, and elements of artificial intelligence in land management works were refined.

The results of the study contribute to the improvement of methods for collecting, processing, storing, and analyzing spatial data in the field of land management. At the same time, they make it possible to scientifically substantiate the role of geoinformation technologies in conducting the land cadastre, organizing land monitoring, managing land resources, and land-use planning. The conducted research is aimed at developing digitalization processes in land management science, forming theoretical prerequisites for the application of innovative technologies, and improving the scientific foundations of their implementation in practice.

The obtained scientific results make it possible to increase the accuracy of spatial information, improve data management efficiency, and develop methods for making scientifically grounded decisions in the field of land resource management through the application of modern digital technologies in the land management system. These results can serve as a theoretical basis for further improvement of scientific research in the fields of land management, land cadastre, geodesy, and geographic information systems.

Practical significance of the research. Practical significance of the study.

The practical significance of the study lies in the development of specific recommendations for the application of modern Geographic Information Systems (GIS), blockchain technologies, and digital information systems in land management works within the Talgar District of Almaty Region. Based on the conducted research, methods for the use of geoinformation technologies have been proposed, aimed at improving the processes of collecting, processing, and analyzing spatial data on the land resources of the district.

The results of the study can be applied in land parcel accounting, land-use planning, land monitoring, assessment of land quality conditions, as well as in organizing measures for land transformation and improvement. In addition, practical recommendations have been developed for the application of blockchain technology in land parcel registration systems and land rights accounting, which enhance the transparency, reliability, and security of cadastral information.

The geoinformation software products and digital technologies proposed in the study enable the automation of land management processes, reduce the time required for spatial data processing, decrease labor and financial costs, and improve the quality of managerial decision-making. The research results can be applied in the practical activities of land relations departments, land cadastre organizations, design institutions, and state bodies responsible for land resource management.

The developed scientific and methodological solutions can be applied not only in the Talgar District of Almaty Region but also in other regions with similar natural, climatic, and economic conditions for improving land management practices. This, in turn, will contribute to effective land resource management, rational land use, and increased economic efficiency of land management.

Publication of research results. On the topic of the dissertation, 11 scientific articles have been published, including 2 articles in international peer-reviewed scientific journals indexed in the Scopus database, 4 articles in journals of the Committee for Quality Assurance in the Field of Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan, as well as 5 articles in the proceedings of international scientific and practical conferences.

List of main publications:

1 Scientific Foundations of Application of New Effective Technologies in Land Surveying Studies (On the Example of Talgar District, Almaty Region) // Instrumentation Measure Métrologie Vol. 23, No. 3, June, 2024, pp. 183-191 Journal homepage: <http://iieta.org/journals/i2m>, 183-191.

2 SUSTAINABLE LAND USE FORMATION FEATURES ON AGRICULTURAL LAND IN KAZAKHSTAN // Editada por el Instituto de Estudios Avanzados de la Universidad de Santiago de Chile, Vol. 12, N° 34, 208-222.

3 Цифрландыру жағдайында елді мекендердің жерлерін ұтымды пайдаланудың теориялық және әдіснамалық негіздері // Журнал: «Ізденістер, нәтижелер – Исследования, результаты» КазНАИУ, Алматы 2024 г., №4., С.375-389

4 Ауылшаруашылық жерлерін жалға беру механизмінің теориялық тәсілдері //

Журнал: «Исследования и результаты», КазНАИУ, Алматы 2024г., №3., С.388-400

5 Анализ формирования земель сельскохозяйственного назначения в Казахстане // Журнал: «Ізденістер, нәтижелер – Исследования, результаты» КазНАИУ

6 Жерге орналастыру жұмыстарын жүргізу барысында геоақпараттық жүйелерді пайдалану // Журнал: «Ізденістер, нәтижелер – Исследования, результаты» КазНАИУ, Алматы 2024 г., №4., С.333-344

Structure and volume of the dissertation. The dissertation consists of 149 pages and includes the main text, conclusion, and list of references. The reference list contains 110 sources. To substantiate the reliability of the research results, the structure of the work includes 33 figures, 17 tables, and supplementary materials.