ISSN: 2450-8160

Herald pedagogiki. Nauka i Praktyka

wydanie specjalne

Warszawa
2021

Editorial Team

(wydanie specjalne) Volume-3, № 1 January 2023

ARCHIVING

Sciendo archives the contents of this journal in ***ejournals.id*** *- digital long-term preservation service of scholarly books, journals and collections.*

PLAGIARISM POLICY

The editorial board is participating in a growing community of ***Similarity Check System's*** *users in order to ensure that the content published is original and trustworthy. Similarity Check is a medium that allows for comprehensive manuscripts screening, aimed to eliminate plagiarism and provide a high standard and quality peer-review process.*

About the Journal

Herald pedagogiki. Nauka i Praktyka (HP) publishes outstanding educational research from a wide range of conceptual, theoretical, and empirical traditions. Diverse perspectives, critiques, and theories related to pedagogy – broadly conceptualized as intentional and political teaching and learning across many spaces, disciplines, and discourses – are welcome, from authors seeking a critical, international audience for their work. All manuscripts of sufficient complexity and rigor will be given full review. In particular, HP seeks to publish scholarship that is critical of oppressive systems and the ways in which traditional and/or "commonsensical" pedagogical practices function to reproduce oppressive conditions and outcomes.Scholarship focused on macro, micro and meso level educational phenomena are welcome. JoP encourages authors to analyse and create alternative spaces within which such phenomena impact on and influence pedagogical practice in many different ways, from classrooms to forms of public pedagogy, and the myriad spaces in between. Manuscripts should be written for a broad, diverse, international audience of either researchers and/or practitioners. Accepted manuscripts will be available free to the public through HPs open-access policies, as well as we planed to index our journal in Elsevier's Scopus indexing service, ERIC, and others.

HP publishes two issues per year, including Themed Issues. To propose a Special Themed Issue, please contact the Lead Editor Dr. Gontarenko N **(info@ejournals.id)**. All submissions deemed of sufficient quality by the Executive Editors are reviewed using a double-blind peer-review process. Scholars interested in serving as reviewers are encouraged to contact the Executive Editors with a list of areas in which they are qualified to review manuscripts.

APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN LAND USE

Gulchera Shadmanova
Barna Rakhmankulova
Tashkent Institute of Engineers of Irrigation and Agricultural Mechanization "TIIAME" national research institute

Abstract: The land factor plays a huge role in the life support of society as a whole and of each of its members individually. The most valuable are agricultural land - the main source of food and the basis of food security of the country. These lands in the total land area occupy a relatively small proportion, their condition is constantly deteriorating due to the undeveloped environmental, economic and legal basis for the use of land. In the set of measures for the rational use of agricultural land, the most important place belongs to the problem of improving land use, including issues of regulating land relations, land ownership, economic regulation of environmental measures, as well as organizational, legal, informational, personnel, technical, technological and agronomic issues. The lack of a scientific concept on the optimal ratio of land to cultivated arable land led to unreasonably accelerated plowing of land, including unproductive, which upset the natural balance, worsened the condition of the land, and reduced the productivity of the fields. With regard to the agro-industrial complex, land protection and protection, that is, bringing land resources in line with environmental laws, is the starting point on the path to a sustainable development model. The transition from utilitarian-consumer land use to integral-protective land, the subject of which would be human society as a whole, and the criterion for assessing and using natural resources - some basic social need, will be quite long. However, in order to avoid environmental disasters, it is important to establish environmental rules for economic activity today. The essence of protecting agricultural lands and increasing their fertility lies in the rational use of nature.

Keywords. Land factor, agricultural land, increasing soil fertility, computer modeling, software, modeling, optimization

Introduction

One of the important directions of increasing the efficiency of farms is their adaptation In Uzbekistan and in Kazakhstan, with its geostrategic territory in Asia, a variety of climatic, historical and socio-economic conditions, the problem of increasing the efficiency of agricultural production is particularly acute. Deep transformations and reforms in the agricultural sector are already yielding their expected results. The formation of market relations in our country is estimated at a fairly high level. At the same time, the diversity of forms and subjects of economic activity, the entrepreneurial environment that provides the conditions for the free development of equal interaction and partnershi p of various forms of entrepreneurial activity become important elements of agrarian transformations.

To solve these problems, agrarian reform is deepening. The basis of all relations in the process of agricultural production is the form of ownership of the means of production and material wealth produced [1]. In this sphere of production, agrarian relations have their own specifics, stipulated by the forms of land ownership, since land is the main means of production.

The ecological condition of the land should be related to its economic characteristics. Therefore, an increase in environmental efficiency should be considered from the standpoint of increasing soil fertility, allowing to obtain additional high-quality products, and improve the economic performance of the economic system as a whole. Therefore, environmental and economic efficiency is the economic effectiveness of a set of measures taken to improve the quality of land and increase productivity [2]. At the same time, it reflects the effectiveness of environmental costs aimed at improving soil fertility and the biological potential of cultivated crops.

Land management is a complex socio-economic process. It is constantly developing and cannot be a one-time event. Therefore, land management projects, primarily on-farm, should be periodically updated (re-compiled or corrected) [3]. At present all land management works are carried out with the latest information technologies. Because this is the demand of the time. To solve problems in the field of land management all over the country use the latest GAT software. Examples include ArcGIS, QGIS, and other software.

Materials and methods

The development of land use to a certain extent relied on centralized, administrative-planning management. The discrepancy between the implemented land use systems and the resource potential of the lands here was compensated by additional (subsidized) state investments to maintain their stability. Under the conditions of additional investments, the problem of detailed accounting of the resource potential and land quality was not as relevant as it is now [4,5]. With a significant reduction in such investments in the last decade, the sustainability of land use systems that do not correspond to the resource potential of the lands and a significant deterioration in their quality. There are so-called "soft" methods for improving soil quality that do not introduce an imbalance in the agricultural system and contribute to increasing soil fertility. Such methods include land reclamation, soil mulching, agro landscape farming, biological protection methods [6].

The system of measures to protect and protect agricultural lands should be based on a comprehensive assessment of their use. The drawback of existing approaches to assessing land use is that only one side of land use is evaluated - the process of crop production. The process of reproduction of soil fertility is not evaluated at all. Meanwhile, the dual nature of the land as the main means of production, the essence of which is simultaneous participation in the reproduction of soil fertility and the cultivation of crops, should be basic.

For the effective use and protection of agricultural land in determining the main directions of the ecological organization of the territory, the following tasks may enter:

- classification of agricultural land by landscape and environmental factors;
- substantiation of the general principles of functioning of agro landscapes, providing not only market efficiency criteria, but also nature conservation measures for land conservation;
- conducting land management related to the creation of environmentally sustainable agro landscapes;
- development of the most rational organizational and economic mechanism ensuring efficient management;
- improvement of the information collection system;
- application of modern data preparation tools focused on new information technology;
- introduction of an integrated organization of information flows;
- creation of databases and data banks [7,8,9];

With a decrease in soil fertility, land users themselves must recover from their own incomes. And, on the contrary, if fertility rises, then the economic value of the land rises, which is equivalent to obtaining additional income. Hence the need arises to determine in the farm the size of the cost equivalent to a decrease or increase in soil fertility, calculated on the entire area of arable land. Moreover, in the first case, we are talking about the cost of such a volume of organic fertilizer that would ensure simple reproduction, and in the second case, the expanded reproduction of soil fertility. Agriculture systems based on the straightforward principles of organizing the territory are poorly coordinated with the topography and environmental laws of nature and do not provide the desired stock-regulating, soil-protective and environmental effect from the application of organizational, economic, agro technical and other protective measures [10]. Under these conditions, erosion processes intensify, causing significant damage to both the integrity of the soil cover and the effectiveness of reducing labor productivity. In this regard, at the present stage of development of agriculture, the most environmentally promising direction in the protection of agricultural lands is the transition to a landscape base, the foundation of which is the contour organization of the territory with the widespread introduction of reclamation and hydraulic engineering measures.

The most important lever for the economic regulation of land relations is the financing of measures for the rational use and protection of agricultural land. The source of financing will be land tax [11,12]. The size of the land tax should be linked to the profit that the company receives from a unit of land, and at present, the land tax is not associated with the results of economic activity. Studies have shown that the implementation of a range of measures for the conservation system of agriculture with land management on a landscape basis gives a significant environmental and economic effect (cost recovery is carried out for 3.7 years). All measures only in aggregate will be able to stabilize the state of land resources, increase the economic efficiency of their use, and prevent soil degradation.

An equally important factor affecting the efficient use of land resources is the state control and software regulation of the protection of agricultural lands, including the use of new information and communication technologies. The modern use of information and communication technologies in agro ecological assessment of land is based on information about the state and properties of components of agro landscapes and takes into account the environmental features of cultivated crops, which must be adapted to the actual geographical and climatic conditions of the area. This approach is relevant in determining the specialization of agricultural sectors on a landscape-ecological basis. Its implementation requires a qualitatively new cartographic basis, the development of computer modeling methods and the implementation of geographic information systems (GIS), the development and development of soil and agro ecological monitoring methods, the development of computer programs and models of environmental risks of crop cultivation, the implementation of flexible design decisions, taking into account the diversity of socio-economic conditions and situations of society and market conditions.

The analysis of the state and assessment of the land resources of a particular region is a complex task, the solution of which requires taking into account a large number of factors in their relationship and mutual influence. In the last decade, geographic information systems (GIS) technologies have been used more widely for this purpose. An important advantage of GIS is the ability to conduct a joint analysis of a large number of individual layers of information based on the laws of geography, mathematical modeling and expert estimates. Moreover, this analysis is carried out not for "point", but for spatial objects, for example, elementary allotments of land. As part of the GIS technology, when analyzing land resources, a computer database (DB) is created containing actual

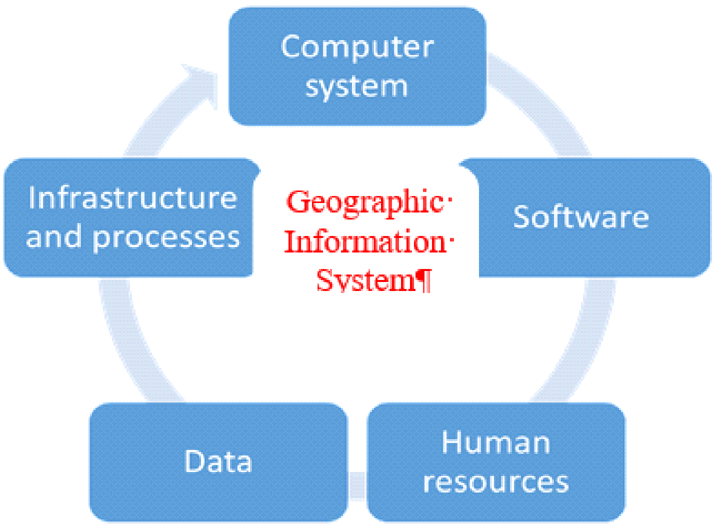

Fig. 1. Components of Geoinformation Systems

information about the state of land resources of the research area. Then, database information analysis algorithms are developed. The implementation of the analysis algorithms and the cartographic presentation of the results are carried out using special software - GIS application software packages.

The geometric part of the database includes a number of layers of basic information about the state of land resources, as well as maps obtained directly in the GIS by analyzing the information of the main layers. Most of the layers of the geometric block of the database is accompanied by

Fig. 1. Components of Geoinformation Systems

information about the state of land resources of the research area. Then, database information analysis algorithms are developed. The implementation of the analysis algorithms and the cartographic presentation of the results are carried out using special software - GIS application software packages.

The geometric part of the database includes a number of layers of basic information about the state of land resources, as well as maps obtained directly in the GIS by analyzing the information of the main layers. Most of the layers of the geometric block of the database is accompanied by attributive information necessary for the implementation of computer analysis. Using GIS technology, you can create slope maps of the terrain and climate, as well as adjust the soil map using materials that automatically process various images. Besides that, GIS constantly works as a cycle with information technologies (Fig 1).

As a result of studies to improve the agro ecological assessment of land, a strategy for assessing the suitability of land resources is determined. At the first stage of constructing the assessment models, an analysis and selection of land properties that could potentially affect the growth of crops within the research region was carried out. The selection of properties was carried out within the framework of three main blocks: climatic, relief, and soil potential limiting properties. The set of properties selected for the estimated types of land use was not constant and varied depending on the environmental requirements of the cultivated crop [13,14]. All selected properties were ranked by the degree of their optimality for culture growth. At the same time, the boundaries of the ranks of individual land properties were also not the same for different cultures and were established using expert estimates based on available stock materials.

Based on the assessment models in the framework of geoinformation technologies, a series of maps was constructed, which shows the suitability of the lands of the research region. The construction was carried out block by block, in the framework of the above approaches. For each type of land use, maps of "climatic", "relief" and "soil" suitability, as well as an integrated map of land suitability were constructed. The obtained results determined the agro ecological potential of the land as a whole, but at the same time the possible environmental consequences from the introduction of the analyzed types of land use were not taken into account. To take them into account, computer models for assessing environmental risks were developed.

In its natural development, any land use system reflects in one way or another the resource potential of soils and landscapes, which shows how efficiently it is possible to use, for example, soil, in an environmentally sound direction. The resource potential of soils is one of the main environmental indicators of their quality and cost. With full compliance with the resource potential of the lands, a specific type of land use will be the least spent, most productive and most environmentally friendly, if the type of land use corresponds to the resource potential of the land, but it is not fully used, then the result will be: low compared to the potential land productivity. In the case of both non-compliance and incomplete use, there is a decrease in quality, land degradation, or an increase in economic costs for maintaining the natural balance of agroecosystems [15,16].

In some places, due to erosion, salinization, and other causes, the soils are degraded and lose their vital ecological functions. Restoring soil bonitet is a very expensive and lengthy process, and sometimes even impossible. Significant types of soil degradation include: water and wind erosion, and deflation; secondary salinization of soil; desertification; flooding; re-compaction; local germokarst; solifluction in the mountains; violation of organogenic soil horizons; chemical pollution with heavy metals and other pollutants. The types of soil degradation that can potentially occur in a particular area are determined by the specifics of land use and climatic conditions.

Analysis and modeling of land suitability for specific crops provides an idea of the resource potential of land. In this case, it is necessary to take into account the requirements of cultivated crops and the technology of their cultivation. Possible environmental consequences that, in principle, may arise during the implementation of various land use systems, have not yet been considered by specialists [17,18]. A joint analysis of both the suitability of land for a specific type of land use, and the possibility of adverse environmental consequences, makes it possible to develop certain practical recommendations for correcting the existing land use system of the studied region and bringing it to the best option, more fully corresponding to the land resource potential and the most rational use. After the correction of the land use system in this direction, it will become more environmentally friendly, less costly and maximally productive in these landscape conditions.

A joint analysis of the suitability and environmental safety of crop production is feasible by constructing a number of models for the optimal placement of agricultural sectors.

According to the first optimal model, land plots that are maximally acceptable for cultivating any of the analyzed crops can be distinguished. Such sites include land characterized by the highest suitability class and minimal environmental risks. These lands can be considered as the best. The results of soil surveys made it possible to obtain additional information about the quality of land and the correction of land use specialization [19,20]. The model for placing agricultural sectors is the least costly and most productive at the same time.

The second model for determining the best type of land use is devoted to building a map of the location of cultivated crops.It is based on the principles of finding the most environmentally friendly and least cost land use system scenario. To this end, the most suitable and at the same time minimally environmentally risky industries were identified. Unlike the first model, where only optimal land was allocated, the second identified the best, but not necessarily optimal, type of land use.

The third environmental safety model for the location of traditional industries reflects the location of crops in which maximum environmental safety is achieved, and only in these conditions - maximum suitability; this is the most environmentally friendly option, but not the most productive [21]. Such modeling gives an idea of the location of agricultural sectors as the most environmentally friendly, but the economic efficiency of the model can be quite low. Comparison of the received cards with the actual distribution of crops allows us to unify the specializations of different types of farms in the absence of sufficient capital investments.

Results

These information technologies in land use can be used to solve the following agroecological problems:

modeling with the formation of probabilistic scenarios for the rational distribution of irrigated crops depending on changes in the ecological and socio-economic situation both at the level of specific farmer and deckman and other types of farms, and at the level of administrative regions, climatic zones of irrigated agriculture;

assessment of the agroecological potential of land; adoption of environmental and economic decisions in the implementation of the correction of the historically established land use system and the assessment of the quality of land resources;

search and assessment of environmentally efficient landscapes, while respecting scientifically based proportions of areas between the main types of agricultural land, which will help protect the types of land used from their active degradation, salinization and even desertification [22].

Solutions to these problems will make it possible to identify both positive and negative aspects of the impact of anthropogenesis on natural-territorial complexes with the least cost and successfully carry out agro-landscape monitoring. The joint use of cartographic materials will increase the environmental awareness of the results of surveys covering vast territories and will allow future studies of inter-landscape relationships on the flows of substances and energy.

The expansion of the computer database and mapping of environmental conditions and risks is one of the rational directions for the use of GIS and the assessment of natural resources in real Earth objects, which is extremely important when obtaining or updating available information about soils, vegetation, natural waters at the level of states and continents of the globe. Obtained on the basis of effective technology, soil and environmental materials can become the basis for further economic justification of land use types and clarification of the rational functioning of various agricultural landscapes.

References:

1.Abdullaev Z.S. Basics of information support of assessment for land valuation. Fan, Tashkent, 2008. P. 93-95.

2.Avezbaev S., Volkov S.N. Land management projecting. Yangi asr avlodi, Tashkent, 2008. 783 p.

3.Berkinov B.B., Rakhmankulova B.O, Karimova X.X. Assessment of the effectiveness of agricultural production activities and modeling of the development of production process. Monograph, Economics, Tashkent, 2013. 105 p.

4.Chertovitskiy A.S. The market for land lease rights is an important factor in increasing the efficiency of its use. 2003. International Agricultural Journal. no. 2.p. 51-53.

5.Ongayev M., Sultanova Z., Ozhanov G., Abisheva S.Engineering and Process Infrastructure of the Agro-Industrial Complex // International Journal of Emerging Trends in Engineering Research.-2019.-7, No. 12. P.879-885. http://www.warse.org/IJETER/static/pdf/file/ijeter257122019.pdf https://doi.org/10.30534/ijeter/2019/257122019

6.Kardash V.A. Optimization economic-mathematical models and methods of analysis in irrigation. Nauka, Novosibirsk, 1973. P. 142-145.

7.Shadmanova G., Abdullaev Z.S. Economic-mathematical methods and models in land management. Musiqa, 2007. 190 p.

8.Shadmanova G., Mirzaev S.S. Economic-mathematical methods and models. TIIM, Tashkent, 2011. P. 22-70.

9.Ongayev M., Tuktarov R. B., Tassanova Zh., Denizbayev S. Assessment of The Current State of Vegetetion of Estuaries in The Zone of Dry Steppes of Western Kazakhstan // Research Journal of Pharmaceutical, Biological and Chemical Sciences. - 2016. - RJPBCS 7 (5). - P. 382-389.

10.Shadmanova G., Mirzaev S.S. Modern information and communication technologies. TIIAME, Tashkent, 2018. 158 p.

11.Umurzakov U.P., Abdurakhimov I.L. Water management. Economics and Finance, Tashkent, 2008. P. 235-240

12.Shadmanova G., Mirzaev S., Karimova X. Upgrading Higher Education through Open Online Courses. International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019. DOI: 10.1109/ICISCT47635.2019.9012019

13.Sharipov D.,Abdullaev Z., Tazhiev Z., Khafizov O. Implementation of a mathematical model of a hexacopter control system. International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019. DOI: 10.1109/ICISCT47635.2019.9011842

14. Abdullaev Z., Kendjaeva D., Xikmatullaev S. Innovative approach of distance learning in the form of online courses. International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019 DOI: 10.1109/ICISCT47635.2019.9011821

15.Allayarov F., Mirzaev S. Support systems for monetary circulation decision-making. Published in: 2019 International Conference on Information Science and Communications Technologies (ICISCT). DOI: 10.1109/ICISCT47635.2019.9011998

16.Shadmanova G., Karimova Kh.Kh. Information systems in water management. 2019 International Conference on Information Science and Communications Technologies (ICISCT). 4-6 November, Tashkent, Uzbekistan. DOI: 10.1109/icisct47635.2019.9011978

17.Karimova Kh.Kh, Shadmanova G., Ziyaeva Sh.K. Choice of optimal options for land use of farms with the application of information technologies. International Conference on Information Science and Communication Technologies. ICISCT-2019, 4-6 November, Tashkent, Uzbekistan. DOI: 10.1109/icisct47635.2019.9011864

18.Rakhmankulova B.O., Abdikayimova G.A., Saparova D.P. Econometric models of using production factors and estimating their efficiency. EPRA International Journal of Economic Growth and Environmental Issues journal-article.DOI: 10.36713/epra0713

19.Ergasheva D., Kasimbetova S., Aynakulov Sh., Sharipov D., Khamraeva Sh. Development a mathematical model of a water-salt balance on irrigated lands of the Sirdarya area. IOP Conference Series: Materials Science and Engineering. DOI: 10.1088/1757-899x/896/1/012050

20.Jiyanova N.Issues of increasing the role of the digital economy in the socio-economic development of Uzbekistan. International journal of trends in business administration ISSN: 2349-4212 2022 year Volume 12 issue 1 Universal impact factor 7.828 https://zenodo.org/record/6370150#.YjrU32pBzIU

21.Durmanov A., Li M., Khafizov O., Maksumkhanova A., Kilicheva F., Jahongir R. Simulation modeling, analysis and performance assessment. International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019. DOI: 10.1109/ICISCT47635.2019.9011977

22.Imomov S., Sultonov M., Aynakulov S., Usmonov K., Khafizov O. Mathematical Model of the Processes of Step-By-Step Processing of Organic Waste. International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019. DOI: 10.1109/ICISCT47635.2019.9011929

23.Sharipov D., Aynakulov Sh., Khafizov O. Computer Modeling of Aerosol Emissions Spread in the Atmosphere. E3S Web of Conferences. DOI: 10.1051/e3sconf/20199705023