

# Information and technological support of digital land management

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**Abstract.** The article discusses issues related to the information and technology provision of digital land management as an instrument of spatial platform of digital agriculture and the digital economy. And the non-formation and technological provision of digital land management (DLM) creates a systemic environment of support for land management, allows one to achieve optimal results in the management of the country's land resources at all territorial levels. The development of information and technological support for digital land management is based on the creation of computer devices (fast processors, high-capacity hard drives, laser scanners and rangefinders, unmanned aerial vehicles, high-resolution digital and optical cameras for remote sensing, etc.), allowing the use of modern technologies for obtaining, storage, transformation and analysis of spatial information. It is the achievements of recent years that make it possible to solve complex spatial problems, taking into account a much larger number of factors and data that affect the quality of their solution. These new types of spatial problems and models form streams of data arrays (Big Data). New technologies, as well as a new paradigm of land management at various territorial levels, should help to analyze and operate with these data. And the most important condition for the further development of all land management should be automation and informatization in all areas of land management in the country, which should be based on digital land management. It is the information technology support of digital land management that should ensure the modernization of the entire industry, which will certainly require state support. This will require an assessment of the financial costs for the creation and implementation of the necessary measures, as well as an assessment of the results from the implementation of these innovations.

## 1. Introduction

Automation and information support of all land management has long been of particular importance in the management of land resources, not only in agriculture, but also in the natural environment. Information bases and platforms of land design of agricultural organizations are disconnected from industrial enterprises because they are based only on analytical, technical and statistical systems, which leads to a decrease in the efficiency of management decisions and increase the percentage of errors in their accounting in the design itself when optimizing the organization of the territory.

Scientific progress and progress in technology in the field of geodesy, cartography is based on the improvement of geodesic and information mechanisms and generally mechanistic growth in general, it



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will be the main reason for the evolutionary leap towards the implementation of automatic complexes and systems in the organization and optimization of land use. It should be noted that at the present stage the need for a systemic professional approach and based on these qualities new models of rational use of the earth has greatly increased [1, 11].

As the lack of support of the state in the matter for a long time and systemic activity on the arrangement of the land did not carry out and so, which resulted in the abolition of the system of land-building service of the country and the elimination of research organizations and the destruction of the system of instructions in the field of design and research.

The most important condition for the further development of the entire land development should be automation and information, in all areas of land management of the country, on the basis of digital land management.

Therefore, it is necessary to take into account that the existing conceptual model of the system of automated land design (SALD) also requires appropriate geodesic support, which in turn also requires global modernization in accordance with the world trends of technology development.

Land management projects, existing to date, take into account the materials of the internal economic assessment of agricultural landscapes not in full, and the relationship between geodesic provision of land management and the information system of automated land design, design is not established.

The creation and pervasive implementation in the practice of the ideology of integrated land development projects based on the application of the agricultural and shape of the territory and their full information support, and digital support - at the moment is a top of the problems and priority of land-building science.

## 2. Results and Discussion

The new system of innovative technologies must comply with the legislative standards.

The development of new technologies will also be based on the technologies of many disciplines of different fields of science, the basis of which is applied mathematics and computer technologies and from the capabilities of intellectual resources will make the project digital land management (DLM) avant-garde in the era of the digital economy.

Any transformation in science requires highly qualified professionals in the subject area, as well as in the field of informational technology, capable of collecting, analyzing, completing and processing all incoming data, materials, indicators based on a comprehensive analysis of information for their entry into the digital space.

An important factor in DLM is the object of land management, that is - land as a spatial basis and natural resource. The current models for problem-solving in land policy produce changes in land-building processes, a circumstance similar to that of natural phenomena, which are very difficult to formalize and program. Such spontaneous and innovative solutions in land management lead to additional costs for processing and storing data and various kinds of their intelligent interpretations.

Important aspects of land properties - agricultural, urban planning, engineering, engineering environmental, sanitary and other, should be systematically taken into account already at the initial level, when monitoring the land, the formation of the initial information about the territory. The role of increasing the demand for information provision in these areas of land management can be compared with the quantum leap. Perennial spatial information in these areas requires a technological solution for the system processing, analytics and storage, eliminating redundancy and duplication, ensuring its updating, and updating.

Geoinformation technologies are an important part of the information technology provision of DLM and are fundamental in layering the organization of land resource data. The lack of up-to-date mapping info does not allow qualitatively to solve the problems of tracking the state of the land.

I think a number of scientists [2, 3, 4, 7, 8] are highlighting a number of problems on the way to the implementation of the digital land management (DLM) project:

“- there is a lack of actual mapping framework, which makes it impossible to solve the tasks of land monitoring in many regions of Russian Federation;

- it is difficult to control vast agricultural areas with the boundaries of separate crop rotation fields, as a result of the lack of digital thematic maps for such categories;

- the topographical maps available in most subjects of RF date back to the end of the last century, and the pace of work on their centralized renewal has decreased significantly;

- the results of the processing of the All-Russian Agricultural Census in 2006, 2009 are largely unreliable because their provision to the statistical reporting collection system was carried out by unqualified users, directly agricultural producers...” [3,5].

All these tasks are basic to:

- develop the latest digital technologies for information support of modern land management;

- development of an information hardware and software complex to create a system of digital land use and land management.

The most important task is to monitor land, control the state of agricultural areas based on artificial intelligence.

The essential criteria of the original mapping materials are their completeness, conformity to the solved territorial tasks.

Thus, digital mapping is the most important and relevant base for digital land management.

Accordingly, high-tech specialized aircraft are required to carry out the tasks, correspond to all the needs of remote sensing, capable of fulfilling a great range of monitoring tasks.

Separately, it is necessary to coordinate the scope of the set and expected tasks related to changes in the content of the land management itself and the modernization of its legal support. The development of automated systems in land management should be carried out in conjunction with the use of geographic information system (GIS) technologies and non-formal modeling of M-structures (BIM).

GIS-Special Purpose Computer Systems are capable of entering, conserving, recycling, modeling and distributing a large mass of data, contained in the text and graphics formats, coordinated in space. BIM is a process based on the use of intelligent 3D models.

Modern GIS and BIM, depending on their functional features, are divided into several conditional groups.

The core group includes particularly significant open systems that are designed for network use and have different applications.

1. The most popular software tools used to solve problems SASPR. The most common are AutoCAD, Global Mapper.

2. In addition to its core function, automated systems have additional capabilities to solve mapping and land-building problems. These include: Rhinoceros 3D, program for all types of cadastral works Polygon-PRO.

3. Software products with tools to create integrated GIS and a mathematical imaging device. These products include ArcGIS, Mapinfo, and ZGIS [9, 10].

4. They carry the entire set of special purpose GIS and BIM for processing and analysis of mapping materials, geodesic materials, land-building. These products include Autodesk - Revit and Civil.

In the context of the rapid growth of informatization and globalization of agricultural production, a worldwide tendency towards an increase in the level of methodological universalization, technological unification and functional detailing of the created information support for all land management, including the land management process, is clearly expressed. The creation of computer-aided design systems in land management is based on GIS technologies, with a set of hardware and software (software) designed to collect, store, process and reproduce a large amount of graphical and textual data with spatial reference. GIS is based on electronic maps (plans) of the area, based on digital elevation models (DEM) and terrain (DTM), which characterize the three-dimensional (3D) location of objects in space. Spatial data is used in many computer programs (for example, in AutoCAD Civil 3D CAD, Surfer, and many others). But only specialized packages of applied programs (PPP) based on GIS and CAD have the necessary set of capabilities to ensure the process of making various management

decisions. They allow you to include new information and update existing data, manipulate the accumulated information, make its spatial and temporal analysis, model and place various objects in space, as well as provide the results obtained, both in computer and traditional forms (in the form of maps, tables, graphs, etc.) [8].

Thus, a set of tools for information technology support of digital land management should form a comprehensive, well-grounded solution of interrelated land management tasks with the achievement of the maximum economic effect as a result of automation, and obtaining additional products not only due to the best land management solution, but also in the form of a new information resource that allows create additional surplus value [8].

### Conclusion

Our research provides us with the following key findings and suggestions:

1. The information systems created in the design and operation of SASPR must have the versatility and the ability to adapt to the various challenges of the land-building design. For this purpose, it is necessary to have a digital basis for projecting.
2. Automation and informatization in all areas of land management of the country, based on digital land management, should be the most important condition for the further development of the entire land development. It should therefore be taken into account that the existing conceptual model of the automated LBDS also requires appropriate geodesic support, which in turn also requires global modernization in line with global technology trends.
3. Since we have the modern land-use systems of countries, there has been a large amount of information due to significant increase in the number of land-related facilities and entities.
4. The implementation of the recommended measures should be carried out on the basis of the federal target program or subprograms of the relevant areas in the field of digital economy. According to our calculations, with regular and timely conduct of all types of land-building work, this level of annual revenues should increase in all related and land-dependent sectors of economy, and achieve an annual additional increase, and come from 30 to 40% [7,8].

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